CITY OF LEBANON AUTHORITY  
LEBANON, PENNSYLVANIA  

GENERAL SPECIFICATIONS  
FOR  
SANITARY SEWER SYSTEM CONSTRUCTION  

TABLE OF CONTENTS  

Note: These General Specifications are arranged in the nationally recognized CSI (Construction Specifications Institute) Format. However, only the applicable Sections of certain Divisions are included, which results in the Section numbering not being consecutive. This Table of Contents is included for convenience only and its accuracy is not guaranteed.  

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.01</td>
<td>SCOPE</td>
<td>GC-1</td>
</tr>
<tr>
<td>1.02</td>
<td>DEFINITIONS</td>
<td>GC-1</td>
</tr>
<tr>
<td>1.03</td>
<td>DRAWINGS AND SPECIFICATIONS</td>
<td>GC-2</td>
</tr>
<tr>
<td>1.04</td>
<td>EXTENSION OF SERVICE GUIDLINES</td>
<td>GC-3</td>
</tr>
<tr>
<td>1.05</td>
<td>DESIGN CRITERIA</td>
<td>GC-3</td>
</tr>
<tr>
<td>1.06</td>
<td>AUTHORITY’S RIGHT OF INSPECTION</td>
<td>GC-5</td>
</tr>
<tr>
<td>1.07</td>
<td>WORKING CONDITIONS</td>
<td>GC-5</td>
</tr>
<tr>
<td>1.08</td>
<td>CONTRACTOR</td>
<td>GC-5</td>
</tr>
<tr>
<td>1.09</td>
<td>LIABILITY</td>
<td>GC-5</td>
</tr>
<tr>
<td>1.10</td>
<td>EXPLORATORY TEST PITS</td>
<td>GC-6</td>
</tr>
<tr>
<td>1.11</td>
<td>STANDARD SPECIFICATIONS</td>
<td>GC-6</td>
</tr>
<tr>
<td>1.12</td>
<td>WORK AREA TRAFFIC CONTROL AND MAINTENANCE</td>
<td>GC-6</td>
</tr>
<tr>
<td>1.13</td>
<td>COMPLIANCE WITH PROVISIONS OF ACT NO. 287</td>
<td>GC-6</td>
</tr>
<tr>
<td>1.14</td>
<td>PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (CLEAN FILL POLICY)</td>
<td>GC-6</td>
</tr>
<tr>
<td>1.15</td>
<td>GUARANTEE PERIOD</td>
<td>GC-7</td>
</tr>
<tr>
<td>1.16</td>
<td>SPECIAL REQUIREMENTS</td>
<td>GC-7</td>
</tr>
</tbody>
</table>
SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>01300</td>
<td>SUBMITTALS</td>
<td>01300-1</td>
</tr>
<tr>
<td>01400</td>
<td>QUALITY CONTROL</td>
<td>01400-1</td>
</tr>
<tr>
<td>01530</td>
<td>CONSTRUCTION BARRIERS</td>
<td>01530-1</td>
</tr>
<tr>
<td>01540</td>
<td>SECURITY</td>
<td>01540-1</td>
</tr>
<tr>
<td>01560</td>
<td>TEMPORARY ENVIRONMENTAL CONTROLS</td>
<td>01560-1</td>
</tr>
<tr>
<td>01570</td>
<td>TRAFFIC REGULATION</td>
<td>01570-1</td>
</tr>
<tr>
<td>01600</td>
<td>MATERIAL HANDLING, STORAGE AND PROTECTION</td>
<td>01600-1</td>
</tr>
<tr>
<td>01710</td>
<td>PROJECT CLEANUP</td>
<td>01710-1</td>
</tr>
<tr>
<td>01720</td>
<td>PROJECT RECORD DOCUMENTS</td>
<td>01720-1</td>
</tr>
</tbody>
</table>

DIVISION 2 - SITE CONSTRUCTION

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>02055</td>
<td>REMOVAL AND ABANDONMENT OF EXISTING FACILITIES</td>
<td>02055-1</td>
</tr>
<tr>
<td>02151</td>
<td>SHORING</td>
<td>02151-1</td>
</tr>
<tr>
<td>02221</td>
<td>TRENCHING, BACKFILLING AND COMPACTING</td>
<td>02221-1</td>
</tr>
<tr>
<td>02270</td>
<td>SLOPE PROTECTION AND EROSION CONTROL</td>
<td>02270-1</td>
</tr>
<tr>
<td>02314</td>
<td>BORED PIPE</td>
<td>02314-1</td>
</tr>
<tr>
<td>02485</td>
<td>SEEDING</td>
<td>02485-1</td>
</tr>
<tr>
<td>02500</td>
<td>PAVING AND SURFACING</td>
<td>02500-1</td>
</tr>
<tr>
<td>02510</td>
<td>OVERLAY PAVING</td>
<td>02510-1</td>
</tr>
<tr>
<td>02601</td>
<td>MANHOLES</td>
<td>02601-1</td>
</tr>
<tr>
<td>02722</td>
<td>SANITARY SEWER SYSTEM</td>
<td>02722-1</td>
</tr>
<tr>
<td>02724</td>
<td>FORCE MAINS</td>
<td>02724-1</td>
</tr>
<tr>
<td>02725</td>
<td>LOW PRESSURE WASTEWATER SEWER</td>
<td>02725-1</td>
</tr>
<tr>
<td>02855</td>
<td>WORK ON RAILROAD PROPERTY</td>
<td>02855-1</td>
</tr>
<tr>
<td>02856</td>
<td>WORK ON HIGHWAY PROPERTY</td>
<td>02856-1</td>
</tr>
</tbody>
</table>

DIVISION 3 - CONCRETE

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>03300</td>
<td>CAST-IN-PLACE CONCRETE</td>
<td>03300-1</td>
</tr>
<tr>
<td>03600</td>
<td>GROUT</td>
<td>03600-1</td>
</tr>
</tbody>
</table>

END OF CONTENTS
SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: General procedures and requirements for submittals.

1.02 DEFINITIONS

A. The term Shop Drawing used throughout this Section includes manufacturer's product data in forms of descriptive literature, specifications and published detail drawings, and also Contractor prepared drawings, certified test records or reports and other certificates required by Specifications.

1.03 SUBMISSIONS REQUIRED

A. General: Descriptions under Submittals Article in each Specifications Section indicates type of submission required. Make submissions to address given as office of Authority.

1.04 CONSTRUCTION PROGRESS SCHEDULE

A. Submit a Schedule of Work in chart form, in accordance with Section 01400.

1.05 SUBMISSION OF SHOP DRAWINGS

A. Submit for approval, one reproducible and one print (Shop Drawing) of fabrication and erection diagrams or layout drawings and five copies of material lists and catalog cuts. Authority will return approved or corrected reproducible and two of five copies of material lists and catalog cuts. Provide additional copies of prints from reproducibles, material lists or catalog cuts if needed for distribution to suppliers or subcontractors.

B. After review by Authority, Shop Drawings will be returned marked as follows: Approved, Approved As Noted*, Approved as Noted, Returned for Correction, Not Approved, or Acknowledge Receipt.

1. Approved: When Shop Drawings are returned Approved, that means Shop Drawings are found to be in conformance with Contract Documents. Authority's approval of Shop Drawings does not relieve Contractor from responsibility for errors or discrepancies in Shop Drawings.

2. Approved As Noted: When Shop Drawings are returned Approved As Noted, that means Shop Drawings are found to be in conformance with Contract Documents.
Documents, provided changes noted by Authority are incorporated in Shop Drawings. Shop Drawings returned Approved As Noted will require resubmission for record purposes only, in accordance with paragraph A. above. Fabrication may proceed if changes are incorporated.

3. Returned For Correction: When Shop Drawings are returned noted Returned For Correction, that means Shop Drawings are found not to be in conformance with Contract Documents. Make required corrections and resubmit corrected Shop Drawings to Authority in accordance with Paragraph A. above. Return only two copies marked-up for correction. No fabrication is allowed.

4. Not Approved: When Shop Drawings are returned Not Approved, that means Shop Drawings are found not to be in conformance with Contract Documents. Make completely new Shop Drawings and submit in accordance with Paragraph A. above. Return only two copies marked-up for correction.

5. Receipt Acknowledged: Shop Drawings returned Receipt Acknowledged means Authority has acknowledged receipt of Shop Drawing and provided applicable comments.

C. Working Drawings for Changes, Substitutions or Contractor Design Items:
1. Have working drawings and calculations certified by a Professional Engineer registered in State of Pennsylvania accompanied by calculations or other sufficient information to completely explain proposed method of construction, including but not limited to type of machinery and method proposed. Submit design calculations with working drawings.

2. Review and approval of working drawings by Authority does not relieve Contractors responsibility with regard to fulfillment of terms of Contract. Contractor is to assume risk of error, with no responsibility by Authority.

D. Identification:
1. Data: Provide following identification data, as applicable, contained or permanently adhered to submittals for approval.
   a. Authority's contract number/name. (See attached suggested sample)
   b. Project name and location.
   c. Number each Shop Drawing using Specification Section numbers followed by 1.0, 2.0, 3.0, etc. for each submittal within a Section. Resubmittals must include .1, .2, .3, etc. in addition. For example, if the fifth item submitted in Section 03300 is returned for correction three times, the next resubmittal number will be 03300-5.3.
   d. Product identification.
   e. Shop Drawing title, product, drawing number, revision number, date of drawing and revision.
   g. Subcontractor's, vendor’s, and/or manufacturer's name, address and phone number.
   h. Contractor's certification statement.
2. Catalog Data: Furnish each separate catalog, brochure, or single page submitted with identification required above.
   a. Catalogs or brochures submitted containing multiple items for approval need identification only on exterior. In this instance, identification to include page and catalog item numbers.

3. Space: Provide vacant space approximately 3 inches high by 4 inches wide adjacent to identification data to receive Authority's status stamp.

E. Contractor's Responsibility:
   1. Affix following signed Certification Statement to each Shop Drawing, working drawing, sample and catalog data submitted:
      a. Certification Statement: By this submittal, I hereby represent that I have determined and verified field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with Contract Drawings, Specifications, other applicable approved Shop Drawings and Contract requirements.

2. Review and approval of Shop Drawings, Samples, or Catalog Data by Authority will not relieve responsibility with regard to fulfillment of terms of Contract. Assume risk of error and omission with no responsibility by Authority.

3. No portion of work requiring a Shop Drawing, working drawing, sample, or catalog data allowed to be started nor materials be fabricated or installed prior to approval or qualified approval of item. Fabrication performed, materials purchased or on site construction accomplished that does not conform to approved Shop Drawings and data is at Contractor's risk. Authority will not be liable for expense or delay due to corrections or remedies required to accomplish conformity.

4. Project work, materials, fabrication, and installation to conform with approved Shop Drawings, working Drawings, applicable Samples, and Catalog Data.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION
SHOP DRAWING STAMP FORMAT

ABC Contractors, Inc.
Anytown, PA

Project:  Contract No. XXX
Construction of
XYZ Plant

Authority: ________________________________________________________________

Submittal No.:____________________________________________________________
Product:_______________________________________________________________
Mfg. By:_______________________________________________________________
Ref. Dwg/Spec:_________________________________________________________

"Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with the Contract Drawings, Specifications, other applicable approved Shop Drawings and all Contract requirements."

 Contractors Review

[ ] Approved  [ ] Approved as Noted

By_________________________  Date
SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: General requirements related to responsibility for Inspections, Tests, Schedules and Reports.

1.02 ORDER OF WORK

A. Commence work promptly and continue at locations, in order, and at times most expedient to completion of Work. Perform work with safety during all stages of construction, and complete in accordance with schedule. Authority reserves right to direct that certain portions of work be commenced and completed before work on other portions is started.

1.03 TESTING

A. Arrange for services of a testing laboratory to perform tests as specified in Contract Documents. Testing laboratory utilized is to be approved by Authority and be completely independent of Contractor's and/or supplier's operations.

1.04 SCHEDULE OF WORK

A. Within 30 days after Award of Contract, prepare and submit to Authority for review, a schedule showing the order proposed to carry on the work and dates proposed to start and complete each salient feature, including dates for procurement of materials, plant and equipment and schedule for submission of Shop Drawings. Prepare schedule of work in chart form showing contemplated completion percentages and arranged to record actual completion percentages at stated intervals.

B. Keep schedule of work up to date, and submit current updated schedule to Authority monthly.

C. Schedule of Work determines the order in which work is to proceed. Authority, however, may order and authorize minor changes to schedule when such changes are of advantage to Authority.

D. Furnish sufficient forces, construction equipment and plant as necessary to ensure the prosecution and completion of work in accordance with submitted schedule. Increase forces and plant and request from Authority an increase in working hours if falling behind progress shown on schedule. If, in opinion of Authority, such increases are
necessary for completion of work in accordance with terms of Contract, they will be approved. Failure to comply with requirements of Authority may be grounds for determination by Authority that Contractor is not preceding at such rates as will ensure completion within specified time and may result in declaring Contractor to be in default.

1.05 REPORTS

A. Certified Test Reports:
   1. Certified test reports required by Contract Documents, will meet following requirements:
      a. Before delivery of materials for which certified test reports are required, certified copies of reports of all tests required in referenced publications or specified within Contract Documents are to be submitted for approval to Authority.
      b. Testing is to be performed in an approved independent laboratory, within one year of submittal of reports for approval.
      c. Submit with test reports a notarized certificate from manufacturer or supplier certifying tested material meets specified requirements and is of same type, quality, manufacture and make as that proposed to be supplied.

B. Certificate of Compliance:
   1. If approved by Authority, or where specified, furnish a Certificate of Compliance from manufacturer in lieu of specified tests and other tests required in various reference documents.
   2. Certificate to state that manufacturer has performed all required tests; that products to be supplied meet all test requirements; that tests have been performed within one year of submittal of certificate; that products tested were of same type, quality, manufacture and make as those proposed to be supplied.

C. Installation Certificates:
   1. Submit Installation Certificates for those items of equipment listed by Contract Documents.
   2. Installation Certificates to state that equipment has been installed under either continuous or periodic supervision of manufacturer's authorized representative, that it has been adjusted and initially operated in presence of manufacturer's authorized representative and that it is operating in accordance with specified requirements to manufacturer's satisfaction.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION
SECTION 01530
CONSTRUCTION BARRIERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Temporary fencing, barricades and other protective devices required during construction.

1.02 TEMPORARY FENCING

A. Provide temporary fencing as required to fence off excavation, storage and operating areas. Temporary fences to be substantially constructed, neat in appearance, and unless otherwise indicated be six (6) feet high.

1.03 TREE AND PLANT PROTECTION

A. Protect trees and plants outside Authority’s property lines, right-of-way lines and construction easements. Replace in kind, trees or plants located on private property that are damaged by construction activities.

B. Protect trees and plants within Authority's property lines, right-of-way lines and construction easements which are not marked or otherwise designated for removal. Conduct operation of equipment, storage of materials, disposition of excavated material, and construction so as not to injure tree trunks, branches or roots. Protect trees and plants designated to remain by use of temporary fencing.

1. When excavating within limits of limb spread of trees, proceed with extreme care using hand tools or equipment that will not cause damage to trees. Wrap exposed roots, two inches and larger in diameter in burlap or other approved material and keep moist at all times. Do not cut roots two inches and larger outside the actual space occupied by pipe. Excavate by tunneling under these roots.

2. Tree branches that interfere with construction may be trimmed in advance of excavation. Trim branches to clear final grade by a minimum of 10 feet. Trim these branches back to the trunk of the tree. Trim branches 10 feet above final grade as necessary. Trim branches and cut roots in accordance with accepted horticultural practices by experienced personnel.

C. Replace trees within property line of Authority or within right-of-ways and construction easements which are designated to remain and are damaged beyond repair at no additional expense to Authority.
1.04 BARRICADES

A. Barricade or close all openings in roadways, floors, walls, or other parts of structures or walkways while openings are not in use.

B. Size, type and location of barricades to conform to OSHA, PennDOT, or other jurisdictional authority requirements.

C. Provide, erect, and maintain necessary barricades, suitable and sufficient lights, danger signals, signs and reflective markers and take necessary precautions for protection of work and safety of public. Streets closed or partially closed to traffic to be protected by effective barricades, and obstructions illuminated during hours of darkness. Provide suitable warning signs to properly control and direct traffic.

D. Erect warning signs in advance of any location where operations may interfere with use of a street by traffic and at intermediate points where new work crosses or coincides with an existing street.

E. All barricades, warning signs, lights, temporary signals and other protective devices to conform with Bulletin 43, Maintenance and Protection of Traffic on Construction Projects, published by the Pennsylvania Department of Transportation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide temporary fencing of type approved by Authority.

B. Paint for tree wounds to be antiseptic, waterproof, and black in color and have an asphaltic base.

C. Provide barricades, warning signs, lights and other protective devices conforming to Pennsylvania Department of Transportation Standards.

PART 3 EXECUTION

3.01 CLEANING

A. Dismantle and remove all barricades, warning signs, lights and other protective devices upon completion of construction work in a particular area.

END OF SECTION
SECTION 01540
SECURITY

PART 1 GENERAL

1.01 SUMMARY

   A. Section Includes: General requirements for providing security at the Project site(s) during construction.

1.02 PROTECTION OF WORK AND PROPERTY

   A. Take positive measures to prevent entry to site of work and storage areas by children, animals and unauthorized adults.
      1. Provide temporary fencing as required to fence off excavation, storage and operating areas.
      2. Except as otherwise specified in Contract Documents, Contractor is authorized to refuse admission to Project site to any person whose admission is not specifically authorized in writing by Authority.
      3. Provide night security, if problems arise at construction sites relating to public safety, etc. Vandalism connected with construction of Project is sufficient grounds for requiring security.
      4. Costs related to security and vandalism is considered incidental to Contract and included under appropriate bid price.

PART 2 PRODUCTS

   NOT USED

PART 3 EXECUTION

   NOT USED

END OF SECTION
SECTION 01560
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements relating to responsibilities for environmental protection during construction of Project.

1.02 NOISE CONTROL

A. Take every action possible to minimize noise caused by construction operations. Operate in conformance with any applicable ordinances, regulations, rules and laws in effect in area pertaining to noise.

B. Provide equipment that operates with least possible noise. Provide electrically operated equipment in work area to extent possible. Equip air intake of compressors with silencers, and provide machinery operated by gearing with a type of gearing designed to reduce noise to a minimum. Equip internal combustion engines with mufflers. Maintain equipment silencing features in good condition and use at all times.

1.03 AIR POLLUTION CONTROL

A. Exercise every reasonable precaution to keep air pollution to a minimum throughout life of Project.

B. Maintain dust control throughout entire construction period by use of water sprinklers or chemical dust control binder as approved by Authority. Coatings on structures located on private property, resulting from failure to control dust, will be removed promptly at no additional expense.

1.04 WATER CONTROL

A. Keep excavations free from water while site grading, structural work, pipe laying, or other construction is in progress.

1. Surface Drainage:
   a. Intercept and divert upstream surface drainage away from work site by use of dikes, curb walls, ditches, pipes, sumps, or other means.
   b. Intercept and divert work site surface drainage away from excavation by use of dikes, curb walls, ditches, pipes, sumps, or other means.
   c. Design surface drainage systems so they do not cause erosion on or off site or cause unwanted flow of water.
d. Remove surface drainage system when no longer required.
e. Remove debris and restore site to original condition.

2. Dewatering:
   a. Provide and maintain ditches of adequate size to collect surface water and seepage that could enter excavations and divert into a sump that can be drained or pumped into drainage channels, or storm sewers if approved by Authority and jurisdictional agency concerned.
   b. Maintain trenches free of standing water until backfill operations are complete.
   c. Install sedimentation ponds or other approved means as required to reduce amount of fine particles carried by water diverted into storm sewers or flowing off site. Provide treatment facilities as required to prevent construction originated pollutants from entering adjacent streams or property.
   d. Should a storm sewer become blocked or have its capacity reduced due to dewatering operations, make arrangements with the jurisdictional agency for cleaning the sewer.
   e. Backfill drainage ditches, sumps, and sedimentation ponds when no longer required, with granular material, concrete, or other material as approved by Authority.

1.05 PLANT PEST CONTROL

A. The indiscriminate movement of nursery stock, hay or straw mulch, equipment and soil samples into and out of Pennsylvania constitutes a potential hazard to State and National Agriculture. Comply with all applicable State and Federal Plant Pest Regulations in fulfillment of this Contract.

B. Information regarding these regulations may be obtained from the United States Department of Agriculture, Agriculture Research Service, Plant Pest Control Division, P.O. Box 1257, Roanoke, Virginia 24001.

1.06 DEBRIS CONTROL

A. Proceed with construction cleanup as construction progresses. Cleanup consist of removal of mud, oil, grease, trash, used forms, scrap, debris, excess materials, and any other items that are unsightly or can cause the tripping or slipping of workmen, ladders, or equipment.

B. Dispose of construction waste material in an authorized disposal area.

C. Upon failure to clean up construction area each day to satisfaction of Authority, Authority may clean area and deduct cost from monies due.
1.07 POLLUTION CONTROL

A. Take precautions in conduct of operations as necessary to avoid contaminating water in adjacent water courses or water impoundments such as lakes, reservoirs, etc. Do not discharge pollutants such as chemicals, fuels, lubricants, bitumens, raw sewage, and other harmful waste into or along side of rivers, streams, impoundments or into natural or man-made channels leading to them. Do not discharge water used during work on Project that has become contaminated, into rivers, streams, or impoundments.

B. Conduct all earthwork, moving of equipment, water control of excavations or other operations likely to create silting, so as to minimize pollution of rivers, streams, and impoundments. Do not deposit excavated material in or so near to rivers, streams, or impoundments that it will be washed away by high water or runoff. Unless otherwise approved in writing by Authority, do not operate mechanized equipment in live streams except as required to construct pipe line crossings and temporary or permanent structures.

C. Comply with applicable regulations of the Commonwealth of Pennsylvania Department of Environmental Protection and any other statutes relating to prevention and abatement of pollution.

D. See Section 00800 - Special Conditions for requirements related to preparation and approval by PADEP of a Wastewater Disposal Plan.

1.08 EROSION CONTROL

A. Where determined necessary by Authority, arrange for an on site review of potential soil erosion problems with personnel of the Soil Conservation District where Project is located. Use proper and acceptable methods of soil erosion and sedimentation control for exposed earthwork. Assume obligation for fines and related costs resulting from failure to provide adequate protection against soil erosion.

B. Conduct work in complete compliance with all rules, regulations, and requirements of the Pennsylvania Department of Environmental Protection and the Soil Conservation District where Project is located.

C. Preconstruction Conference: Be prepared at preconstruction conference to submit for approval, schedules and methods for accomplishing required soil erosion and sedimentation control. No work will be started until soil erosion and sedimentation control schedules and methods have been approved by Authority. Minimum control devices are shown on Drawings.

D. General Requirements:
   1. Perform stripping of vegetation, regrading or other earthmoving activities in a way that will minimize erosion.
2. Where possible, preserve salient natural features; keep cut and fill operations to a minimum; and development is to conform to existing topography so as to minimize erosion.

3. Clear only those areas as required for construction and, where possible, maintain a vegetative buffer zone between the disturbed working area and any watercourse. If a minimum twenty-five foot buffer with heavy vegetation (75 percent of soil surface covered by plant life) cannot be maintained for any reason, construct a silt fence in its place and maintain until final restabilization is complete.

4. Do not deposit excavated materials in or near rivers, streams, or impoundments or otherwise located in a manner susceptible to erosion due to high water, flooding, or runoff.

5. Keep disturbed areas and time of exposure to a minimum.

6. Stabilize disturbed soils as quickly as practicable.

7. Immediately stabilize critical areas (disturbed areas with a surface gradient exceeding 30 percent) with vegetation after backfilling operations. Provide temporary seed consisting of annual rye grass and barley or oats or annual rye grass and cereal rye or wheat. Adequately cover those areas that cannot be planted with straw mulch, wood chips, or stone mulch. Matting for erosion control to be jute or excelsior matting.

8. Disturbed areas less than 30 percent in surface gradient are considered critical after exposure of more than 30 calendar days. Divert runoff from flowing onto critical areas.

9. Provide erosion control measures such as silt fence, earth berm or dike channels and other diversion devices that will safely convey runoff through disturbed areas to prevent scour or gulley erosion. When possible, divert runoff in a safe manner around disturbed areas using pipes with headwalls and protected outlets.

10. Install all permanent vegetation, paving, erosion control, and drainage facilities as soon as possible.

11. Restrict construction operations in rivers, streams, and impoundments to those areas which must be entered for construction of water mains and/or structures.

12. Frequent fording of live streams with construction equipment will not be permitted. Use temporary bridges or other structures wherever an appreciable number of stream crossings are necessary.

13. Place stone riprap on stream banks immediately after pipe is installed.

14. Maintain erosion control measures and facilities in proper condition, so they will individually and collectively perform the functions intended. Make periodic inspections at frequent intervals to detect any impairment of structural stability, and equate capacity or requisites of measures and facilities which might impair effectiveness. Take immediate steps to correct any impairment found to exist.

15. Repair existing sediment control devices disturbed during construction operations by end of that concurrent working day.

16. Do not permit sediment to accumulate in sedimentation basins to a depth sufficient to limit storage capacity or interfere with settling efficiency. Handle and dispose of any material removed so that a problem is not created and every reasonable and practical precaution is taken to prevent material from reaching streams.
17. Stabilize slopes, channels, ditches or any disturbed areas as soon as possible after final grade or final earthmoving is completed. Where not possible to permanently stabilize a disturbed area immediately after final earthmoving is completed or where activity ceases for more than 20 days, promptly implement temporary stabilization measures, such as temporary seeding.

18. Upon completion of Project, stabilize all areas disturbed so that accelerated erosion will be prevented. Maintain any erosion and sedimentation control facility required or necessary to protect areas from erosion during the stabilization period until stabilization is completed. Upon completion of stabilization, remove all unnecessary or unusable control measures and facilities, grade areas and stabilize soils.

19. As applicable, conform with Federal, State and local laws, and Contract Documents concerning soil erosion and sedimentation.

E. Regardless of compliance with schedule and methods of soil erosion and sedimentation control as required in paragraph C above, Authority reserves the right to impose whatever limitations deemed necessary to assure an operation providing for soil erosion and sedimentation control consistent with the intent of this Article of the Specifications.

F. All soil erosion and sedimentation control measures employed are subject to approval of Authority, Pennsylvania Department of Environmental Protection and local Soil Conservation District.

G. In case of repeated failure on part of Contractor to control erosion, pollution, or siltation, Authority reserves the right to employ outside assistance or to use own forces to provide necessary corrective measures. Such incurred direct costs plus related engineering costs will be charged to Contractor and appropriate deductions made from any moneys due or to become due him under Contract.

H. Slope protection and erosion control facilities is as specified in Section 02270.

I. Include all costs incurred in connection with soil erosion and sedimentation control measures in applicable bid items in Proposal-Schedule of Prices, as indicated in Section 01150 - Measurement and Payment.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION
SECTION 01570

TRAFFIC REGULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: General guidelines for control of traffic while Project work within street or highway Right-of-Way is being performed. Goal is to help ensure safe and efficient traffic movement through work areas and provide safety for Contractor's work force.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. The Contractor shall exercise careful control of traffic in work areas in order to protect the public and workmen, while at the same time minimizing the inconvenience to the public.
   2. The traffic regulation shall follow the standards and specifications established for the Pennsylvania Department of Transportation and shall be responsive to requirements as may be stipulated by The Local Municipality.
   3. The Contractor shall be prepared to discuss work area traffic control and shall, if required by the Authority, submit detailed plans for traffic control.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Furnish, erect and maintain at closures, intersections, and throughout Project, necessary approved barricades, suitable and sufficient red lights, torches, approved reflectors, danger signals, warning, detour and closure signs. Provide a sufficient number of watchpersons and take necessary and legal precautions for protection of work and safety of public. Provide illuminated barricades, danger signals, signs and obstructions at night and keep lights burning from sunset until sunrise. Materials and safety devices (i.e., barricades, flashing warning lights, torches, reflectors and signs) to conform to State Department of Transportation Specifications.
   2. Perform traffic regulation on streets other than State Highways in accordance with requirements of local government.
   3. State Highways:
      a. Provide traffic control in complete compliance with rules and regulations of Pennsylvania Department of Transportation (PDT), including but not necessarily limited to following:
         1) PA Code Title 67, Transportation: Chapter 203 - Work Zone Traffic Control.
2) PA Code Title 67, Transportation: Chapter 441 - Access to and Occupancy of Highways by Driveways and Local Roads.

3) PA Code Title 67, Transportation: Chapter 459 - Occupancy of Highways by Utilities.

4) Section 901 "Maintenance and Protection of Traffic During Construction" of Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408/90, as supplemented.

b. Requirements for traffic control specified in this Section are for convenience of Contractor and is not to be construed as a release from PDT requirements previously referenced.

c. Pay fines and related costs resulting from failure to provide adequate traffic control.

B. Traffic Control Figures:

1. Traffic control requirements of construction site within State Highway Right-of-Way are attached to and made part of this Section by way of figures taken from Chapter 203 of PDT regulations.

2. Traffic control figures attached are to be used in conjunction with Project Manual to establish minimum requirements for Project and in no way preclude installation of additional control measures.

1.04 PROJECT CONDITIONS

A. Accommodation of Traffic:

1. When the construction will occur in streets owned and maintained by the local municipality, the streets shall not be unnecessarily obstructed, unless the appropriate municipality, in writing, authorizes the complete closing of a street. The Contractor shall take such measures at his own expense as may be necessary to keep the street open and safe for traffic.

2. The local municipalities reserve the sole right to close streets to traffic, and will not close a municipal street for the convenience of the Contractor or to expedite construction. The local municipality will consider closing a street to traffic when conditions in a specific area along the street justifies closing the street during the construction operations in that particular area. The Contractor shall contact the appropriate municipal authority prior to starting work on the project and establish the procedure he is to follow in submitting a request to close a street in each municipality.

3. The Contractor shall construct and maintain such adequate and proper bridges over excavations as may be required for safe accommodation of pedestrians or vehicles. The Contractor shall furnish and erect, substantial barricades, auxiliary barriers, channelizing devices, hazard warning lights, flares and reflective markers at crossings of trenches, or along the trench, to protect the traveling public.

4. The Contractor shall not obstruct fire hydrants.

5. The roadway on one side of the line of work shall be kept open at all times.

6. The streets, crosswalks, and sidewalks shall be kept clean, clear and free for the passage of vehicles or pedestrians unless otherwise authorized in writing by the
Municipality. A straight and continuous passageway on sidewalks and over crosswalks, at least 3 feet in width, shall be preserved free from all obstruction.

7. All material piles, equipment, and pipe which may serve as obstructions to traffic shall be protected by proper lights, lanterns, torches, or guards as is necessary or required by the Authority or governing agencies having jurisdiction in the areas of construction.

8. Care shall be taken so that driveways to private properties and business establishments are not unnecessarily obstructed.

9. At the end of the workday or in event work is shutdown, all streets shall be left in such condition whereby they can be readily opened and safely traveled in cases of emergency, such as fire or for ambulance service. If so directed by the Authority, the Contractor shall either backfill the trench or place steel plate bridging over the end of the trench.

B. Maintenance of Traffic:
   1. All traffic control devices shall be fabricated and installed according to the manual, "Maintenance and Protection of Traffic on Construction Projects," published by the Pennsylvania Department of Transportation. All traffic control devices shall be inspected at least weekly. Maintaining the control devices shall include keeping them in good condition, correct position, unobstructed by weeds, brush trees, construction material or equipment. Cleaning of all traffic control devices, when directed by the Authority, shall consist of hand cleaning with a mild detergent followed by a thorough rinse with clear water.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide materials and safety devices, including as barricades, flashing warning lights, torches, reflectors and signs, provided for purpose of protecting work and safety of the public and for maintaining and protecting traffic. Conform to the requirements specified in Section 901 of the current edition of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented, and to the requirements specified in the current edition of Bulletin No. 43 complementing Section 901.

B. Provide orange colored danger signals and warning signs

PART 3 EXECUTION

3.01 INSTALLATION

A. Install traffic control devices immediately before the beginning of construction and keep in place as long as they are needed and remove immediately thereafter.
3.02 REMOVAL

A. Remove, cover, or turn traffic control device that does not apply to the existing condition so as not to be readable by oncoming traffic.

END OF SECTION
SECTION 01600

MATERIAL HANDLING, STORAGE
AND PROTECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: General requirements for delivery, storage, handling, and protection of materials and products used in the work.

1.02 GENERAL REQUIREMENTS

A. Store equipment and materials in an orderly manner in designated work site storage area. Only bring equipment and materials to work areas when needed. Assume responsibility for security of storage area and work site, and protect installed items until acceptance by Authority of final performance tests.

1.03 STORAGE OF MATERIALS AND EQUIPMENT

A. Store valves and gaskets, grass seed and any other items which manufacturer or supplier recommends be stored above 50 degrees F., on wooden or concrete floor in wooden or metal enclosed structure(s).

B. Keep structure clean, dry and heated. Protect structure and subsequent work areas from dirt, dust, water, rain, snow, condensation, freezing conditions and any other conditions detrimental to life of equipment and material from date of delivery till control of equipment is assumed by Authority. Maintain 50 degrees F. minimum temperature within enclosure.

C. Pipe, fittings, and steel may be openly stored, on wooden platforms. Schedule delivery of primed steel so as not be exposed directly to sunlight for over two months and will be installed and finished painted within five months after priming. If above requirement is not met, blast clean primer and reprime steel.

D. Properly store each item in accordance with manufacturer's recommendations and supplemental requirements included in particular specification section covering material or equipment. Store materials and equipment in a neat and orderly manner to facilitate locating, inspecting, maintaining and removing when needed. Avoid damage to any item during handling and storage. Handling of equipment is as specified under the particular material or equipment specification section and as recommended by the manufacturer. Repair damaged items to satisfaction of Authority or replace if directed by Authority at no additional cost.
E. Check material and equipment when delivered to ensure it conforms to Contract Documents and Shop Drawings, and has not been damaged during shipment. Any materials or equipment not in compliance with Contract Documents and Shop Drawings will be directly returned to manufacturer. Report damaged items to attention of Authority, who will decide whether item can be repaired in field or must be returned to manufacturer at no expense to Authority.

1.04 MAINTENANCE OF MATERIALS AND EQUIPMENT

A. Obtain from manufacturer, prior to or at delivery, written instructions and recommendations for storing, handling, and maintaining material or equipment until it is field tested. In addition, operating and maintenance manuals will be provided for selected valves and equipment as specified in Section 01730. Develop a comprehensive maintenance program and schedule from received information and submit to Authority for approval for stored and installed material and equipment. Approval is for general procedures and content and in no way relieves responsibility for proper storage, protection, handling and maintenance of the equipment. If any materials and/or equipment are found not to be in an as new condition when it is to be installed or during testing, Authority, at its discretion, may order the Contractor to furnish and install new material or equipment, or repair material or equipment to his satisfaction, at no additional cost to Authority.

B. To reduce possibility of damage to materials and equipment which will not be used until the late stages of construction, schedule fabrication and deliveries if possible so that materials and equipment are only on storage site for a minimum of time before they are installed.

1.05 ADDITIONAL STORAGE SPACE

A. If determined that additional storage space is needed, or preference to use nearby off site storage for some materials and equipment because of better controlled storage conditions and/or security, submit a written request to Authority stating reasons for wanting the off-site storage; its location, size, type structure, type of heat if applicable, etc; and when it can be inspected by Authority. If Authority approves the off site storage site, all of above conditions and responsibilities pertaining to on site storage will apply. Assume all costs related to acquisition of off site storage facilities at no extra or additional cost to Authority.

1.06 RIGHT OF INSPECTION

A. Authority has right to inspect all storage sites and preventive maintenance records at any time. Immediately correct any noted deficiencies. Failure to note a deficiency on part of Authority does not relieve responsibility for proper storage and maintenance of materials and equipment.
SECTION 01710
PROJECT CLEANUP

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for final cleanup and restoration of Project.

1.02 CLEANUP

A. Before work is considered as being complete, clean site and remove evidence of construction activities.

B. Construction site cleanup consists of removal of mud, oil, grease, dust, trash, scrap, debris, and surplus excavated material.

C. Do not discard items on site or adjoining private property. Remove discarded items to an authorized public landfill.

1.03 RESTORATION AND RESTABILIZATION

A. Restore and re-stabilize areas disturbed by construction operations, including storage and stockpiling areas, access roads, stream crossing sites and areas within acquired right-of-way.

B. Proceed with final restoration and re-stabilization, including fine grading, landscaping, seeding and paving immediately after construction activity is completed in a given area (when season permits). Dismantle and remove temporary construction facilities and leave site in a neat and orderly condition.

C. Preserve and maintain public and private signs, markers, guard rails and fences in original condition. If authorized, remove conflicting facilities, preserve, store, protect and re-erect upon completion of construction. Replace damaged items at no cost to Authority.

D. Protect and guard trees, repair damaged trees or replace trees damaged beyond repair as specified elsewhere in Contract Documents.

E. Reseed damaged lawn areas and seed areas used for access roads, parking and storage as specified elsewhere in Contract Documents.

F. Restore gravel surfaces and shoulders to original condition. Remove and replace existing gravel contaminated by foreign material. Methods of construction to conform
to jurisdictional requirements and applicable permits issued for work. Stabilize areas adjacent to shoulders with gravel if left unstable by construction.

G. Restore pavement, curbs, and other paved areas as specified elsewhere in Contract Documents.

1.04 DISPOSAL OF WASTE MATERIALS

A. Dispose of construction waste material in authorized disposal areas, including municipal facilities if available.

B. Remove waste material disposed in unauthorized area and restore to original condition, at no cost to Authority.

1.05 REMOVAL OF CONDEMNED MATERIAL

A. Promptly remove material brought on site that is determined by Authority to be unsuitable or not in conformity with Specifications.

B. Failure to remove condemned material from site within 72 hours after receipt of notice from Authority, may cause Authority to have condemned material removed and cost of removal deducted from monies due Contractor.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION
SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: General requirements for maintaining a record copy of Contract Documents.

1.02 RECORD DRAWINGS

A. Keep one record copy of Contract Documents, reference documents, and technical Submittals on site, in order and annotated to show all changes made during construction process. Keep annotations current. Make record copy available to Authority during life of Project.

1. If the Project is contracted by the Authority, at completion of Project and before final payment is made, furnish Authority one set of reproducible documents reflecting all changes described. Record drawings will include changes made to locations of buried and exposed piping, equipment changes, substitutions and variations from Contract Documents. Upon request, Authority will provide one set of sepias of original Contract Drawings, at cost to Contractor.

2. If the Project is contracted by the Applicant, at completion of Project and before the system is accepted by the Authority, the Applicant will furnish the Authority one set of reproducible documents reflecting all changes herein described. Record Drawings will include changes made to locations of buried and exposed piping, equipment changes, substitutions and all variations from the General Specifications.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION
SECTION 02055
REMOVAL AND ABANDONMENT OF EXISTING FACILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Provision for removal and abandonment of existing sanitary sewer services.

B. Related Sections:
   1. Trenching, Backfilling and Compacting: Section 02221.
   2. Cast-In-Place Concrete: Section 03300.

1.02 PROJECT CONDITIONS

A. Protection: Exercise care during removal work to confine operations to facilities as indicated on Drawings. Physical means and methods used for protection are discretionary; however, assume complete responsibility for replacement and restitution work of whatever nature and at no expense to Authority.
   1. Additionally, if public safety is endangered during progress of demolition work, provide adequate protective measures to protect public pedestrian and vehicular traffic on streets and walkways.
   2. Signs, signals, and barricades to conform to requirements of Federal, State and local laws, rules, regulations, precautions, orders, and decrees.

1.03 REFERENCES

A. Commonwealth of Pennsylvania Department of Transportation (PDT), Specifications Publication 408, as supplemented.
   1. PDT Section 703.2, Course Aggregates.

PART 2 PRODUCTS

2.01 MATERIALS

A. Type of equipment, machinery, and apparatus (motorized or otherwise) used to perform demolition and removal work is discretionary, but provides type to perform work within limits of Contract requirements.

B. Aggregate Backfill: No. 2A Coarse Aggregate conforming to PDT Section 703.2.

C. Class B Concrete: As specified in Section 03300.

PART 3 EXECUTION

Lebanon General Sanitary Sewer Construction Specifications 02055-1 Removal &Abandonment of Existing Facilities ©Gannett Fleming Inc. 2017
3.01 EXAMINATION

A. Prior to performance of actual work, carefully inspect sites and locate facilities designated to be removed or abandoned.

B. Do not begin work of this Section without approval to do so by Authority.

C. Locate existing exposed and buried active utilities and determine requirements for protection.

3.02 PERFORMANCE

A. Excavation and Backfilling: As specified in Section 02221.
   1. In removing existing facilities, should excavation below subgrade for new facilities occur, backfill area excavated below subgrade with Aggregate Backfill or concrete as required by Authority at no additional cost to Authority.

B. Debris Removal: Dispose of demolition debris off site in a lawfully approved landfill area.

C. Salvage: Authority has right to claim as salvage, items and materials removed under work of this Section. Move and neatly store removed items claimed as salvage by Authority to a location agreeable to Authority, and in manner approved by Authority.

D. Abandoning Existing Mains & Laterals
   1. Transfer services to new sanitary sewer main.
   2. Plug the ends of pipe sewers that are indicated to be abandoned.
   3. Plug openings in manholes that are to be abandoned.
   4. Provide watertight seals using class B Concrete; for large openings use formed concrete or manhole brick with waterproofed mortar.

END OF SECTION
SECTION 02151
SHORING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for protection of excavations by sheeting and shoring.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Furnish shoring materials and install work conforming to Federal, State and local laws, rules, regulations, requirements, precautions, orders and decrees.
   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 required to protect workers and public, or to maintain trench widths specified in Section 02221, regardless if considered necessary by Contractor.

1.03 PROJECT CONDITIONS

A. Responsibility for Condition of Excavation:
   1. Failure or refusal of the Authority to suggest use of bracing or sheeting, or a better quality, grade, or section, or larger sizes of steel or timber, or to suggest sheeting, bracing, struts, or shoring be left in place, does not relieve Contractor of responsibility concerning condition of excavation or of his obligations under Contract, nor impose liability on Authority. Delays, whether caused by action or want of action on part of Contractor, or by act of Authority, or their agents, or employees, resulting in keeping of excavation open longer than would otherwise have been necessary, does not relieve Contractor from necessity of properly and adequately protecting excavation from caving or slipping, nor from his obligations under Contract relating to injury to persons or property, nor entitle him to claims for extra compensation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wood Materials: Use wood sheeting, sheet piling, bracing and shoring in good serviceable condition and timbers of sound condition, free from large or loose knots, and of proper dimensions.
B. Metal Materials: Steel or manufactured aluminum sheet piling and bracing of equal strength may be substituted for wood.

PART 3 EXECUTION

3.01 INSTALLATION

A. Using skilled labor, drive or set sheeting, sheet piling, braces or shores in place and arranged that they may be withdrawn as excavations are backfilled, without injury to piping and structures, and without injury to or settlement of adjacent structures and pavements.

B. Drive sheeting in advance of excavation when tight plank or steel sheeting is required. Make joints of tongue and groove or interlocking type and as watertight as possible.

C. Remove sheeting, bracing and shores as trenches and other excavations are being backfilled, except where and to extent Authority requires, in writing, it be left in place or where permitted to leave in place at Contractor’s own request and cost.
   1. In withdrawing sheeting and sheet piling, exercise care to ensure that voids or holes left by planks as they are withdrawn are backfilled and thoroughly rammed with thin rammers provided especially for that purpose.
   2. Exercise care to carry backfill up evenly on all sides of items installed in excavations.

D. Cut off sheeting or sheet piling left in place as required by Authority and remove from work portion cut off. No additional compensation allowed for cutting and removal of sheeting or sheet piling left in place.

END OF SECTION
SECTION 02221
TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Excavating, backfilling, and compacting trenches for pipelines and inline structures, within limits specified or indicated on Drawings.

B. Related Sections:
   1. Shoring: Section 02151.
   2. Slope Protection and Erosion Control: Section 02270.
   3. Paving and Surfacing: Section 02500.
   4. Cast-In-Place Concrete: Section 03300.

1.02 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM D698, ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort (12,400 ft.-lbf/ft.3).
   2. ASTM D2922, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. Commonwealth of Pennsylvania Department of Transportation (PDT), Specifications Publication 408, as supplemented.
   1. PDT Section 703.2, Coarse Aggregates.
   2. PDT Section 703.3, Select Granular Material (2RC).

1.03 DEFINITIONS

A. Earth Excavation: Removal down to subgrade elevation of clay, silt, loam, sand, gravel, slate, hard pan, pavements, soft sandstone, loose stone in masses, and boulders measuring less than 1/2 cubic yard.

B. Rock Excavation: Removal down to subgrade elevation of large rock and boulders measuring more than 1/2 cubic yard, or other rock requiring continuous drilling and blasting, or drilling and wedging in opinion of Authority.
   1. Material that can be removed by means other than specified above, but for reasons of economy, removal by drilling and blasting, or drilling and wedging is preferred, will not be classified as rock.
   2. Unless predrilling or predrilling and blasting are approved in advance by Authority, strip rock for measurement by Authority. No payment will be made for rock excavated or loosened before measurement.
C. Unclassified Excavation: Material removal of any kind in excavation, including Rock Excavation.

D. Unclassified Excavation below Subgrade: As specified for Unclassified Excavation except performed below subgrade.

E. Subgrade: Trench bottom prepared as specified to receive Class A Bedding, Concrete Cradle or Concrete Encasement, or excavation bottom prepared to receive pipeline structures.

1.04 SUBMITTALS

A. Test Reports:
   1. Submit testing laboratory aggregate test reports based on requirements stated in Quality Control.
   2. Compaction density test reports based on method of density determination as specified in Reference Standards and method approved by Authority.

B. Certificates: Submit certificate from aggregate supplier based on requirements stated in Quality Control, when requested by Authority.

C. Blasting Plan:
   1. Submit data concerning proposed blasting operations to Authority, and utility owners if required.

D. Testing Agency: Submit name and qualifications of Testing Agency performing seismographic tests to Authority for approval prior to proceeding with blasting operations.

1.05 QUALITY ASSURANCE

A. Quality Control:
   1. Laboratory Tests: In accordance with Section 01400, aggregate materials under Part 2 - Products require advance examination or testing according to methods referenced, or as required by Authority.
      a. Arrange for testing laboratory to furnish Authority test result reports in triplicate. Test reports are considered sufficient evidence of acceptance or rejection of materials represented.
      b. Conduct aggregate quality tests in accordance with requirements of appropriate Referenced Standard.
      c. Authority reserves right to accept aggregate materials based on certification from supplier that aggregate originates from a source approved by PennDOT and that aggregate complies with specified PennDOT requirements.
B. Regulatory Requirements:
   1. Work of this Section within State Highway Right-of-Way is subject to inspection by Commonwealth of Pennsylvania Department of Transportation representatives. Perform work in accordance with requirements of latest edition of Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Transportation, Department of Transportation, Chapter 459, Occupancy of Highways by Utilities.

1.06 PROJECT CONDITIONS

A. General Requirements: Excavate and backfill trenches necessary for completing work of this Contract. Excavate and backfill trenches by machinery or by hand, however, Authority is empowered, if necessity exists, to direct that hand excavation and backfilling be employed. Perform excavation of whatever substances encountered, to grades and depths indicated on Drawings, as specified, or as directed by Authority. Remove and waste excavated material not required for backfill.

B. Environmental Requirements:
   1. Do not perform trenching, backfilling or compacting when weather conditions or condition of materials will prevent satisfactory work, in opinion of Authority.
   2. Do not use frozen materials as backfill or wet materials containing moisture in excess of quantity necessary for satisfactory compaction.
   3. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
   4. Plan work to provide adequate protection during storms with provisions available constantly for preventing flood damage. Protect installed piping and other work against damage from uplift due to high ground water levels.
   5. Accommodation of Drainage: Keep gutters, sewers, drains and ditches open constantly for surface drainage. No damming, ponding, water in gutters, or other waterways permitted, except where stream crossings are necessary and then only to extent Authority considers necessary. Do not direct water flows across or over pavements except through approved pipes or properly constructed troughs. When required, provide pipes or troughs of sizes and lengths required at no expense to Authority. Perform grading in vicinity of trenches so that ground surface is properly pitched to prevent water running into trenches.
   6. Pumping: Keep excavations free from water during performance of work at no expense to Authority. Build dams and other devices necessary for this purpose, and provide and operate pumps of sufficient capacity for dewatering excavations. Provide for disposal of water removed from excavations in a manner not to cause injury to public health, public or private property, work of others, portions of work completed or in progress, or produce an impediment to street, road and highway usage.
   7. When necessary to haul soft or wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clear away spillage of materials on roadways caused by hauling.
8. Provide effective dust control by sprinkling water, use of calcium chloride or other method approved by Authority. Employ dust control when, where and in a manner required by Authority.

9. Comply with Section 02270, Slope Protection and Erosion Control.

C. Explosives and Blasting: Use and store explosives in accordance with requirements of Federal, State and local laws, rules, regulations, precautions, orders and decrees. Additionally comply with following:

1. Do not use methods of blasting that result in breakage beyond trenching areas or is dangerous to public or destructive to property.

2. Assume sole responsibility for injury to persons or property as a result of explosives and blasting.

3. Schedule blasting in proximity of proposed new concrete work prior to placement of concrete.

4. Notify utility owners having structures or other installations above or below ground in proximity to trenching work prior to use of explosives. Give notice sufficiently in advance to enable utility owners to take steps necessary to protect their property from injury. Notifying utility owners does not relieve sole responsibility of damage resulting from use of explosives.

5. Provide competent, licensed blaster to supervise blasting.

6. Cease blasting operations when street paving adjacent to trench is damaged. Repair damaged street paving.

7. Employ an independent testing laboratory, acceptable to Authority, to conduct seismographic tests in conjunction with blasting operations. Tests will be made to establish acceptable blast patterns and procedures, and as often as Authority deems necessary.

8. Prior to starting work, furnish Authority data concerning proposed blasting operations. Include location, depth, and area of blast; diameter, spacing, depth, pattern, and inclination of blast holes; type, strength, quantity, column load, and distribution of explosives to be used per hole, per delay, and per blast; sequence and pattern of delays; and description and purpose of special methods to be adopted. Authority reserves right to limit maximum size of explosive charge.

9. Authority's acceptance of blasting data and techniques does not relieve responsibility to exercise proper supervision and field judgment and to produce specified results.

10. Blasting is permitted only after proper precautions have been taken for protection of persons, work and property. Control fly rock and material to prevent damage to persons or structures. When directed by Authority, use blasting mats in areas where overburden has been removed prior to blasting. Provide a positive means of dust control with equipment used for drilling of holes, subject to Authority's approval.

11. Perform blasting no closer than 25 feet from existing utilities, transverse crossings and parallel installations, unless utility company relieves this requirement. Before blasting within 150 feet of cured concrete, submit and obtain approval of a plan showing relative positions of concrete, area to be blasted, and blasting technique.
to be employed. Right is reserved by utility company not to allow blasting in trench adjacent to utility.

12. Use controlled blasting techniques. Modify blasting round as necessary to achieve best obtainable results and to keep air blast over pressure, vibrations and noise within limits specified. Exercise care in drilling and blasting operations to minimize overbreak and blast damage of adjacent unexcavated ground. Assume responsibility to produce a satisfactory excavated surface by determining proper relationships of factors of burden, spacing, depth of charge, quantity, and type of explosive, hole size and delay pattern, and other necessary considerations to achieve required results.

13. Perform blasting operations during normal working hours 7 am to 6 pm prevailing time. In event of an emergency, for example a thunderstorm, prevents a blast from being made before 6 pm, and holes are loaded, set blast off as soon as safety allows. In event blasting is found necessary during restricted hours, inform Authority and local residents, within hearing and vibration range, prior to firing. In addition, report in writing following day to Authority, conditions requiring blasting during restricted hours. Impact or impulsive noise from blasting operations is not to exceed 130 dB peak sound pressure level measured at nearest structure or property line. Do not leave blasting materials in hole for extended periods of time.

14. Notify residents within hearing and vibration range, on morning of blasting as well as 72 hours in advance.

15. Store explosives on site only during blasting hours specified in preceding paragraph. Truck explosives to site at start of each work day from a magazine located remote from populated areas. Return surplus explosives to magazine at close of each work day. Locations of magazines on site and parking for explosives trucks will be determined by Authority.

16. Monitor vibrations by measuring Peak Particle Velocity (PPV) in vicinity of blast at locations approved by Authority. Provide experienced personnel to operate instrumentation used to monitor air blast overpressure and PPV. Arrange to have an experienced vibrations engineer available to review seismograph and instrumentation calibration data, and to recommend blasting techniques on Project. Data from measurements will be used in controlling blasting operations. PPV, as measured on or at structures in vicinity of blasting operations, is not to exceed two inches per second. Limitations on PPV do not relieve responsibility in ensuring integrity and safety of adjacent structures. PPV is defined as maximum of three velocity components of a vibration measured at any point in three mutually perpendicular directions by a seismograph approved by Authority, capable of producing a permanent record and capable of internal dynamic calibration. Record air blast overpressure with a peak impact recording instrument having linear frequency response.

17. Furnish, install, and operate at site, an approved thunderstorm monitor and automatic lightning warning device. Make adequate provisions for transmitting alarms from device to locations where electric blasting or preparation for electric blasting is in progress. Locate and install system according to manufacturer's recommendations. Employ qualified personnel to operate and periodically test.
entire monitoring and alarm system for satisfactory operation, and promptly
correct discovered defects. Provide for repair or replacement of facilities
damaged by blasting operations at no cost to Authority.

D. Removal of Rock by Means Other Than Blasting: Where removal of rock by means
other than blasting is required, in accordance with requirements of State and local
laws, rules and regulations, and utility owner requirements, remove by use of
mechanical surface impact equipment, or by drilling and hydraulic rock splitting
equipment, or by other methods.

E. Responsibility for Condition of Excavation: Assume responsibility for condition and
results of excavation. Remove slides and cave ins at whatever time and under
whatever circumstance they occur.

F. Protection: Assume risks attending presence or proximity of overhead or underground
public utility and private lines, pipes, conduits and support work, existing structures
and property of whatever nature. Assume responsibility for damages and expenses for
direct or indirect injury to structures or to person or property by reason of them or by
reason of injury to them; whether structures are or are not shown on Drawings, by
work of this Contract.

1. Outside Rights-of-Way: Take necessary precautions to protect trees, shrubs,
lawns and other landscaping from damage. Restitution work for damages rests
solely with Contractor and at no expense to Authority.

2. Pipe Supports: Adequately support underground pipes or conduits exposed as a
result of excavations. Provide adequate support along entire exposed length by
timber or planking. Install supports in a manner that backfilling may be
performed without dislodging pipes or conduits. Place and carefully compact
required Select Backfill or Aggregate Backfill, around supports, and leave in
place as a guard against breakage due to backfill settlement. No additional
payment will be made for support material left in place nor for labor of installing
and maintaining supports.

3. Temporary Protective Construction: As specified in Section 01530 - Construction
Barriers.

G. Structure Supports: Where trenching past buildings or structures that by their
construction or position might exert detrimental pressure upon trench, right is reserved
by Authority to require that buildings or structures, be underpinned or supported and
protected, or special sheeting be driven, or that short lengths of trench be opened at
one time.

H. Removal of Obstructions:

1. Remove, realign or change direction of above or below ground utilities and
appurtenant supports, if required in opinion of Authority. Perform as extra work
unless performed by owner of obstruction without cost to Contractor. However,
uncover and sustain obstruction at no additional cost prior to final disposition of
obstruction. No claims for damage or extra compensation due to presence of
obstructions or delay in removal or rearrangement of obstructions will be made. Additional precautions concerning obstructions as follows:

a. Do not interfere with persons, firms, corporations or utilities employing protective measures, removing, changing or replacing their property or structures, but allow taking measures necessary or advisable under circumstances, without relieving responsibilities of Contract.

b. Without extra compensation, break through and reconstruct if necessary, invert or arch of sewers, culverts or conduits encountered if structure is in a position, in judgment of Authority, as not to require its removal, realignment or complete reconstruction.

c. Expenses incurred by owner of trackage for shoring his railroad tracks due to trenching adjacent to or tunneling under railroad Right-of-Way is Contractor's responsibility whether billed to him directly or to Authority. Should bills be unpaid by Contractor before final payment of Contract is made, Authority is empowered to pay bill and retain amount from moneys due or to become due Contractor.

I. Advance Trenching: Where existing utilities or other suspected underground obstructions are within close proximity of proposed pipelines, uncover and verify exact location of obstructions far enough in advance of pipelaying to allow changes in pipe alignment or grade required to bypass obstructions and to avoid removing sections of pipe already installed. If sections of installed pipe require removal and reinstallation as a result of not verifying utilities or other underground obstructions far enough in advance, remove and reinstall pipe at no additional cost.

J. Excess Materials: No right of property in materials is granted for excavated materials prior to backfilling. This provision does not relieve responsibility to remove and dispose of surplus excavated materials. Obtain written consent and any necessary permits and approvals before disposing of excess materials at an off-site location.

K. Borrow Excavation: Where required quantity of backfill exceeds quantity of suitable material excavated within limits of Project site and Rights-of-Way, obtain sufficient material to complete backfill at no additional cost to Authority. If borrow excavation is needed, notify Authority sufficiently in advance of borrow excavation requirements to permit Authority to verify need for borrow excavation and to view proposed borrow pit and determine suitability of material to be provided. Borrow excavation from outside sources is subject to approval of Authority. Obtain written consent and any necessary permits and approvals before use of borrow excavation from outside sources.

L. Change of Trench Location or Depth:

1. Should Authority require a change in location of a trench from that indicated on Drawings due to presence of an obstruction, or from other cause, and change in location is made before excavation is begun, no extra compensation or claim for damages will be granted.
2. If a change in trench location made at requirement of Authority involves abandonment of excavation already made, abandoned excavation, together with necessary refill will be classed as earth or rock excavation and backfill or unclassified excavation and backfill as applicable, in case full width of trench has not been abandoned.

3. If a changed location of a trench is authorized by Authority upon Contractor's request, Contractor is not entitled to extra compensation or to a claim for damage. If change of trench location involves abandonment of excavation already made, abandoned excavation and refill is at Contractor's expense.

M. Accommodation of Traffic: Do not obstruct streets, roads and highways. Unless Municipality or Governing Agency authorizes in writing complete closing of street, road or highway, employ necessary measures at no expense to Authority to keep street, road or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three feet wide and free from obstructions. Do Not Obstruct Fire Hydrants.

N. Classification of Excavated Materials: If unclassified excavation is indicated in the Bid Form, no consideration will be given to nature of materials encountered in trenching operations. Therefore, as unclassified trenching, no additional payment will be made for difficulties occurring in excavating and handling of materials.

PART 2 PRODUCTS

2.01 MATERIAL

A. General: All materials to be free of topsoil, plant life, lumber, metal, refuse, coal waste, slag and cinders

B. Approved Backfill: On site excavated soil or soil-rock mixed materials free of rocks or similar hard objects larger than six inches in any dimension. Rocks or similar hard objects are not to represent more than 20 percent of backfill by volume.

C. Select Backfill: On site excavated material free of rocks or similar hard objects larger than one inch in any dimension.

D. Aggregate Backfill: Select Granular Material (2RC) durable bank or crushed gravel or stone with suitable filler materials and conforming to PDT Section 703.3.

E. Pipe Bedding: Class A Bedding consisting of AASHTO No. 8 stone or gravel coarse aggregate conforming to PDT Section 703.2.

F. Concrete Cradle and Encasement: Per requirements of Cast-In-Place Concrete - Section 03300 and of following Class:
   1. Class B: 3000 psi.
G. Underground Warning Tapes: Underground Warning tapes to be marked with a continuous one line message. Wording to have in bold lettering: CAUTION. Printing to be black on 6 inch wide, 0.004 inch thick blue polyethylene film conforming to latest APWA and AASHTO specifications. Tape to be Catalog Style No. 37244 as supplied by Seton Identification Products or approved equal. Bury tape over centerline of pipe approximately 1.5 feet below finished grade.

H. Flowable Backfill:
1. Cement: Type I or II conforming to PDT Section 701.
3. Fine Aggregate: Type A, B, or C conforming to PDT Section 703.1, except having a maximum loss of 20 percent in the Soundness Test.
4. Coarse Aggregate: Type C or better, AASHTO No. 10, conforming to PDT Section 703.2.
7. Admixtures: Conforming to PDT Section 711.3. Can be used when specifically approved.
8. Mix Design (Per Cubic Yard):
   a. Provide design mix in accordance with PDT 704b.(c).
10. Compressive Strength (PTM No. 604):
    a. 3 days: 500 minimum.
    b. 28 days: 900.

PART 3 EXECUTION

3.01 PERFORMANCE

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

B. Perform soil erosion control work in accordance with requirements of Section 02270.

C. Excavating: Perform excavation and backfilling using machinery except that hand excavation and backfilling may be required where necessary to protect existing structures, utilities, private or public properties. No additional compensation will be paid for hand excavation and backfilling instead of machine excavation and backfilling as may be necessary.
1. Remove surface materials of whatever nature, including pavement and topsoil, over line of trenches and other excavations and properly separate and store removed materials as suitable for use in backfilling or other purposes.
   a. Remove pavement in accordance with requirements of Paving and Surfacing - Section 02500.
2. Remove subsurface materials of whatever nature, including rock, masonry and cementitious materials, down to subgrade elevation. Properly separate and store removed subsurface materials as suitable for use in backfilling.
3. Remove rock to subgrade at least 25 feet in advance of pipe laying.
4. Remove rock below subgrade if shattered due to excessive drilling and blasting, and in opinion of Authority it is unfit for foundations. Backfill to subgrade with Class B Concrete per requirements of Cast-In-Place Concrete - Section 03300, AASHTO No. 8 coarse aggregate conforming to requirements for Pipe Bedding, or other material acceptable to Authority. No separate or additional payment will be made for removal and backfill due to excessive drilling and blasting.

5. Excavate rock in miscellaneous excavations to extent required by Authority.

6. When rock is encountered in excavations where blank connections are to be left for future extensions of sewerlines, remove rock for a distance of not less than ten feet from blank connection in direction of future extension. Excavate trench to specified width, depth and length.

7. Remove and waste or otherwise dispose of excavated materials not required for backfill at no expense to Authority.


D. Trench Width and Depth: For full depth of trench, maximum trench pay width is a vertical plane as specified in Table A. If sheeting is required, following Table A dimensions apply to the inside face of sheeting.

<table>
<thead>
<tr>
<th>Diameter of Pipe</th>
<th>Maximum Trench Width (Outside Diameter of Pipe at Barrel Plus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 through 24 inches</td>
<td>24 inches</td>
</tr>
</tbody>
</table>

1. Depth: Excavate below planned bottom of pipe, 4 inches in earth and 8 inches in rock.
2. No additional compensation will be paid for excavation beyond trench widths indicated in Table 'A' unless approved in writing by Authority.
3. Excavate rock for manhole, chamber, catch basin or other structure installations 1 foot outside exterior lines of structure walls and to a depth of outside bottom.

E. When unsuitable material is found below subgrade, as determined by Authority, remove material to a depth determined by Authority, and provide Class A Bedding compacted in 4 inch layers.

F. Length of Open Trench: Authority has right to limit quantity of trench opened in advance of pipe laying and quantity of pipe laid in advance of backfilling, but in no case are these quantities to exceed 300 feet and 100 feet respectively. Complete trench excavation at least twenty five feet in advance of pipe laying and keep trenches free from obstructions, except that at end of a work day or at discontinuance of work,
pipe laying may be completed to within five feet of end of open trench. Additional open trench limitations as follows:
1. Authority is empowered to require trench backfilling over completed pipe lines at any time if in his judgment it is necessary. No claim for extra compensation will be allowed for trench refilling even though work stopped elsewhere as a result.
2. If trenching work is stopped for any reason, except as required by Authority, and excavation is left open for an unreasonable period in advance of construction in opinion of Authority, Authority may order trench refilling at no additional expense and not allow trench reopening until ready for actual use.

G. Excavated Material Storage:
1. In streets, roads, and highways, or in other locations where working space is limited, remove excavated materials from first 100 feet of opening as soon as its excavated, when required by Authority. Store and return excavated materials for backfilling when required, at no expense to Authority. In no case cast excavated material beyond curb or Right-of-Way lines or on sidewalks or lawns.
2. Where more material is excavated from trenches than can be backfilled or stored on street or within Rights-of-Way limits, leaving space for traffic and drainage, remove and store excess material. Return excess material for backfilling when required, at no expense to Authority.

H. Subgrade Preparation: Provide Class A Bedding in trenches as pipe foundations. Depth of Bedding is indicated in Detail Drawings. In lieu of Class A Bedding, provide concrete encasement or concrete cradle or other type of bedding as indicated on Drawings or required by Authority. If maximum trench widths specified in Table A are exceeded, provide concrete cradle or concrete encasement at no expense to Authority.

I. Backfilling: Perform trench backfilling and backfilling excavations for other in line structures by methods resulting in thorough compaction of backfill material without displacement of grade and alignment of pipeline and its appurtenances and minimum settlement of backfilled material. Displacement of pipeline and settlement of backfill will be considered evidence of improper workmanship or inclusion of unsuitable backfill materials, or both, and will require regrading and realigning pipeline and removing and recompingsettled material at no expense to Authority. Following pipe bedding, piping and inline structure installation, backfill trenches in following manner:
1. State Highway and Shoulder, Municipal Streets, Paved Entrances, Parking Lots, and Driveways: Aggregate Backfill compacted in four inch layers to bottom of temporary or permanent paving. If vibratory compaction equipment is used, lifts may be 8 inches.
2. Unpaved Shoulder Along Municipal Streets: If edge of trench is three feet or more from edge of road, backfill trench with Select Backfill compacted in four inch layers flush with existing shoulder. If edge of trench is less than three feet from edge of road, backfill trench with Select Backfill within 18 inches from top of trench; remaining 18 inches to be backfilled with Aggregate Backfill; entire
depth to be compacted in 4 inch layers, unless vibratory compaction equipment is used, then lifts may be 8 inches.

3. Unpaved Areas: Backfill trenches to a height at least one foot above top of outside barrel of pipe with Select Backfill material placed in four inch layers. If vibratory compaction equipment is used, lifts may be 8 inches. Carefully place this backfill in a manner not to damage or disturb pipe. Backfill remainder of trench with Approved Backfill compacted in eight inch layers to bottom of topsoil. Replace topsoil to approximate depth of existing, as final refill operation and crown to height required by Authority. Maintain crowned surface as required by Authority, during guarantee period.

J. Compacting: During course of backfilling and compacting work, Authority may, at any location or depth of trench, require Contractor to perform tests to determine whether compaction operations are sufficient to meet specified requirements. Trench excavation and backfill on State Highways is subject to inspection by representatives of Pennsylvania Department of Transportation. Perform work in accordance with requirements of that department without additional payment regardless if requirements entail more labor or services than methods specified here. Similar inspection and requirements apply to township and borough street excavations. Compact trench backfill as follows:
1. Solidly tamp each layer of required backfill around pipeline with proper tamping tools made specially for this purpose.
2. Thoroughly compact aggregate backfill with a vibratory compactor of type and size satisfactory to Authority and PennDOT. Compacting of aggregate backfill by puddling or jetting is not permitted.
3. Use mechanical tampers to compact backfill materials in trench refill operations to produce a density at bottom of each layer of not less than 95 percent of maximum density obtained at optimum moisture content as determined by ASTM D698. Perform field determinations of density, in accordance with ASTM D2922. Make a minimum of two field determinations for each lift of backfill for every 200 ft. length of trench.
4. From a point one foot above top of pipe to subgrade of paving (or below surface where paving is not required), compact backfill by tamping. Use of Hydra-Hammer for compacting backfill in trenches is prohibited.

K. Flowable Backfill: Mix and transport in accordance with PDT Section 704. Submit sequence of operations for approval prior to placement.
1. Testing and Acceptance: Conforming to PDT Section 704.1(d) except as follows:
   a. Concrete for flowable backfill will be tested for slump in accordance with PTM No. 600, and for yield in accordance with PTM No. 613
   b. Cylinders for compressive strength testing will be molded in accordance with PTM No. 611 and cured in accordance with PTM No. 611, Section 11.1"

L. Replacement of Sidewalks, Curbs, Gutter and Inlets:
1. General: All sidewalks, concrete aprons, curbing, gutters and inlets removed, damaged, or disturbed shall be replaced at the Contractors expense if replacement
is necessary through fault or for the convenience of the Contractor. Cost associated with removal and replacement, as authorized by the Authority, shall be included in the unit price of excavation.

2. Sidewalk Replacement: In accordance with PDT Section 676.
3. Curb replacement: In accordance with PDT Section 630, 633 and 636 as applicable.
4. Gutter Replacement: In accordance with PDT Section 640 and 641 as applicable.
5. Endwall or Inlet Replacement: In accordance with PDT Section 605.

M. Cleanup:
1. Remove surplus excavated material, rubbish and other construction debris, and keep removed to a point not more than two hundred feet from head of open trench, unless otherwise authorized by Authority.
2. After trenches and other excavations are backfilled and work completed, remove surplus excavated materials, rubbish or other materials from work site. Dispose of materials off site in a lawful manner at no additional expense to Authority.
3. Evenly spread and leave in neat, smooth condition excavated material disposed of lawfully on public property.
4. Furnish and place topsoil, fertilize and seed grassed areas, within and outside Rights-of-Way affected by construction. Reseed and refertilize areas that fail to show a uniform stand of grass. Water, mow, rake, weed and otherwise maintain grass until final acceptance of Contract.
5. Restore area covered by temporary and permanent Rights-of-Way to as near original conditions as is practical. Bring area up to original grade, place topsoil, seed, replant or replace shrubbery, repair or replace walks, driveways, fences and other improvements, damaged or removed.
6. When repaving over trenches and other excavations is completed, sweep paved surfaces affected by work using hand or power sweepers, and if required by Authority, flush with water to remove dust and small particles.
7. In case Contractor fails or neglects to do so or makes unsatisfactory progress in doing so, within twenty four hours after receipt of a written notice from Authority may remove surplus material and clear roadways, sidewalks and other places, and expense for work charged to Contractor and deducted from moneys due or to become due him under Contract.
8. Comply with applicable requirements of Section 01710.

N. Maintenance: Assume responsibility for injury or damage resulting from lack of trench maintenance during guarantee period. If trench surfaces are not satisfactorily maintained or repairs begun within seven days after written notice from Authority, repairs may be made by Authority, and cost charged against Contractor.

END OF SECTION
SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Soil erosion and sedimentation control measures for earthwork activities as specified in various other Sections of the Specifications.

B. Related Sections:
   1. Temporary Environmental Controls: Section 01560.
   2. Trenching, Backfilling and Compacting: Section 02221.
   3. Seeding: Section 02485.

1.02 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM A 82; Specification for Cold-Drawn Steel Wire for Concrete Reinforcement.
   2. ASTM A615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM D1117; Nonwoven Fabrics, Methods of Testing.
   7. ASTM D3776, Standard Test Method for Mass Per Unit Area (Weight) of Woven Fabric.

B. Commonwealth of Pennsylvania Department of Transportation (PDT) Specifications, Publication 408.
   1. PDT Section 212, Geotextiles
2. PDT Section 703, Aggregates
3. PDT Section 735, Geotextiles
4. PDT Section 804, Seeding and Soil Supplements
5. PDT Section 805, Mulching
6. PDT Section 806, Water Course and Slope Erosion Protection
7. PDT Section 845, Unforeseen Water Pollution Control
8. PDT Section 850, Rock Lining
9. PDT Section 856, Rock Barrier
10. PDT Section 859, Sedimentation Pond
11. PDT Section 860, Sediment Trap
12. PDT Section 861, Cleaning Sedimentation Structures
13. PDT Section 864, Diversion Ditch
14. PDT Section 865, Silt Barrier Fence

C. Commonwealth of Pennsylvania, Department of Environmental Protection, Bureau of Soil and Water Conservation.
1. Erosion and Sediment Pollution Control Program Manual.
   a. Chapter 5, Standards and Specifications.

1.03 SUBMITTALS

A. Furnish certificates from manufacturers of following materials, certifying their products meet requirements of these Specifications.
   1. Matting for Erosion Control.
   2. Fabric for Silt Barrier Fencing.

1.04 PROJECT CONDITIONS

A. Environmental Requirements:
   1. See Section 01560 for environmental protection, erosion control general requirements and scheduling.

PART 2 PRODUCTS

2.01 STONE FOR RIPRAP

A. Provide riprap obtained from an offsite source from an approved PennDOT Type A source. Do not use stone for riprap protection containing boulders, or cobbles from soil or gravel deposits, earth, roots, debris or similar material. Each stone to weigh not less than 162 pounds per cubic foot, based on saturated dry specific gravity, determined in accordance with ASTM C97.

B. Provide stone that is predominantly angular and blocky in shape rather than elongated, with sharp clean edges at intersection of relatively flat faces. Following shape limitations are specified for stone used for riprap protection.
1. Not more than 25 percent of stones reasonably well distributed throughout gradation to have a length more than 2.5 times breadth or thickness.
2. Do not use stone having a length exceeding 3.0 times its breadth or thickness.

C. Stone for riprap protection obtained from an offsite source to conform to gradation requirements for Rock Lining as specified in PDT Section 850. "R" classification is as indicated on Drawings. Stone protection material may contain up to 5 percent, by weight of air dried rock, fragments, spalls, and dust with each particle weighing less than permissible minimum stone size and be defined as a stone in stone protection material. In computing percentages by weight of stones in required gradation, do not include weight of a particle weighing less than permissible minimum stone size in total weight.

2.02 BEDDING MATERIAL FOR RIPRAP

A. Aggregate Bedding Material for Corresponding "R" Classification of Riprap is as follows:

<table>
<thead>
<tr>
<th>&quot;R&quot; Class</th>
<th>Max. Size</th>
<th>Avg. Size (d50)</th>
<th>Min Size (d15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-3</td>
<td>2&quot;</td>
<td>No. 4</td>
<td>No. 100</td>
</tr>
<tr>
<td>R-4</td>
<td>2&quot;</td>
<td>No. 4</td>
<td>No. 100</td>
</tr>
<tr>
<td>R-5</td>
<td>2&quot;</td>
<td>No. 4</td>
<td>No. 100</td>
</tr>
<tr>
<td>R-6</td>
<td>6.5&quot;</td>
<td>2.5&quot;</td>
<td>No. 16</td>
</tr>
<tr>
<td>R-7</td>
<td>6.5&quot;</td>
<td>2.5&quot;</td>
<td>No. 16</td>
</tr>
<tr>
<td>R-8</td>
<td>6.5&quot;</td>
<td>2.5&quot;</td>
<td>No. 16</td>
</tr>
</tbody>
</table>

2.03 MATTING FOR EROSION CONTROL

A. Jute Matting: PDT Section 806.2(a)1.
B. Wood Excelsior Blanket: PDT Section 806.2(a)2.
C. Mulch Control Netting: PDT Section 806.2(d).
D. Nylon Erosion Control Mat: PDT Section 806.2(b)2.
E. Staples: PDT Section 806.2(e)
2.04 EROSION CONTROL DEVICES

A. Straw Bale Barriers:
   1. Bales: Straw stalks of threshed grain or tall hay grass stalks commercially available locally.
   2. Stakes: Wood Stakes. Sound, rough sawn, red or white cedar or hardwood measuring two inches by two inches; of required length, with tapered point.
   3. Reinforcement Bars: ASTM A615 (S1), Grade 60, Deformed.

B. Filter Fabric Fence: PDT Section 865.2.

C. Rock Construction Entrance:
   2. Filter Cloth - PDT Section 735, Class 4.

D. Sediment Removal Pond for Pumped Water: Erosion and Sedimentation Control Plan Details and Notes.

E. Pumped Water Sediment Control Device (PWSCD):
   1. Nonwoven geotextile fabric sewn with double needle machine using high strength thread.
   2. Provide PWSCD with opening large enough to accommodate a 4 inch discharge hose with attached strap to tie off the hose preventing pumped water from escaping from PWSCD without being filtered.
   3. Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>ASTM D3776</td>
<td>10 oz./yd.</td>
</tr>
<tr>
<td>Grab Tensile</td>
<td>ASTM D4632</td>
<td>270 lbs.</td>
</tr>
<tr>
<td>Puncture</td>
<td>ASTM D4833</td>
<td>150 lbs.</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>ASTM D4491</td>
<td>70 gal./min./ft.²</td>
</tr>
<tr>
<td>Permeability</td>
<td>ASTM D4491</td>
<td>1.3 sec⁻¹</td>
</tr>
<tr>
<td>UV Resistance</td>
<td>ASTM D4355</td>
<td>70%</td>
</tr>
<tr>
<td>AOS % Retained</td>
<td>ASTM D4751</td>
<td>100</td>
</tr>
<tr>
<td>Seam Strength</td>
<td>ASTM D4884</td>
<td>100 lbs./in.</td>
</tr>
</tbody>
</table>

   All properties are minimum average roll value except the weight of the fabric which is given for information only.
4. Manufacturer:
   a. ACF Environmental, Dirtbag.
   b. Or Approved Equal.

F. Inlet Sediment Control Device (ISCD):
   1. Woven geotextile fabric sack sewn with double needle machine using high strength thread. Geotextile fabric sack to have an average wide width strength of 100 lb/in per ASTM D4884.
   2. Provide ISCD manufactured to fit openings of the inlets.
   3. Provide ISCD with integral dump straps, lifting loops and restraining strap.
   4. Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile</td>
<td>ASTM D4632</td>
<td>300 lbs.</td>
</tr>
<tr>
<td>Grab Elongation</td>
<td>ASTM D4632</td>
<td>20 Percent</td>
</tr>
<tr>
<td>Puncture</td>
<td>ASTM D4833</td>
<td>120 lbs.</td>
</tr>
<tr>
<td>Mullen Burst</td>
<td>ASTM D3786</td>
<td>80 psi</td>
</tr>
<tr>
<td>Trapezoid Tear</td>
<td>ASTM D4533</td>
<td>120 lbs.</td>
</tr>
<tr>
<td>UV Resistance</td>
<td>ASTM D4355</td>
<td>80%</td>
</tr>
<tr>
<td>Apparent Opening Size</td>
<td>ASTM D4751</td>
<td>40 US Sieve</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>ASTM D4491</td>
<td>40 Gal/Min/Sq. Ft.</td>
</tr>
<tr>
<td>Permittivity</td>
<td>ASTM D4491</td>
<td>0.55 sec-1</td>
</tr>
</tbody>
</table>

All properties are minimum average roll values.

4. Manufacturer:
   a. ACF Environmental, Siltsack.
   b. Or Approved Equal.

G. Channel Inlet Protection: DEP Erosion and Sediment Pollution Control Program Manual Details and Notes and Detail Drawings.

H. Curbed Roadway Inlet Protection: DEP Erosion and Sediment Pollution Control Program Manual Details and Notes and Detail Drawings.

I. Rock Filters: DEP Erosion and Sediment Pollution Control Program Manual, Chapter 5, Section 11.

J. Sediment Traps: PDT Section 860.2.
2.05 TEMPORARY SEEDING MIXTURES

A. As indicated on the Drawings.

<table>
<thead>
<tr>
<th>Variety of Seed</th>
<th>Spring Mar. 1-May 15 (lb. per acre)</th>
<th>Summer May 15-Aug. 15 (lb. per acre)</th>
<th>Fall &amp; Winter Aug. 15-Mar. 1 (lb. per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual rye grass</td>
<td>20</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Barley or Oats (local seed)</td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millet (Japanese)</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual rye grass</td>
<td></td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Winter rye or</td>
<td></td>
<td></td>
<td>168</td>
</tr>
<tr>
<td>Winter wheat</td>
<td></td>
<td></td>
<td>180</td>
</tr>
</tbody>
</table>

2.06 SOIL SUPPLEMENT MATERIALS

A. As specified in Section 02260.

2.07 MULCHING MATERIALS

A. Mulches: As specified in PDT Section 805.2(a)1.

B. Mulch Binding: As specified in PDT Section 805.2(b).

C. Wood Chips: Wood chips, recovered from clearing and grubbing operations is acceptable as mulch for seeding and used at a rate of 35 cubic yard per acre.

PART 3 EXECUTION

3.01 INSTALLATION

A. Bedding Material for Riprap: Place bedding material uniformly on prepared base, in a satisfactory manner, over areas to receive riprap and to a minimum thickness of 6 inches. Repair damage to surface of bedding base during placement of bedding material or riprap before proceeding with work. Compaction of bedding is not required, but finish to present a reasonably even surface, free from wounds or windows.

B. Riprap: Firmly bed each stone abutting against other stones to form a layer, with interstices filled with suitably sized spalls. Take care in placing stone so that its weight is carried by underlying material and not by adjacent stones. Surface of each
stone is not to vary more than four inches from surface plane. Depths of abutting stones are not to differ by more than 4 inches. Progress by fitting additional and abutting stones with well broken joints so that most compact mass of riprap is developed.

C. Erosion Control Devices: Provide in place prior to start of construction in any area.

1. Diversion Terraces and Interceptor Terraces:
   a. Provide diversion and interceptor terraces consisting of low ridges of compacted soil or earthfilled burlap bags installed in series to prevent erosive velocities from developing on long, uninterrupted slopes and to direct surface runoff away from critical, disturbed areas. Intercept runoff at each terrace, then filter through a sediment barrier and direct into a stable, nonerosive or vegetated area. Outlet ends of successive interceptor terraces should alternate from side to side of exposed Right-of-Way. Install diversion terraces prior to excavation and earth moving activities. Install interceptor terraces on sloping terrain during construction, after backfill and final grading, and prior to seeding. Construct diversion and interceptor terraces in accordance with details indicated on Drawings. Spacing and location of interceptor terraces are governed by onsite conditions in accordance with following guidelines.

<table>
<thead>
<tr>
<th>Typical Spacing for Diversion Terraces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope Above Terrace (%)</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>5 - 15%</td>
</tr>
<tr>
<td>15 - 30%</td>
</tr>
<tr>
<td>30% or greater</td>
</tr>
</tbody>
</table>

2. Trench Plugs:
   a. Provide temporary trench plugs at intersections between interceptor terraces and open pipeline trench to prevent unconsolidated soils from being washed down trench during periods of rainfall. Temporary trench plugs consist of eight foot long dams of compacted earth.
   b. Provide permanent trench plugs on critical slopes and on each side of creek crossings to form a solid barrier against subsurface water movement. Permanent trench plugs consist of earth filled sacks packed tightly around pipe.

3. Rock Check Dams:
   a. Provide rock check dams as temporary facilities at points to intercept surface runoff from project areas, and are intended for removal of sediment. Construct with a filter blanket of AASHTO No. 57 coarse aggregate on upstream face of rockfill section. Locate rock check dams as indicated on Drawings or directed by Authority and construct in accordance with details indicated on Drawings.
4. Sedimentation Traps:
   a. Provide sedimentation traps prior to performing excavations. Provide as indicated on Drawings or as directed by Authority to remove sediment from storm water runoff or dewatering activities. Design sediment traps to provide a capacity of 2000 cubic feet per contributing acre.
   b. Structure discharges to natural water way with outlet works designed to pass a minimum of 2 cubic feet per second for each acre of drainage served plus flow resulting from dewatering activities.
   c. Remove sediment and restore trap to its original dimensions when sediment has accumulated to 1/2 design depth of trap.
   d. Remove sedimentation trap from service and stabilize area when disturbed areas have been properly stabilized.

5. Silt Barrier Fence: Install fence near limits of excavation or fills where indicated on Drawings or as directed by Authority to control erosion until disturbed areas are permanently stabilized.
   a. Construct silt barrier fencing with Class 3 geotextile material with wire or plastic mesh support fencing fastened to support posts. Overall height of fabric above ground to be nominally 18 inches. Provide geotextile material of width required including an 8 inch to 12 inch section for embedment.
   b. Excavate a trench 6 inches wide by 6 inches deep on fabric side of barrier and along inside of post line.
   c. Install posts a minimum of 18 inches deep, by an approved method, on downstream edge of trench at a maximum spacing of 10 feet.
   d. Provide wire or plastic mesh support fence when used, of sufficient height to extend from top of fabric to ground or into excavated trench and be securely fastened to posts. Provide staples for wood posts and tie wires for steel and plastic posts, with a minimum of three fasteners per post.
   e. Secure geotextile fabric material by fasteners to top of wire mesh and posts, keeping sag to a minimum, and at a maximum spacing of 30 inches. Extend fabric 8 to 12 inches into excavated trench for embedment. Backfill and compact over geotextile material to prevent water from flowing under fabric. Overlap fabric roll ends a minimum of 6 inches at post locations.
   f. Preassembled silt barrier fence systems to be approved by Authority. Install preassembled fence systems in accordance with manufacturer's recommendations.
   g. Construct silt barrier fence across a ditch or swale area of sufficient length to eliminate end flow, with ends pointing upstream and upslope.
   h. Maintain silt barrier fence satisfactorily to keep functional. This includes removal of trapped sediment and cleaning fabric of trapped sediment by tapping fabric material when dry. Replace fabric not functioning due to clogging, damage or deterioration as directed by Authority.
   i. Remove fencing when no longer required, as determined by Authority. Dispose of fencing materials in a suitable manner and restore area where fence had been erected at no additional cost to Authority.
6. Pumped Water Sediment Control Device (PWSCD):
   a. Install the PWSCD on a slope. It should be placed so the incoming water flows into the bag and will flow through the PWSCD and then flow off the site without creating more erosion. The neck of the PWSCD should be tied off tightly to stop the water from flowing out of the PWSCD without going through the walls of the bag. To increase the surface area being used, the PWSCD may be placed on a gravel bed to allow water to flow in all directions.
   b. The PWSCD is considered full and should be disposed when it is impractical for the bag to filter the sediment out at a reasonable flow rate and should be replaced with a new PWSCD.
   c. Disposal may be accomplished as directed by the Authority. If the site allows, the PWSCD may be buried on site and seeded, visible fabric removed and seeded or removed from site to a proper disposal area.

7. Inlet Sediment Control Device (ISCD):
   a. Installation and emptying instructions in accordance with manufacturers printed instructions.

8. Temporary Seeding and/or Mulching:
   a. General: Authority reserves right to direct temporary seeding and/or mulching of disturbed areas in event permanent grading and seeding cannot be immediately performed. Include cost of temporary erosion control measures in appropriate pay item.
   b. Liming: Lime application rates will be determined on basis of tests performed by Contractor or apply a minimum of 800 pounds of agricultural lime stone per 1000 square yards.
   c. Fertilizer: Apply fertilizer at a rate of 140 pounds per 1000 square yards of 10-20-20 fertilizer or in conformance with results of soil tests performed.
   d. Tilling: Till seedbed to a depth of 3 inches prior to seeding. Lime (if required) and fertilizer may be applied during tilling operation.
   e. Seeding: Type of temporary seed mixture to be used is determined by Authority. Sow seed at rate indicated in Temporary Seeding Mixtures Article. Cover seed with 1/2 inch of topsoil and lightly roll seeded area.
   f. Mulching: Apply hay or straw mulch at rate of three tons per acre on slopes of 1.5 to 1 or flatter. Apply asphalt material to anchor mulch at rate of 50 gallons per ton on straw or hay mulch. Apply wood cellulose fiber mulch on slopes steeper than 1.5 to 1 at a rate of 1500 pounds per acre. Wood chips, recovered from clearing and grubbing operations, is acceptable as mulch for temporary seeding. Use at a rate of 35 cubic feet per acre in lieu of straw or hay.

9. Mulching Alone: For embankments or cuts 1.5 to 1 or flatter, susceptible to critical erosion during periods of cold weather or other site conditions, Authority may require a three ton per acre application of straw or hay mulch for temporary erosion control and later seeding. Apply asphalt for anchoring mulch at a rate of 50 gallons per ton. Straw or hay may be rolled immediately with a sheepsfoot roller to anchor mulch in lieu of using asphalt. When weather becomes favorable, seed areas provided with a mulch cover alone using normal application rates of
seed, fertilizer and lime. If additional mulch is needed, rate of application and area to be mulched will be as determined by Authority.

10. Matting for Erosion Control: Provide matting in lieu of mulch on slopes 3:1 and steeper or when directed by Authority.
   a. Prepare area to be covered as a fine seedbed, fertilized and seeded. Place matting immediately and water to give a firm bond to soil and start germination of seed. Either jute or excelsior matting may be used.
   b. Jute Matting: Lay jute matting snugly to ground with a 4 inch overlap on edges and a 12 inch overlap on ends. Make check slots from a 2 foot wide strip of jute matting folded and buried in a 6 inch deep trench with a 6 inch flap extending on each side of trench. Place check slots perpendicular to water flow, tamped and stapled in place before jute matting is laid. Use check slots for jute matting when slope exceeds a 5 percent grade. On grades or slopes steeper than 5 percent, Authority will determine spacing of check slots.
   c. Excelsior Matting: Lay excelsior matting with netting on top and fibers in contact with soil over entire area. Butt ends and sides of excelsior blanket snugly and staple. It is not necessary to dig check slots, anchor ditches or bury ends of excelsior matting.
   d. Staples: Hold matting in place by means of wire staples driven at a 90 degree angle to soil surface. Space staples not more than 3 feet apart in three rows for each strip, with one row along each edge and one row alternately spaced in middle. Space staples 6 inches apart across matting ends and check slots width.

3.02 MAINTENANCE

   A. Begin maintenance operations immediately and continue throughout construction period until Contract is completed. Inspect sediment control structures and repair after each storm.

3.03 SOIL EROSION AND SEDIMENTATION PLAN

   A. An approved Erosion and Sedimentation Control Plan is indicated on Drawings. Should Contractor desire to modify this Plan, obtain necessary approvals prior to implementing any provisions at no additional cost to Authority.

END OF SECTION
SECTION 02314

BORED PIPE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Provision for construction of a water main highway crossing or railroad crossing by boring construction method.

B. Related Sections:
   1. Shoring: Section 02151.
   2. Trenching, Backfilling and Compacting: Section 02221.
   5. Work On Railroad Property: Section 02855.
   5. Work On Highway Property: Section 02856.

1.02 REFERENCES

A. American National Standards Institute:
   1. ANSI A21.51, Ductile-Iron, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

B. American Society for Testing and Materials:
   1. ASTM A53, Pipe Steel Black and Hot Dipped Zinc-Coated Welded and Seamless.
   2. ASTM A123, Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressured and Forged Steel Shapes, Plates, Bars and Strips.
   3. ASTM A139, Electric-Fusion (Arc)-Welded Steel Pipe (Sizes 4 inch and over).
   5. ASTM C 270; Specification for Mortar for Unit Masonry.

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

D. American Water Works Association:
   1. AWWA C200, Steel Water Pipe 6 in. and Larger.
   2. AWWA C206, Standard for Field Welding of Steel Water Pipe.

E. Consolidated Rail Corporation’s "CE-8 Specifications for Pipeline Occupancy of Consolidated Rail Corporation Property".
1.03 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Encasing conduit under highway to be of sufficient strength to support superimposed loads, including an H 20 AASHTO live loading.
   2. Encasing conduit under railroads to be of sufficient strength to support superimposed loads, including a Cooper E80 live load with 50 percent added for impact.

1.04 SUBMITTALS

A. Shop Drawings and Product Data: Furnish completely dimensioned Shop Drawings, Catalog Cuts or other data required to provide a complete description of products to be installed.

B. Certificates: Certified records or reports of results of shop tests. Records or reports to contain a sworn statement that shop tests have been made as specified.

1.05 QUALITY ASSURANCE

A. Workers Qualifications:
   1. Use personnel thoroughly trained and experienced in skills required. Field supervisor of boring operations and boring machine operator to have not less than 12 months experience in operation of equipment being used.
   2. Make welds only by welders, tackers and welding operators previously qualified by tests as prescribed in Structural Welding Code AWS D1.1 of American Welding Society to perform type of work required. Show proof of certification when requested by Authority.

B. Requirements of Regulatory Agencies:
   1. Highway: Materials and methods of construction used on PennDOT property are subject to approval of PennDOT. Conduct work and operations fully within PennDOT's rules, regulations and requirements. Ascertain from PennDOT its rules, regulations and requirements, and what delays may be encountered. If required by PennDOT, submit for approval specific details of construction methods intending to utilize including sketches or drawings.
      a. See Section 02856 for additional requirements.
   2. Railroad: Materials and methods of construction used on railroad company property shall be subject to the approval of the railroad company and the Contractor shall at all times conduct his work and operations fully within the railroad company's rules, regulations and requirements. Ascertain from the railroad company, its rules, regulations and requirements, and what, if any, delays
may be encountered. If required by the railroad company, submit for approval an outline of the methods and means proposed for prosecuting the work.

a. Perform work within Norfolk Southern Corporation property in accordance with the requirements of the current edition of the Consolidated Rail Corporation’s "CE-8 Specifications for Pipeline Occupancy of Consolidated Rail Corporation Property".

b. Perform work within other railroad’s property, private sidings and crossings in accordance with the requirements of the railroad property owners involved or owners of the track.

c. See Section 02855 for additional requirements.

C. Source Quality Control:
   1. Inspection and Certification by Manufacturer:
      a. Ductile Iron Pipe: Furnish manufacturers sworn statement that inspection and specified tests have been made on ductile iron pipe as required by ANSI A21.51 and results comply with requirements of that standard.
      b. Steel Pipe: Furnish manufacturers sworn statement that inspection and specified tests have been made on steel pipe as required by ASTM A139 and results comply with requirements of that standard.

1.06 DELIVERY, STORAGE AND HANDLING

A. Transport, handle and store materials and products specified in a manner recommended by respective manufacturers to prevent damage and defects.

1.07 PROJECT CONDITIONS

A. Scheduling: Do not start work within State Highway Right-of-Way or railroad company property until authorization is received from PennDOT or the railroad company to do so. Continue boring operations once started, until completed.

B. Environmental Requirements:
   1. As specified in Sections 02221, 02270, and 02713.

C. Protection: As specified in Section 02221 and the following:
   1. Adequately support and protect utilities and facilities encountered in, or affected by work.
   2. Blasting not permitted under or near State Highways.
   3. Sheet, shore, and brace excavations as required to prevent subsurface subsidence.
   4. Keep boring pits dewatered, and pumps attended on a 24 hour basis, if conditions require. Maintain close observation to detect settlement or displacement of highway embankment, pavement, and facilities during dewatering operations. Dewater into a sediment trap and comply with applicable environmental protection criteria specified elsewhere in Contract Documents.
   5. Maintain suitable air in pipe when hand excavating for health of workers.
   6. Temporary Protective Construction: As specified in Section 01530.
PART 2 PRODUCTS

2.01 ENCASING CONDUIT

A. Steel Pipe: ASTM A139, Grade B or ASTM A53. Materials for use under railroads or highways shall be verified with the approving agencies. In general, casings shall be uncoated steel pipe designed in accordance with AWWA C200 with minimum diameters and thicknesses noted below:
   1. Minimum diameter and wall thickness is indicated on Drawings.
   2. Joints: Provide field welded butt joints.

<table>
<thead>
<tr>
<th>Encasing Pipe Diameter</th>
<th>*Minimum Thickness (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>0.250</td>
</tr>
<tr>
<td>16&quot;</td>
<td>0.281</td>
</tr>
<tr>
<td>18&quot;</td>
<td>0.312</td>
</tr>
<tr>
<td>20&quot;</td>
<td>0.344</td>
</tr>
<tr>
<td>24&quot;</td>
<td>0.375</td>
</tr>
<tr>
<td>30&quot;</td>
<td>0.469</td>
</tr>
<tr>
<td>36&quot;</td>
<td>0.532</td>
</tr>
<tr>
<td>42&quot;</td>
<td>0.625</td>
</tr>
</tbody>
</table>

2.02 SANITARY SEWER MAIN PIPE AND FITTINGS

A. Solid Wall Polyvinyl Chloride (PVC) Pipe: As specified in Section 02722 and 02724.

B. Ductile Iron Pipe (DIP): As specified in Section 02722 and 02724. Use only when required by the approving agency.
   1. Use only mechanical joint type DIP.

B. Reinforced Concrete Pipe (RCP) and Prestressed Concrete Cylinder Pipe (PCCP): As specified in Section 02722. Use only when required by the approving agency.

2.03 MISCELLANEOUS MATERIAL

A. Brick: Manufactured from clay or shale and burned, meeting requirements of ASTM C32, Grade MS.

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

2.04 CONTRACTOR OPTIONS IN PRODUCTS

A. A larger diameter encasing conduit than is indicated on approved plans may be installed provided that prior written approval is secured from PennDOT or other agencies having jurisdiction. If installing a larger diameter encasing conduit than indicated on approved plans, maintain necessary clearances under roadways, pipelines or other structures. Substitution of a larger diameter encasing conduit will be made without additional compensation.

PART 3 EXECUTION

3.01 GENERAL

A. Approved plans indicate smallest diameter casing acceptable for installations. A larger diameter casing can be used if expectations of encountering rock or boulders would require hand mining. If electing to utilize casing diameter called for on approved plans, rock is encountered and installation is abandoned due to nonability to hand mine in casing, installation will be abandoned at no expense to Authority. Abandonment of a casing due to an obstruction is identified below.

B. Obstruction:
1. An obstruction is defined as being any physical object including water, electric, gas, sewer, telephone lines, and manholes, encountered during installation of casing pipe. Rock, boulders, sandstone, shale, or similar objects encountered during construction of a crossing are not considered as obstructions and are to be removed.
2. If an obstruction is encountered during installation of steel casing pipe, cease operations and notify Authority immediately. In event installation cannot be modified and continued, abandon steel casing pipe in place and fill completely with grout. Cost of filling abandoned casing with grout will be paid for at actual cost to the Contractor in dollars plus 20 percent as overhead and profit. Cost for work prior to abandoning steel casing pipe in place will be paid for at Contract lump sum breakdown price for work actually completed.
3. If required to shift location or depth of crossing because of encountering an obstruction, work related to adding fittings, pipe, and appurtenances other than that shown on Drawings necessary for connecting mains prior to passing through casing conduit and additional excavation will be paid for by Change Order.
4. If the crossing must be installed by open cut methods, perform the installation in accordance with PennDOT requirements as approved by the Authority. The cost of filling the abandoned casing with grout will be paid for at actual cost to the Contractor in dollars plus 20 percent as overhead and profit. No work is to proceed until the required PennDOT permits are secured, or revised as required.
3.02 INSPECTION

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

B. Remove rejected materials and products from Project Site.

3.03 PREPARATION

A. As specified in Sections 02221 and 02713.

3.04 PERFORMANCE

A. Excavation and Backfill: As specified in Section 02221.
   1. Locate boring pits outside highway or railroad Right-of-Way limit. Boring pits not permitted closer to highway or railroad unless lesser distance is specifically authorized in writing by PennDOT or railroad company. Minimum distance from railroad outside track is 25 feet.
   2. Cut end of boring pit away from boring face, perpendicular to axis of boring operation to provide a bearing surface for back stop and blocking.
   3. Construct back stop of heavy timber or steel rails capable of withstanding jacking force during boring operation.
   4. Nominal boring pit dimensions are 30 feet long, 8 feet wide and a depth of 1 foot below invert elevation of casing pipe.
   5. If excavation performed below required subgrade for water main, backfill area below subgrade with coarse aggregate backfill or with concrete as required by Authority and at no additional cost to Authority.
   6. Sheet and shore boring pit as specified in Section 02151. Provide a sump pump in one corner of pit to provide for dewatering.

B. Boring:
   1. Install steel casing pipes by boring and jacking method. Utilization of other method of installing casing pipe requires approval by Authority and PennDOT or railroad company in writing. Minimum depth of casing under roadways to be 4 feet measured from top of casing to existing road surface as indicated on Drawings, or 5 feet-6 inches under railroads measured from top of casing to bottom of rail. No additional payment over price bid per linear foot for particular crossing will be made unless additional payment is specifically authorized by Authority in writing.
   2. Install casing pipe true to line and grade without hand mining ahead of pipe. Bored hole to be equivalent to outside diameter of casing pipe, and over cutting by cutting head is not to exceed outside diameter of casing pipe by more than 1/2 inch. If voids should develop, or if bored hole diameter is greater than outside diameter of casing pipe by more than approximately 1 inch, employ grouting or other methods approved by Authority, PennDOT or railroad company to fill voids.
3. Provide front of pipe with a mechanical arrangement or device that positively prevents auger and cutting head from leading pipe, so that there is no unsupported excavation ahead of pipe. Design equipment so that auger and mechanical stop is removable from within pipe in event an obstruction is encountered. Arrange face of cutting head to provide reasonable obstruction to free flow of soft or poor material.

4. Use of water or other liquids to facilitate casing emplacement and spoil removal is prohibited.

5. If required by field conditions, continue boring operation without interruption, except to install new lengths of casing pipe. Join lengths of casing pipe by welding. Join and weld pipe in accordance with AWWA C206. Completely weld joints around circumference of pipe.

C. Installation and Testing Carrier Pipe:
   1. Install water main pipe one length at a time and push through steel casing pipe on high density polyethylene casing spacers.
   2. Casing spacers are specified in Section 02713.
   3. Assemble the joints with restraining gaskets or mechanical joints with wedge action retainer glands.
   4. After carrier pipe is completely installed and before sealing the ends of the casing pipe, test the water main as specified in Section 01666.

D. Closing Encasing Pipe: After water main pipe has been installed and tested, close both ends of encasing conduit with brick and mortar to prevent entrance of material. Make provision in closure wall to allow leakage to drain out of encasing conduit.

E. Cleanup: As specified in Section 02221. Restore highway property to condition equal to or better than existed prior to start of work.

END OF SECTION
SECTION 02485
SEEDING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Seeding of work site(s).

B. Related Sections:
   1. Site Grading: Section 02210.
   2. Finish Grading: Section 02260.

1.02 REFERENCES

A. American Association of State Highways and Transportation Officials, AASHTO Emulsified Asphalt.

1.03 SUBMITTALS

A. Seed Certification: Submit certificates or certifying tags indicating lawn seed mixture, seed purity percentage, seed germination percentage, and weed seed content percentage to certify conformity with Specifications.

1.04 QUALITY ASSURANCE

A. Quality Control:
   1. Packaged products to indicate manufacturer's guaranteed analysis on each package and arrive on site as originally packaged and unopened.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver packaged products to site in unopened containers with labels intact and legible.

B. Store packaged products in a manner to prevent moisture damage and other forms of contamination.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Do not perform work of this Section when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation present or occurring during work.
B. Seeding Dates: Following dates govern except when environmental conditions warrant, Authority may extend seeding dates.
   1. Spring: March 1 to June 1.
   2. Fall: August 1 to October 1.

C. Protection:
   1. Protect seeded areas from washouts by methods specified in this Section. Reseed washouts and bare spots that develop from inadequate protection or otherwise until a healthy, complete coverage stand of grass is obtained.
   2. Use temporary barricades to protect lawn areas from foot traffic or other areas until a healthy, total coverage stand of grass is obtained. Barricade materials subject to Authority's approval.

D. Application seed areas disturbed by construction.
   1. Seed Mixture No. 1: Use on lawns.
   2. Seed Mixture No. 2: Use on areas other than lawns and stockpile areas.
   3. Seed Mixture No. 3: Use on slopes 3:1 and greater.
   4. Seed Mixture No. 4: Use on wetland areas.

PART 2 PRODUCTS

2.01 LAWN AND SEED MATERIALS

A. Grass Seed: New crop seed, furnished in sealed package with proof of correct mixture evidenced, age indicated, and compliance with applicable state regulations evidenced if required. Seeds and mixture as follows:

   1. Mixture No. 1, Lawn Areas:

<table>
<thead>
<tr>
<th>Species in Mix</th>
<th>Mix % by Weight</th>
<th>Min. %</th>
<th>Max. % Weed Seed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Purity</td>
<td>Germination</td>
</tr>
<tr>
<td>Red Fescue Chewings (Festuca ruaba) (Illahee strain)</td>
<td>30</td>
<td>95</td>
<td>85</td>
</tr>
<tr>
<td>Kentucky Bluegrass (Poa pratensis)</td>
<td>50</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>Red Top (Agrostis alba)</td>
<td>3</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Perennial Rye Grass (Lolium perenne)</td>
<td>17</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>
2. Mixture No. 2, Areas Other Than Lawns and Stockpile Areas:

<table>
<thead>
<tr>
<th>Species in Mix</th>
<th>Mix % by Weight</th>
<th>Min. %</th>
<th>Max. % Weed Seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky Bluegrass (Poa pratensis)</td>
<td>30</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>Perennial Rye Grass (Lolium perenne)</td>
<td>70</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

3. Mixture No. 3, Slopes 3:1 and Greater:

<table>
<thead>
<tr>
<th>Species in Mix</th>
<th>Mix % by Weight</th>
<th>Min. %</th>
<th>Max. % Weed Seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Rye (Lolium multiflorum)</td>
<td>100</td>
<td>95</td>
<td>90</td>
</tr>
</tbody>
</table>

4. Mixture No. 4, Wetland Areas:
   a. Provide seeding mixture for wetland areas consisting of herbaceous mixture of Kentucky 31 Tall Fescue, Birdsfoot Trefoil, and Red Top. Other commercially available wetland grass mixtures will be considered if submitted as a substitute.

2.02 MULCHING MATERIAL

A. Lawn Mulch: Straw Stalks of threshed grain or tall hay grass stalks free from seed bearing stalks or roots harmful to lawn growth. Mulch material containing noxious weeds, decomposed material or brittle weed material is not acceptable.

B. Mulch Binder: Emulsified asphalt conforming to requirements of AASHTO Grade RS-1 and containing no solvents of other diluting agents toxic to plant life.
PART 3 EXECUTION

3.01 PREPARATION

A. Tillage: Perform tillage of finish graded soil over areas indicated for lawn regardless of lawn work type performed. Use equipment and methods common to lawn work and till soil to a 2 inch depth minimum.

3.02 PERFORMANCE

A. Seeding: Sow seed mixtures when air current is low and not more than five days after soil supplements have been applied. Sow seeds in two applications using power seeders or mechanical seeders. Sow one half of seed mixture in one direction over designated areas and remainder at right angles to first sowing. Seeding rates as follows:

1. Seed Mixture Nos. 1 and 2: 45 pounds per 1,000 sq. yd. areas.
2. Seed Mixture No. 3: 9 pounds per 1,000 sq. yd. area.
3. Seed Mixture No. 4: As recommended by manufacturer.

B. Seed Cover: Imbed seed mixtures into topsoil 1/4 inch using a light drag or rake moving in directions parallel to contour lines. Immediately after dragging or raking, compact seeded areas using a cultipacker or similar design lawn roller, weighing 60 to 90 pounds per linear foot of roller. Roll at right angles to existing slopes.

C. Contractor Option: Seeding and soil supplement application may be performed by the hydroseeding method. However, rates of application, methods, and equipment require Authority's prior approval.

D. Lawn Mulching: Evenly apply mulch over seeded areas not more than 48 hours after seeding. Start mulching at windward side of relatively flat areas, or upper part of slopes. Spread mulch in a total coverage to a depth not less than 1-1/2 inches nor more than 3 inches.

E. Mulch Binding: Immediately following mulch spreading, apply mulch binder to anchor mulch to soil. Do not exceed three passes of binder for securing mulch with maximum applied binder not exceeding 10.0 gallons per 1,000 square feet.

F. Contractor Option: Secure mulch by peg and string method in lieu of mulch binding. Drive stakes into ground on 3 foot centers or less and string binder twine between adjacent stakes in straight lines and criss-crossed diagonally over mulch. After twine is attached, drive stakes nearly flush to ground to draw twine down tight onto mulch.
3.03 MAINTENANCE

A. Begin maintenance operations immediately after seeding and planting is performed and continue throughout construction time and guarantee period. In general, maintenance includes weeding, applying mulch as needed, controlling insects and diseases, grass cutting, and performing other particular operations as follows:

1. Seeded Areas: Keep seed moist continually for proper germination and maintain watering to prevent drying out or burning. Reseed areas not showing a prompt catch of grass. Correct depressions and irregularities and reseed. Repeat until a complete coverage is obtained. Cut seeded areas at required intervals to maintain a maximum height of 2-1/2 inches.

B. At conclusion of maintenance periods, Authority will inspect seeding work to determine condition of acceptance. Make additional repairs and replacements as required by Authority at no additional expense.

END OF SECTION
SECTION 02500

PAVING AND SURFACING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Removal and replacement of existing pavement.

B. Related Sections:
   1. Trenching, Backfilling and Compaction: Section 02221.
   2. Overlay Pavement: Section 02510.

1.02 REFERENCES

A. PDT Sections referenced below pertain only to materials, construction equipment, methods and labor. Payment provisions do not apply to work performed under this Contract.

B. Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented.
   1. PDT Section 301 Plain Cement Concrete Base Course.
   2. PDT Section 305 Bituminous Concrete Base Course.
   3. PDT Section 309 Superpave Asphalt Mixture Design, HMA Base Course (Standard).
   4. PDT Section 401 Plant Mixed Bituminous Concrete Courses.
   5. PDT Section 409 Superpave Asphalt Mixture Design, HMA Wearing Course (Standard); Superpave Asphalt Mixture Design, HMA Wearing Course RPS; Superpave Asphalt Mixture Design, HMA Binder Course (Standard); Superpave Asphalt Mixture Design, HMA Binder Course, RPS.
   6. PDT Section 420 Bituminous Wearing Course ID-2 and Bituminous Wearing Course ID-2, RPS.
   7. PDT Section 421 Bituminous Binder Course ID-2 and Bituminous Binder Course ID-2, RPS.
   8. PDT Section 460 Bituminous Tack Coat.
   9. PDT Section 461 Bituminous Prime Coat.
   10. PDT Section 470 Bituminous Seal Coat.
   11. PDT Section 480 Bituminous Surface Treatment.
   12. PDT Section 501 Reinforced or Plain Cement Concrete Pavements.
   13. PDT Section 630 Plain Cement Concrete Curb.
   14. PDT Section 636 Bituminous Concrete Curb.
   15. PDT Section 653 Paved Shoulders, Type 3.
   16. PDT Section 654 Paved Shoulders, Type 4.
   17. PDT Section 656 Paved Shoulders, Type 6, Type 6-F, Type 6-I Type 6-S and 6SP.
   18. PDT Section 676 Cement Concrete Sidewalks.
19. PDT Section 702 Bituminous Material.
20. PDT Section 703 Aggregates.
21. PDT Section 704 Cement Concrete.
22. PDT Section 721 Calcium Chloride.
23. PDT Section 962, Painting Traffic Lines and Markings.

C. Commonwealth of Pennsylvania Department of Transportation Bulletin 27.

D. Commonwealth of Pennsylvania Department of Transportation Standards for Roadway Construction
   1. PDT Publication #72, RC Series.


1.03 DEFINITIONS

A. Street: The term Street as used in this Section is understood to mean a street, highway, avenue, boulevard, road, alley, lane, driveway, parking lot, or other area used as a way for vehicles.

B. Specified Maximum Trench Width: Applicable maximum trench width specified in Section 02221.

1.04 SUBMITTALS

A. Product Data:
   1. Submit traffic paint material manufacturer's technical information, including paint label analysis and application instructions for each material proposed.

B. Quality Assurance/Control Submittals:
   1. Design Data: Submit job mix formula for approval.
   2. Certificates: Furnish certification from bituminous and aggregate producer attesting that materials conform to requirements of Pennsylvania Department of Transportation Specifications.

1.05 QUALITY ASSURANCE

A. Producer Qualifications:
   1. Maintain quality of work by using products of a qualified bituminous concrete producer and qualified plant operating workers.
   2. Use products of a bituminous concrete bulk producer regularly engaged in production of hot-mix, hot-laid bituminous concrete conforming to referenced standards.
   3. Use materials conforming to requirements of Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented.
B. Workmen Qualifications:
   1. Provide at least one person thoroughly trained and experienced in skills required, readily understands design and is completely familiar with application of bituminous concrete paving work. This person is required to be present during progress of bituminous concrete paving work and direct performance of work.
   2. Employ personnel thoroughly trained and experienced in skills required for actual finishing of bituminous concrete surfaces and operation of equipment.

C. State Highway Regulatory Requirements:
   1. Removal, protection and replacement of paving on State Highways is subject to inspection by Commonwealth of Pennsylvania Department of Transportation representatives. Perform work in accordance with requirements of Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Transportation, Department of Transportation, Chapter 459, Occupancy of Highways By Utilities, July, 1989.
   2. Pavement removal and replacement requirements on State Highways specified in this Section are requirements of Highway Occupancy Permit obtained by Authority and supersede similar requirements of Title 67, Chapter 459, regulations. However, requirements of Highway Occupancy Permit are subject to change by Pennsylvania Department of Transportation.
   3. If the Project is contracted by the Authority, inspection, insurance or other charges demanded by Commonwealth of Pennsylvania Department of Transportation, or other authority having jurisdiction will be paid for by Authority whether billed to Authority or Contractor.

D. Local Highway Agency Regulatory Requirements:
   1. Perform removal, protection and replacement of paving on other than State Highways in accordance with requirements of authority having jurisdiction.
   2. Perform removal, protection and replacement of paving on streets other than State Highways in accordance with requirements of authority having jurisdiction.

1.06 DELIVERY, STORAGE AND HANDLING

A. Use means necessary to ensure safe storage and use of paint materials and prompt and safe disposal of waste. Store paint products protected from weather when products may be affected by freezing.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Dust Control: Provide effective dust control by sprinkling water, by the use of calcium chloride, or by other methods as approved by the Authority. Use dust control measures where and when, and in a manner as required by the Authority.
   2. Weather Limitations (ID-2 and BCBC Type Pavements): Terminate placement of bituminous concrete surface courses of permanent pavement between October 15 to 31, and do not resume placement prior to April 1 to 15. Interim days between
date limits may be used for placement as determined by Authority depending on weather conditions.

a. Do not install aggregate courses when ambient temperature is below or is expected to fall below freezing.

b. Do not use aggregate containing frost nor place aggregate courses on frozen subgrade.

c. Do not place bituminous concrete surface courses of permanent pavement when ambient temperature is 40 degrees F. or lower, or when temperature of substrate, pavement base or binder is 40 degrees F. or lower.

3. Weather Limitations (HMA Superpave Pavements): Do not place HMA paving mixtures between October 31 and April 1 unless permitted otherwise in writing by the Authority or PennDOT’s District Engineer. See PDT 409.3 for individual Engineering Districts’ date limitations for placement of HMA wearing courses.

a. HMA Base Course: Do not place base course when surfaces are wet or when the temperature of either the air or the surface on which the mixture is to be placed is 35 degrees or lower.

b. HMA Wearing Course: Do not place base course when surfaces are wet or when the temperature of either the air or the surface on which the mixture is to be placed is 40 degrees or lower.

4. Paint Application Limitations: Adhere to manufacturer’s data on air and surface temperature limits and relative humidity during application and curing of coatings.

a. Do not spray apply paint when wind velocity is above 15 mph.

b. Schedule painting work to avoid dust and airborne contaminants.

c. Apply paint during daylight hours only.

B. Time Requirements:

1. State Highways: Permanent replacement of street roadway and shoulder pavement not permitted until at least 90 days after required temporary pavement has been placed. However, place permanent replacement pavement before 210 days after required temporary pavement has been placed.

2. City Streets and Township Roads: Place permanent replacement of street roadway and shoulder pavement as soon as trenches have been acceptably backfilled; however, in event permanent pavement cannot be placed due to weather limitations specified previously, provide a temporary pavement. No separate or additional payment allowed for furnishing, placing and removing temporary pavement.

C. Protection:

1. Protect and maintain cut pavement edges until permanent replacement pavement is placed.

2. Protect paved surfaces outside of pavement removal limits. Repair pavement outside removal limits damaged by constructing operations at no additional expense to Authority.

3. Use means necessary to protect and maintain pavement materials before, during, and after installation to protect installed work and materials of other trades.
4. In event of damage or failure of work of this Section within Guarantee Period, immediately make repairs and replacements. Failure to perform maintenance or repairs within three days after notice from Authority, entitles Authority to perform maintenance or repairs and deduct cost from moneys due or to become due Contractor under this Contract.

5. Assume responsibility for injury or damage resulting from lack of required maintenance or repairs during Guarantee Period. Indemnify and save harmless Authority from loss by reason of suit or action at law, based upon occurrence or omission occurring during this period.

D. Completion Certificate not issued until work of this Section is completed.

PART 2 PRODUCTS

2.01 BASE COURSE MATERIALS

A. Bituminous Concrete Base Course (BCBC): Conforming to PDT Section 305.

B. HMA Base Course: Superpave Asphalt Mixture Design, HMA Base Course (Standard) conforming to PDT Section 309. Mixture Design as indicated in Highway Occupancy Permit.

C. Aggregate Base Course:
   1. Coarse Material: Crushed Type A, or better, stone conforming to PDT Section 703.2, AASHTO No. 1.
   2. Fine Material: Crushed Type A, or better, stone conforming to PDT Section 703.2, AASHTO No. 10.

D. Plain Cement Concrete Base Course:
   1. High early strength cement concrete (HES) conforming to PDT Section 704.
   2. Class A cement concrete (normal strength) conforming to PDT Section 704.

2.02 SURFACE COURSE MATERIALS

A. ID-2 Bituminous Pavements:
   1. Wearing Course: Hot mixed, hot laid, Bituminous Wearing Course ID-2: Conforming to PDT Section 420.
   2. Binder Course: Hot mixed, hot laid, Bituminous Binder Course ID-2 conforming to PDT Section 421, using asphalt cement.
   3. Bituminous Surface Treatment: Conforming to PDT Section 480.2.
   4. Bituminous Prime Coat: Conforming to bituminous material requirements of PDT Section 461.2(a).
   5. Bituminous Seal Coat: Conforming to PDT Section 470.2.

B. HMA Wearing Course: Superpave Asphalt Mixture Design, HMA Wearing Course (Standard) conforming to PDT Section 409. Mixture Design as indicated in Highway Occupancy Permit.
C. Cement Concrete Pavement: Conforming to PDT Section 501.
   1. Reinforced.
   2. Plain.
   3. High early strength cement concrete (HES).

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

2.03 SHOULDER MATERIALS

A. Paved Shoulders, Type 3: Conforming to PDT Section 653.2.

B. Paved Shoulders, Type 4: Conforming to PDT Section 654.2, 6 inches thick after compaction.

C. Paved Shoulders, Type 6: Conforming to PDT Section 656.2.

D. Stabilized Shoulder:
   1. AASHTO No. 8 Aggregate: Conforming to PDT Section 703.2, Course Aggregate.

2.04 BITUMINOUS MATERIALS

A. Asphalt Cement: PG 64-22 conforming to PDT Section 702.

B. Bituminous Tack Coat: Class AE-T Emulsified Asphalt conforming to PDT Section 460.

2.05 MISCELLANEOUS MATERIALS

A. Temporary Paving: Type 2-P Bituminous Stockpile Patching Material conforming to Section 484 of Bulletin 27.

B. Calcium Chloride: Conforming to PDT Section 721.

C. Cement Concrete:
   1. For driveways provide Class AA Cement Concrete conforming to PDT Section 704.
   2. For curbs, gutters and sidewalks provide Class A Cement Concrete conforming to PDT Section 704.

D. Traffic Paint: Conforming to PDT Section 962.2 (b).

2.06 PAVEMENT MIXES

A. Composition of Mixtures: Provide binder and wearing course mixture composition conforming to requirements of PDT Section 401 and PDT Section 409 as applicable.
1. Establish a job-mix formula prior to beginning work without changing during progress of work except with Authority's approval. Job-mixing tolerances not to permit acceptance of materials with gradations falling outside master ranges set in specified PDT Sections.

2. Approved job-mix formula to fall within specification limits and be suitable for layer thickness and other conditions prevailing.

PART 3 EXECUTION

3.01 PREPARATION

A. Pavement Removal:
   1. Cut paving to neat lines equidistant from centerline of trench.
   2. Cut paving with a mechanical saw.
   3. Remove pavement to a width equal to Specified Maximum Trench Width specified in Section 02221, plus 2 feet and not less than 1 foot on each side of trench.
   4. In addition to requirements specified above, where street roadway paving consists of a concrete base course and a bituminous surface course, remove bituminous surface course for a width equal to Specified Maximum Trench Width plus 3 feet and not less than 18 inches on each side of trench width as excavated.
   5. On State Highways where pavement consists of a concrete base course and a bituminous surface course it is a requirement of Pennsylvania Department of Transportation that for longitudinal trenches, remove base and surface courses of pavement to closest longitudinal joints in pavement; and for transverse trenches where edge of trench is within 4 feet of a transverse joint in pavement, remove base and surface courses of pavement to transverse joint.
   6. If pavement is removed or disturbed for a greater width without written authorization of Authority, Authority will require Contractor to replace greater width pavement without compensation.
   7. Remove temporary paving and backfill to required depth for installation of permanent replacement pavement. No additional payment will be made for removing temporary pavement and backfill.

B. Subgrade: Backfill and compact trenches in accordance with requirements of Section 02221.

C. Perform paving only after site grading, and trenching, have been completed and accepted by Authority.

D. Moisture content of subgrade material at time of compaction is not to be more than 2 percentage points above optimum moisture content.

E. At joints between existing pavements and new paving work, cut and trim edges of existing pavements as approved by Authority. Provide an application of Bituminous Tack Coat at locations where new bituminous paving joins existing bituminous paving.
F. Prior to traffic line painting, clean surfaces free of dirt, sand, grease or other matter.

3.02 INSTALLATION (REPLACEMENT PAVING)

A. Temporary Pavement:
   1. State Highways: Install temporary pavement over areas where pavement has been removed. Install temporary paving to 2 inches thickness after compaction, with top surface flush with surface of adjacent paving. Temporary pavement in shoulders is the trench backfill. Contact PennDOT for Road Restoration Specifications.
   2. City Streets and Township Roads: In event permanent pavement cannot be placed due to weather limitations specified previously under Project Conditions, provide a temporary pavement over areas where pavement has been removed. Install temporary paving to 2 inches thickness after compaction, with top surface flush with surface of adjacent paving. Temporary pavement in shoulders is the trench backfill. Contact the City or Township for Road Restoration Specifications.

B. Permanent Pavement Replacement:
   1. General:
      a. Method of preparing mixture, placing mixture, compaction, and protection of in-place bituminous concrete for paving to comply with PDT Section 305.3 and PDT Section 401.3 or PDT Section 309.3 and PDT Section 409.3.
      b. Location of types and thicknesses of replacement pavements are as indicated on Drawings. Pavement thicknesses indicated are compacted thicknesses.
   2. Plain Cement Concrete Base Course: Construct in accordance with requirements of PDT Section 301.
      a. Base Course: Consisting of High Early Strength (HES) or Class A cement concrete equal in thickness to original pavement base, or a minimum of 8 inches to subgrade materials.
      b. Reinforcement: If trench exceeds four feet in width, or otherwise required, provide No. 6 deformed reinforcing bars installed in concrete base course, placed at 6 inch centers with 2 inch clearance at each end and a 3 inch clearance on bottom.
      c. Provide Bituminous Tack Coat over cured cement concrete surface per requirements of PDT Section 460.
   3. Bituminous Concrete Base Course (BCBC): Construct in accordance with requirements of PDT Section 305.
      a. Where roadways receive trench restoration only, install Bituminous Concrete Base Course with top surface below surface of adjacent pavement a distance equal to thickness of replacement surface course pavement.
      b. Where roadways receive overlay pavement, install Bituminous Concrete Base Course with top surface flush with surface of adjacent pavement.
   4. HMA Base Course: Construct in accordance with requirements of PDT Section 309.
      a. Where roadways receive trench restoration only, install HMA Base Course with top surface below surface of adjacent pavement a distance equal to thickness of replacement surface course pavement.
b. Where roadways receive overlay pavement, install HMA Base Course with top surface flush with surface of adjacent pavement.

5. Bituminous Binder Course (ID-2): Construct in accordance with requirements of PDT Section 421.
   a. Install binder course with top surface below surface of adjacent pavement a distance equal to thickness of replacement wearing course pavement.

6. HMA Binder Course: Construct in accordance with requirements of PDT Section 409.
   a. Install HMA Binder Course with top surface below surface of adjacent pavement a distance equal to thickness of replacement wearing course pavement.

7. Bituminous Wearing Course (ID-2): Construct in accordance with requirements of PDT Section 420.
   a. Install wearing course with top surface flush with surface of adjacent pavement.

8. HMA Wearing Course: Construct in accordance with requirements of PDT Section 409.
   a. Install HMA Wearing course with top surface flush with surface of adjacent pavement.

9. Cement Concrete Pavement: Construct in accordance with requirements of PDT Section 501.
   a. Replace cement concrete pavement according to details in PDT Publication #72, RC Series, RC-26, Concrete Pavement Rehabilitation.
   b. Following concrete curing, apply Bituminous Tack Coat in accordance with PDT Section 460.
   c. After tack coat has cured, install bituminous binder and wearing course to conform to existing street binder and wearing courses.

10. Overlay Paving: Construct in accordance with requirements of Section 02510.

11. Use Asphalt Cement material to seal joints in wearing courses as specified in PDT Section 401.3 (j) 3.

12. Bituminous Surface Treatment: Construct in accordance with requirements of PDT Section 480.

C. Shoulder Restoration:

1. Paved Shoulder Type 3:
   a. Trench backfilled to elevation of adjacent existing shoulder surface.
   b. Grade, shape and roll entire width of disturbed shoulder area adjacent to trench. Replace aggregate removed.
   c. Apply Bituminous Prime Coat to full width of shoulder, in accordance with requirements of PDT Section 653.3 (b).
   d. After prime coat curing, apply Bituminous Surface Treatment in two separate applications in accordance with requirements of PDT Section 653.3 (c).
   e. Construct successive layers of Bituminous Surface Treatment until finished surface, after compaction, is flush with adjacent finished pavement.

2. ID-2 Paved Shoulder:
   a. Trench backfill to elevation of adjacent existing shoulder surface.
b. Grade, shape and roll entire width of disturbed shoulder area adjacent to trench. Replace aggregate removed.
c. Apply ID-2 wearing course to full width of shoulder in accordance with requirements of PDT Section 420.

3. Paved Shoulder Type 4:
a. Trench backfill to subgrade of base as specified in Section 02221.
b. Excavate existing shoulder to subgrade of base for full width.
c. Install Aggregate Base as specified in PDT Section 654.3 over entire width of shoulder.
d. Grade, shape and roll entire width of disturbed shoulder to receive base. Replace aggregate removed.
e. Apply Prime Coat and Bituminous Surface Treatment to full width of shoulder as specified in PDT Section 654.3.

4. Paved Shoulder Type 6:
a. Trench backfill to subgrade of base as specified in Section 02221.
b. Install Bituminous Concrete Base Course with top surface flush with surface of adjacent pavement.
c. Apply Bituminous Surface Treatment for full width of shoulder.
d. Construction methods per requirements of PDT Section 656 and RC-25 of Publication #72.

D. Unimproved Roads: Backfill as specified in Section 02221 with exception that top 6 inches of backfill be Select Granular Material (2RC). Grade, shape and roll entire width of road.
1. Unimproved Roadway Surface Restoration: In addition to restoration specified above, provide an aggregate surface course, graded, shaped and rolled, of a width and depth as indicated on Drawings.

E. Cement Concrete Curbs: Replace curbs to shape, thickness, workmanship and finish as original curb unless otherwise required by Authority. Construction methods as specified in PDT Section 630.

F. Bituminous Concrete Curb: Construct in accordance with requirements of PDT Section 636.

G. Cement Concrete Driveway: Backfill as specified in Section 02221. Replace cement concrete to workmanship, thickness and finish as original driveway unless otherwise required by Authority.

H. Cement Concrete Sidewalk: Replace cement concrete sidewalk removed or disturbed with a 4 inch thick crush stone bed and a 4 inch thick concrete surface; width to match existing. Construct bed and concrete surface as specified in PDT Section 676.

I. Bituminous Concrete Driveway: Provide a 2 inch thick wearing course of ID-2 bituminous concrete with top surface flush with top surface of adjacent existing paving.
J. Bituminous Concrete Walk: Consists of an Aggregate Base Course and a Bituminous Concrete Wearing Course. Provide Aggregate Base Course not less than 6 inches thick after compaction and top surface not less than 2 inches below surface of adjacent existing paving. Provide Bituminous Concrete Wearing Course consisting of 2 inch thick ID-2 wearing course. Top surface of wearing course to be flush with surface of adjacent existing paving.

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

L. State Highway Guide Rail: Replace guide rail damaged or removed during construction.
   1. Provide type and quality of guide rail material as existing.
   2. Salvage and reuse of guide rail permitted for reconstruction; however, Authority will inspect guide rail after removal and if determined unsuitable for reuse, replace with new guide rail.
   3. Perform work to requirements and approval of Pennsylvania Department of Transportation.

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

3.03 APPLICATION

A. General:
   1. Strictly follow paint manufacturer's label instructions for mixing, thinning, proper spreading rate and drying time. Do not apply film thickness less than manufacturer's recommendations or exceed manufacturer's area coverage per gallon recommendations.
   2. If material has thickened or needs diluted for application, build up coating to film thickness achieved with undiluted material. Do not use thinner to extend coverage of paint.
   3. Regardless of surface, it is painter's responsibility to achieve a suitable finish by decreasing coverage rate or by applying additional coats of paint.

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

3.04 MAINTENANCE

A. Continuously maintain temporary paving without additional compensation until replaced with permanent paving.

B. Maintain without additional compensation, work of this Section for a period of twelve (12) months after date of Authority's approval of Completion Certificate issued by Authority, including repair or removal and replacement of work that failed or has been damaged or where surface depressions have developed. Materials and methods used to repair or replace work to conform to applicable requirements of this Section.
C. Should Contractor fail to perform required maintenance or repairs within three days after written notice from Authority, Authority may perform maintenance or repairs and deduct cost from monies due or to become due Contractor.

END OF SECTION
SECTION 02510
OVERLAY PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Provision for surface preparation, patching, and bituminous overlay paving of existing pavement.

B. Related Sections:
   1. Paving and Surfacing: Section 02500.

1.02 REFERENCES

A. PDT Sections referenced below pertain only to materials, construction equipment, methods and labor. Payment provisions do not apply to work performed under this Contract.

B. Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented:
   1. PDT Section 401 Plant Mixed Bituminous Concrete Courses.
   2. PDT Section 409 Superpave Asphalt Mixture Design, HMA Wearing Course (Standard); Superpave Asphalt Mixture Design, HMA Wearing Course RPS; Superpave Asphalt Mixture Design, HMA Binder Course (Standard); Superpave Asphalt Mixture Design, HMA Binder Course, RPS.
   3. PDT Section 420 Bituminous Wearing Course ID-2 and Bituminous Wearing Course ID-2, RPS.
   4. PDT Section 421 Bituminous Binder Course ID-2 and Bituminous Binder Course ID-2, RPS.
   5. PDT Section 460 Bituminous Tack Coat.
   6. PDT Section 491 Milling of Bituminous Pavement Surfaces.
   7. PDT Section 702 Bituminous Material.

1.03 DEFINITIONS

A. Street: Unless otherwise specifically qualified herein, term Street as used in this Section is understood to mean a street, highway, avenue, boulevard, road, alley, lane, driveway, parking lot, or other area used as a way for vehicles.
1.04 QUALITY ASSURANCE

A. Source Quality Control: As specified in Section 02500.

B. Workmen Qualifications: As specified in Section 02500.

C. Requirements of Regulatory Agencies: As specified in Section 02500 with the following additional requirement.
   1. Unless otherwise specified or required by the Authority, overlay paving of streets will not be permitted until all other work to be performed under this contract has been completed.

1.05 PROJECT CONDITIONS

A. Environmental Requirements: As specified in Section 02500.

B. Time Requirements: As specified in Section 02500.

C. Protection:
   1. Protect paved surfaces outside of the pavement removal limits. Repair pavement outside removal limits damaged by constructing operations at no additional expense to the Authority.
   2. Use all means necessary to protect and maintain pavement materials, before, during, and after installation to protect the installed work and materials of all other contractors.
   3. In the event of damage or failure of the work of this section within the Guarantee Period, immediately make repairs and replacements. Upon failure to perform maintenance or repairs within three days after notice from the Authority, the Authority may perform such maintenance or repairs and deduct the costs thereof from any moneys due or to become due the Contractor under the Contract.
   4. Assume responsibility for any injury or damage resulting from lack of required maintenance or repairs during Guarantee Period. Indemnify and save harmless the Authority from any and all loss by reason of any suit or action at law, based upon any occurrence or omission occurring during this period.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bituminous Pavements:
   1. Asphalt Cement: PG 64-22 conforming to PDT Section 702.
   2. Bituminous Tack Coat: Class AE-T Emulsified Asphalt conforming to PDT Section 460.
   3. ID-2 Binder Course: Hot mixed, hot laid, Bituminous Binder Course ID-2 conforming to PDT Section 421, using asphalt cement.
4. HMA Binder Course: Superpave Asphalt Mixture Design, HMA Binder Course (Standard) conforming to PDT Section 409. Mixture Design as indicated in Highway Occupancy Permit.

5. ID-2 Wearing course: Hot mixed, hot laid.
   a. Bituminous Wearing Course ID-2: Conforming to PDT Section 420.

6. HMA Wearing Course: Superpave Asphalt Mixture Design, HMA Wearing Course (Standard) conforming to PDT Section 409. Mixture Design as indicated in Highway Occupancy Permit.

2.02 PAVEMENT MIXES

A. Composition of Mixtures: Provide binder and wearing course mixture composition conforming to requirements of PDT Section 401 (Conventional Mixture) and PDT Section 409 (HMA Mixture).
   1. Establish a job-mix formula prior to beginning work without changing during progress of work except with Authority's approval. Job-mixing tolerances not to permit acceptance of materials with gradations falling outside master ranges set in specified PDT Sections.
   2. Approved job-mix formula to fall within specification limits and be suitable for layer thickness and other conditions prevailing.

PART 3 EXECUTION

3.01 GENERAL

A. Method of placing, compacting and protection of in-place bituminous concrete for pavement to comply with PDT Section 401.3 for Conventional ID-2 pavements and PDT Section 409.3 for HMA Superpave asphalt pavements.

3.02 PREPARATION

A. Surface Preparation of Existing Paving:
   A. Prior to overlay paving, condition existing paving in accordance with PDT Section 401.3(f) or 409.3(f).

B. Patching Existing Paving:
   1. Prior to overlay paving, patch potholes and other damaged areas in existing paving. Location and extent of pavement patching will be determined by Authority.
   2. Prior to overlay paving, level low and depressed areas on roadways. Location and extent of leveling will be determined by Authority.
   3. Thoroughly clean and remove loose material, dry and prime with a light coat of emulsified asphalt areas to be patched or leveled.
   4. Use ID-2 Bituminous Binder Course material or HMA Binder Course material, as applicable, placed by hand, spread with rakes, lutes, brooms or shovels to obtain uniform placement. Use hand operated vibratory compactor or similar equipment
for compaction. Mechanical pavers or conventional power rollers may be used in areas requiring leveling when approved by Authority.

5. Cut square and vertical the edges of pavement to provide mechanical shoulder when patch exceeds 1 inch in depth.

C. Milling of Bituminous Pavement Surface: Perform milling operation in accordance with PDT Section 491, to a depth of 1-1/2 inch depth, and to limits indicated on Drawings.

D. Adjustment of Height of Gas and Water Service Boxes and Frames of Underground Structures:
   1. Adjust heights of gas and water service boxes, and frames of other underground utility structures, if existing within street to be overlayed. Adjust heights to proposed finish grade elevations of overlay paving well in advance of placing the paving.
   2. Make necessary arrangements with respective utility companies for adjustment of their service boxes and frames of underground structures.
   3. Do not proceed with overlay paving until heights of service boxes and frames of underground structures have been adjusted to satisfaction of Authority.
   4. No separate or additional payment will be made for adjusting heights of service boxes, and frames of other underground structures.

E. Painting Curbs: Prior to placing bituminous concrete overlay pavement, paint inside faces of existing curbs with a thin application of asphalt cement to provide a closely bonded, watertight joint.

F. Tack Coat: Prior to placing bituminous concrete overlay pavement, apply a Bituminous Tack Coat consisting of a thin application of emulsified asphalt to existing paved surface at rate and in a manner as specified in PDT Section 460. Prior to applying tack coat, clean loose and foreign material from existing pavement surface.

G. Construct joints of overlay pavement as specified in PDT Section 401.3 (j) or PDT Section 409.3 (k) as applicable.

H. At joints between existing pavement and new paving work, cut and neatly trim edges of existing pavements as approved by Authority. Cut paving with a mechanical saw. Provide an application of bituminous tack coat at locations where new bituminous paving joins existing bituminous paving.

3.03 INSTALLATION

A. Limits of Overlay Paving:
   1. Provide overlay pavement to limits specified and to such additional limits as required by Pennsylvania Department of Transportation, other agencies having jurisdiction, or Authority.
B. Overlay Paving, Bituminous Wearing Course ID-2:
   1. Use materials, composition of mixture and methods to construct the bituminous concrete overlay paving conforming to all applicable requirements of PDT Section 420 for Bituminous Wearing Course ID-2.
   2. The minimum thickness of the overlay pavement after compaction to be as indicated on Drawings. The contours of the surface of the overlay pavement may be the same as the existing street pavement.
   3. Install a leveling course of binder course material in depressions if necessary.
      a. Include the cost of this extra thickness in the cost of the overlay paving. There will be no additional payment made to the Contractor for installing any leveling course except on roadways indicated to receive such in the Table following this Section.

C. Overlay Paving, Bituminous Wearing Course HMA:
   1. Use materials, composition of mixture and methods to construct the Superpave Asphalt Mixture HMA Wearing Course and HMA Binder Course overlay paving conforming to all applicable requirements of PDT Section 409.
   2. The minimum thickness of the overlay pavement after compaction to be as indicated on Drawings. The contours of the surface of the overlay pavement may be the same as the existing street pavement.
   3. Install a leveling course of HMA binder course material in depressions if necessary.
      a. Include the cost of this extra thickness in the cost of the overlay paving. There will be no additional payment made to the Contractor for installing any leveling course.

D. Shoulders:
   1. Reconstruct existing shoulders adjoining overlayed State Highways to provide support for the new overlay pavement.
   2. Reconstruct shoulders of the type specified in and per requirements of Section 02500.

3.04 MAINTENANCE

A. As per requirements of Section 02500 with the exception of maintaining temporary paving.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Precast or cast-in-place cylindrical concrete manhole components and accessories.

B. Related Sections:
   1. Trenching, Backfilling and Compaction: Section 02221.
   2. Division 3 - Concrete.

1.02 REFERENCES

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

B. American Society for Testing and Materials.
   3. ASTM C32, Sewer and Manhole Brick (Made from Clay or Shale), Spec. for.
   4. ASTM C270, Mortar for Unit Masonry, Spec. for.
   5. ASTM C478, Precast Reinforced Concrete Manhole Sections, Spec. for.

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

D. Federal Specifications:

1.03 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.
   3. Shop Drawings to indicate types of materials, dimensions and details including location of reinforcement, inserts, anchors, connections, accessories, joints, openings, and setting details.
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.

C. Design Calculations: Submit structural calculations for structures furnished under this Section. Have calculations sealed and signed by a Registered Professional Engineer.

1.04 QUALITY ASSURANCE

A. Quality Control:
1. Maintain uniform quality of products and component compatibility by using products of one manufacturer in the case of precast reinforced concrete manholes.

B. Certifications:
1. Obtain certificate of construction compliance with ASTM C478 from the precast reinforced concrete manhole manufacturer. Submit same certificate as part of required submittals.
2. 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.

1.05 DELIVERY, STORAGE AND HANDLING

A. Transport and handle precast reinforced concrete manhole components and other Products specified herein in a manner recommended by the respective manufacturers of such to prevent damage and defects.

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.

1.06 PROJECT 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 per 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 W. R. Grace Epoxite Binder, Sika Chemical Colma-Fix or equal.

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

E. Manhole Steps: Provide steps with minimum width of 10 inches, minimum projection from wall of 5-3/8 inches, unless indicated otherwise on Drawings.

F. Manhole Frame and Cover: Gray iron castings conforming to ASTM A48, Class 35B. Provide castings of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Frame and cover design and dimensions as indicated on Drawings. Provide casting designed for AASHTO H-20 loading.
   1. Finish: Bearing surfaces machined to prevent rocking and rattling.
   2. Identification: Cast the word LDS, or other as indicated on Drawings, integrally on cover in 2 inch size raised letters.
   4. Tensile Test Bar: Size B, cast separately, but poured from same iron as castings they represent.

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.
   1. Size cross-section of rope form to provide squeeze-out of material around entire interior and exterior circumference when joint is completed.

H. Rubber Compression Gasket: Composition conforming to ASTM C361 or ASTM C443.
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 or Type III cement in manhole components and increase compressive strength to 4500 psi (at 28 days) in precast bases.
   2. Casting and Curing: Wet cast and steam curing process in accordance with Section 3.6.11 and 3.7.2 of AWWA C302.
   3. Lifting Holes and Lugs: Thru-wall holes not permitted in manhole component construction. Factory install lifting keys or lugs integrally in manhole components.
   4. Manhole Steps: Factory installed in manhole components, prealigned vertically, spaced on equal centers, and located the minimum distance from ends of risers and top sections as indicated on Drawings.
   5. Manhole Component Seals: Manhole component joints factory formed for self-centering concrete to concrete bearing employing either a rubber compression gasket or preformed plastic sealing compound.
   6. Manhole Component Design: Base, riser section and top section dimensions and diameters, not consistent with ASTM C478, are as indicated on Drawings.
   7. Joints and riser sections shall be water tight.

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

C. Precast Top Sections: Design as indicated on Drawings, of materials and construction as specified previously except additional and differing requirements as follows:
   1. 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.
   2. 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.

D. Precast Grade Rings: Leveling and adjusting units of 3 inch or 4 inch thickness, and of materials and construction as specified previously. Factory cast grade rings with hold down bolt holes matching location of same in manhole frame. Split rings not permitted. Design must provide for full bearing of manhole frame.
2.03 SOURCE QUALITY CONTROL

A. Tests, Inspection: In accordance with Section 01400, certain materials require periodic testing according to methods referenced, or as required by the Authority.
   1. Shop Tests:
      a. Manhole component manufacturers must be equipped to, and will perform the number of tests Authority deems necessary to establish quality of manhole components offered for use.
      b. Have manufacturers furnish to Authority certified test records or reports with sworn statement of tests made as specified.
   2. Precast Reinforced Concrete Manholes: Conduct tests as specified in ASTM C478.
   3. Authority reserves right to accept certified test records or reports of previously conducted tests.

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.

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 Section 02221 and according to the following:
   1. Classification of Excavation: As specified in Section 02221.
   2. Backfill spaces outside manhole using backfill material as specified in Section 02221.

3.03 MANHOLE CONSTRUCTION METHODS

A. Cast-In-Place Concrete Manhole Base: Construct in accordance with design and dimensions indicated on Drawings. When necessary to construct wider or deeper manhole bases than indicated or specified, build such bases as required by the Authority.
   1. Form and pour concrete in accordance with requirements of Division 3 - Concrete. Additional requirements as follows:
      a. 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.

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

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

1. If rubber compression gaskets are used between sections, install gaskets and join sections in accordance with written instructions of manhole component manufacturer.

2. If preformed plastic sealing compound is used between sections, install sealing compound in accordance with manufacturer's recommendations, and join sections 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.

C. Frame and Cover Installation: Where required, make final adjustment of frame to elevation using materials specified in Part 2 Products.

1. Set precast grade rings or bricks 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. Saturate brick immediately before laying.

2. Precast grade ring: Pre-set 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.

3. Brick Leveling Units: Lay brick to line and in header courses. Lay each course to stagger 1/2 brick over previous course. Completely fill joints and make close joints not exceeding 1/4 inch on inside face of manhole. In making closures, use no portion of a brick less than the width of a brick, and whenever practical use whole brick laid with long side at right angles to inside face of manhole wall.
Finish brick work with neatly struck and pointed joints. Clean brick work by removing mortar smears and drippings.

4. Parge the outside of finished brick with a minimum of 1/2 inch thick waterproof mortar.

5. 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.

6. 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.

D. Pipe Connections: Make pipe connections to manholes as indicated on Drawings.

3.04 FIELD QUALITY CONTROL

A. General: Make a visual inspection of each manhole constructed to ensure compliance with installation requirements.

END OF SECTION
SECTION 02722

PIPED SANITARY SEWER

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: This Section specifies construction of the various types and sizes of piped wastewater sewers and appurtenances therein, and connecting into the various structures within the pipeline.

B. Related Sections:
1. Trenching Backfilling and Compacting: Section 02221.
3. Grout: Section 03600.

1.02 REFERENCES

A. American National Standards Institute:
1. ANSI A 21.10, Gray-Iron and Ductile-Iron Fittings, 2 through 48 inches, for Water and Other Liquids.
2. ANSI A 21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.
4. ANSI A 21.51, Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

B. American Society for Testing and Materials.
2. ASTM C 76, Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
3. ASTM C 144, Specification for Aggregate for Masonry Mortar.
5. ASTM C 361, Specification for Reinforced Concrete Low-Head Pressure Pipe.
7. ASTM C 923, Specification for Resilient Concrete Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
8. ASTM C 924, Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
10. ASTM D 2000, Standard Classification System for Rubber Products in
Automotive Applications (SAE Recommended Practice J200).

11. ASTM D 2321, Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

12. ASTM D 3034, Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.


17. ASTM F 794, Specification for Poly (Vinyl Chloride) (PVC) Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

C. American Water Works Association:
   1. AWWA C 100, Cast-Iron Pressure Fittings.
   3. AWWA C 151, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
   4. AWWA C 301, Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.
   5. AWWA C 302, Reinforced-Concrete Water Pipe-Noncylinder Type, Not Prestressed.
   6. AWWA C 600, Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.

D. Uni-Bell Plastic Pipe Association:
   1. UNI-B-6, Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.
   2. UNI-B-9, Recommended Performance Specification for Polyvinyl Chloride (PVC) Profile Wall Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

1.03 SUBMITTALS

A. Shop Drawings and Product Data: Submit completely dimensioned shop drawings, catalog cuts and such other data as required to provide complete descriptive information for the following:
   1. Sewer Pipe and Fittings
   2. Piping Specialties
   3. Service Connection Pipe and Fittings
B. Certificates: Submit certified records or reports of results of shop tests, with such records or reports containing a sworn statement that shop tests have been performed as specified.
   1. Manufacturer's sworn certification that pipe will be manufactured in accordance with specified reference standards for each pipe type.

1.04 QUALITY ASSURANCE

A. Design Criteria: In addition to the design requirements of the Pennsylvania Department of Environmental Protection (DEP), comply with the following:
   1. Use one type and class of pipe in continuous line of sewer between structures, unless otherwise indicated on the Drawings.
   2. Use pipe and fittings designed to withstand imposed trench loadings and prevailing site conditions at the various locations.
   3. Provide a minimum depth of cover of five feet for pipe sewers. Where less cover is provided, protect the pipe with concrete encasement or by some other means acceptable to the Engineer.
   4. Whenever concrete encasement of the sewer is required, the entire length of sewer between manholes shall be Ductile Iron Pipe.

B. Source Quality Control:
   1. Shop Tests: In accordance with Article 1.06 of the General Instructions, factory tests of pipe materials listed in the following, shall have been performed. Each pipe manufacturer shall have facilities to perform the listed tests. The Engineer reserves the right to require the manufacturer to perform such additional number of tests as the Engineer may deem necessary to establish the quality of the material offered for use.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>TEST METHOD</th>
<th>NUMBER OF TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyvinyl Chloride PVC Pipe</td>
<td>ASTM D 3034 or F 789</td>
<td>As specified in ASTM D 3034</td>
</tr>
<tr>
<td></td>
<td>(ASTM F 679 or F 794) as applicable</td>
<td>or F 789 (ASTM F 679 or F 794) as applicable.</td>
</tr>
<tr>
<td>Reinforced Concrete Pipe</td>
<td>ASTM C 76</td>
<td>As specified in ASTM C 76.</td>
</tr>
<tr>
<td>Prestressed Concrete Cylinder Pipe</td>
<td>AWWA C 301</td>
<td>As specified in AWWA C 301</td>
</tr>
</tbody>
</table>

   2. Certificates: The Engineer reserves the right to accept certified test records or reports of previously conducted tests covering the above stated tests.
   3. Laboratory Tests: The Engineer reserves the right to require that laboratory tests also be conducted on materials that are shop tested certified. The Contractor shall
be fully responsible for collecting, packaging, and identifying representative samples of materials to be tested and the shipping of such samples to the Testing Laboratory.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

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

1.06 SITE CONDITIONS

A. Environmental Requirements:
   1. Keep trenches dewatered until pipe joints have been made and concrete cradle and encasement (as required) have cured.
   2. Do not lay pipe in water or on bedding containing frost.
   3. Do not lay pipe when weather conditions are unsuitable for pipe laying work, as determined by the Engineer.

PART 2 PRODUCTS

2.01 SEWER PIPE AND FITTINGS

A. Elastomeric Gaskets: For pipe joint gasket material, provide elastomeric gaskets that have been tested as suitable for continuous contact with domestic sewage.

B. Solid Wall Polyvinyl Chloride (PVC) Pipe: Provide pipe which is permanently marked with manufacturer's trademark, size and ASTM conformance designation.
   1. Pipe, Solid Wall, Size 6 through 15 Inch Diameters: Type PSM SDR-35 conforming to ASTM D 3034 requirements, or Type PS-46 conforming to ASTM F 789 requirements for pipe sizes above 15 inch to 18 inch diameter.
   2. Pipe, Solid Wall, Size 18 through 27 Inch Diameters: Type PS-46 conforming to ASTM F 679 requirements.
   3. Fittings: Commercially manufactured molded fittings made from PVC compounds having a cell classification of 12454-B, 12454-C, or 13343-C as defined in ASTM Specification D 1784.
   4. Joints: Push-on style joint, with elastomeric gasket, conforming to ASTM D 3212 requirements for joint design; gasket conforming to ASTM F 477 requirements for material specifications, providing a watertight seal.
      a. Pipe bell design shall incorporate the gasket locked in a groove so as to prevent gasket displacement when pipes are joined.

C. Closed Profile Polyvinyl Chloride (PVC) Pipe: Provide pipe which is permanently marked with manufacturer's trademark, size and ASTM conformance designation.
   1. Pipe, 21 through 48 Inch Diameters: Manufactured to a controlled inside diameter, with integral bell and elastomeric seal joints, and conforming to ASTM
F 794 requirements.
2. PVC Compounds: Complying with the requirements for a minimum cell classification of 12364A as defined by ASTM D 1784.
3. Fittings: Fabrications made by the pipe manufacturer, using closed profile pipe meeting ASTM F 794 requirements, and formed by fusion heat welded mitered joints. Molded fittings and fabricated fittings made up by solvent cement mitered joints are not acceptable.
4. Joints: Push-on style joint, with elastomeric gasket, conforming to ASTM D 3212 requirements for joint design; gasket conforming to ASTM F 477 requirements for material specifications, providing a watertight seal. Gaskets factory installed and chemically bonded to the pipe to prevent gasket displacement when pipes are joined.

D. Ribbed Wall Polyvinyl Chloride (PVC) Pipe: Provide pipe which is permanently marked with manufacturer's trademark, size and ASTM conformance designation.
1. Pipe, 18 through 48 Inch Diameters: Manufactured to have a smooth interior with a solid cross-sectional ribbed exterior with the ribs perpendicular to the axis of the pipe, and conforming to ASTM F 794 requirements.
2. PVC Compounds: Complying with the requirements for a cell classification of 12454-B, 12454-C, or 13364-B as defined by ASTM D 1784.
3. Fittings: Commercially manufactured molded fittings made from PVC compounds having a cell classification of 12454-B, 12454-C, or 13343-C as defined in ASTM Specification D 1784.
4. Joints: Push-on style joint, with elastomeric gasket, conforming to ASTM D 3212 requirements for joint design; gasket conforming to ASTM F 477 requirements for material specifications, providing a watertight seal.
   a. Pipe bell design shall incorporate the gasket locked in a groove so as to prevent gasket displacement when pipes are joined.

E. Ductile Iron Pipe (DIP): Conforming to ANSI A21.50 and ANSI A 21.51 requirements and the following:
1. Wall Thickness Class, Buried Pipe: As indicated on Drawings or as determined by the Engineer.
2. Fittings: Gray iron or ductile iron conforming to ANSI A21.10 requirements. Fittings larger than 48 inches shall conform to AWWA C100 Class B requirements.
3. Rubber-Gasket Joints, Buried Pipe: Conforming to ANSI A21.11 requirements. For buried pipe installation, provide push-on or mechanical joints except where other types of joints are indicated on the Drawings or required by the Specifications or regulatory agency.
4. Pipe and Fitting Coating: Manufacturer's standard asphaltic coating, approximately one mil thick in accordance with AWWA C151, applied to the outside of pipe and fittings.
F. Reinforced Concrete Pipe (RCP): Provide pipe with Rubber and Steel, or Rubber and Concrete joints; however a mixture of joint types will not be accepted.

1. Pipe Construction: Conforming to ASTM C 76, Class III requirements, of Wall B minimum, except where indicated otherwise on Drawings, and having an interior surface roughness coefficient measured in Kutters ‘n’ not exceeding 0.013. Pipe acceptance is based on Paragraph 5.1.1 of ASTM C 76 Acceptance on the Basis of Plant Load-Bearing Tests, Materials Tests, and Inspection of Manufactured Pipe for Visual Defects and Imperfections, and written certification of conformity to the following. Submit such certification two weeks prior to pipe delivery. Pipe shall also meet the following criteria:
   a. Manufactured with Type II Portland Cement conforming to ASTM C 150.
   b. Cured to meet specified compressive strength.
   c. Manufactured with circular reinforcement with both bell and spigot ends reinforced. Bell and spigot reinforcement welded to barrel reinforcement.

2. Fittings and Specials: Manufactured in conformance to requirements of Section 4, AWWA Standard C 302 with wall thickness being equal to adjoining pipe barrel, and manufactured with circular reinforcement.

3. Rubber and Steel Joints: Formed of steel joint rings on tongue and groove ends or on bell and spigot ends, both with round rubber gasket contained in an external groove in the tongue or spigot end ring. The joint and rubber gasket shall conform to requirements specified in Section 3.3 and 3.4 respectively of AWWA Standard C 302; additional requirements as follows:
   a. The exposed portion of the steel joint rings shall have a factory applied coal tar epoxy, or epoxy-polyamide, protective coating applied to 8 mils dry film thickness. The pipe manufacturer shall prepare the steel surfaces and apply the coating in strict conformance with the coating manufacturer's instructions. Field applied coatings not acceptable.
   b. The bell end of the pipe shall have a factory applied grout retaining diaper anchored in place with corrosion resistant straps. The diaper is inverted for final placement in the field finishing operations of the joint.
   c. Provide joint grout for finishing the joint which grout shall consist of one part Portland cement conforming to ASTM C 150, and three parts sand conforming to ASTM C 144, and water in sufficient quantity to mix the grout to a consistency of thick cream free of lumps.

4. Rubber and Concrete Joints: Formed of concrete and sealed with round rubber gasket contained in an external groove in the concrete of the tongue or spigot end. Joint and rubber gasket shall conform to requirements specified in ASTM C 361.

G. Prestressed Concrete Cylinder Pipe (PCCP): Provide pipe manufactured of Type II Portland Cement conforming to ASTM C 150, and calcareous aggregate (limestone), as well as the following additional requirements:

1. Pipe Construction: Manufactured according to AWWA Standard C 301, either by horizontal centrification, or vertical wet casting with inside and outside forms, or dry pack casting; according to AWWA C 301 3.6.9, 3.6.10, or 3.6.11, respectively.
   a. Minimum wire shall be No. 6 with maximum class of Class III.
b. Minimum cylinder thickness shall be 16 ga. Exterior coating shall have maximum sand-cement ratio of 2 ½ to one.

2. Fittings: Manufactured in conformity with AWWA C 301, Section 4.

3. Joints: Bell and spigot design, steel joint ring and round rubber gasket, each conforming to AWWA C 301 and the following:
   a. The exposed portion of the steel joint rings shall have a factory applied coal tar epoxy, or epoxy-polyamide, protective coating applied to 8 mils dry film thickness. The pipe manufacturer shall prepare the steel surfaces and apply the coating in strict conformance with the manufacturer's instructions. Field applied coatings not acceptable.
   b. The bell end of the pipe shall have a factory applied grout retaining diaper anchored in place with straps. The diaper is inverted for final placement in the field finishing of the joint.
   c. Provide joint grout for finishing the joint which shall consist of one part Portland cement conforming to ASTM C 150, and three parts sand conforming to ASTM C 144, and water in sufficient quantity to mix the grout to a consistency of thick cream free of lumps.

2.02 PIPING SPECIALTIES

   1. Acceptable Manufacturers:
      a. FERNCO Inc., CMA Concrete Manhole Adapter, Distributed by the General Engineering Company.
      b. Or equal.

B. Sleeve Type Pipe Seal: Sleeve type pipe seal used for core-drilled connection of piping to existing manholes. In general, the pipe seal shall conform to the requirements of ASTM C 923 and shall incorporate a positive compression fit of the gasket to both the manhole and the pipe.
   1. Acceptable Manufacturers:
      a. Press-Seal Gasket Corp., Concrete Products Supply Co.; PSX Seal.
      b. Or equal.

C. Modular, Mechanical Type Pipe Seal: Modular, mechanical type pipe seal used for core-drilled connection of piping to existing manholes. Seal component construction as follows:
   1. The seal shall consist of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.
   2. The elastomeric element of the seal shall be sized and selected in accordance with the seal manufacturer's recommendations. Elastomeric element shall conform to ASTM D 2000 requirements for EPDM material.
3. The hardware provided in the seal shall be as recommended by the seal manufacturer for buried service such as will exist at the project site.

4. Acceptable Manufacturers:
   a. Thunderline Corporation; Link-Seal.
   b. Or equal.

D. Flexible Pipe Couplings: Provide flexible pipe couplings designed for differing pipe material connection; and for transition/reducing conditions of differing pipe material connections.
   1. Coupling Construction: Composed virgin polyvinyl chloride (PVC) material which meets the performance requirements of Commercial Standard Specification CS 226-59. Couplings designed for pipe outside diameter and the coupling shall incorporate recesses to contain two stainless steel screw band assemblies. Couplings provided with two pre-assembled AISI Type 305 stainless steel screw band assemblies.
   2. Shear Rings: Provide band-type construction shear rings designed to reduce the possibility of shear failure of the Flexible Pipe Coupling. Shear rings factory fabricated of ANSI Type 300 series stainless steel sheet and provided complete with pre-assembled AISI Type 305 stainless steel screw bands. Provide the proper style shear ring, including bushings as necessary, as is suited to the particular Flexible Pipe Coupling being used.

2.03 SERVICE CONNECTION PIPE AND FITTINGS
   
A. Solid Wall Polyvinyl Chloride (PVC) Pipe: As specified under Sewer Pipe and Fittings; six inch diameter.

B. PVC Saddles: Provide wye or tee saddles with skirts correctly contoured for outside diameter of pipe, and incorporating ring gasket bell outlet and gasketed skirt. Saddles to be commercially manufactured molded units conforming to design requirements of ASTM D 3034 Type SDR-35, made from PVC compounds having a cell classification of 112454-B, 12454-C, or 13343-C as defined in ASTM D 1784.
   1. Outlet Joint: Push-on style with elastomeric gasket, conforming to ASTM D 3212 for outlet joint design.
   2. Gaskets: Both pipe outlet gasket and saddle skirt gasket shall conform to ASTM F 477 requirements for material specifications, providing a watertight seal.
   3. Skirt Bands: Saddle skirts provided with two pre-assembled type 305 stainless steel band and clamp assemblies.

C. Cast Iron Saddles: Provide cast iron saddles for service connection laterals on RCP or RCCP. Saddles shall be correctly contoured for the outside diameter of the pipe and shall incorporate a sealing gasket and strap-on band assembly.
1. **Saddle Body**: Cast iron conforming to ASTM A 48, Class 35 requirements, coated inside and out with heavy coat of saddle manufacturer's standard protective coating. The inlet to the saddle shall be of the proper style or type as suited to the type of service connection pipe material.

2. **Gasket**: Compound rubber (neoprene) tubular O-ring design conforming to ASTM C 361 requirements.

3. **Strap-on Band Assembly**: Fabricated of AISI Type C 304 stainless steel band assembled with two 3/8-inch AISI Type C 304 stainless steel T-bolts, washers and hex nuts.

4. **Acceptable Manufacturer**:
   a. The General Engineering Company; Sealtite.
   b. Or equal.

D. **Compression-Fit PVC Hub**: Provide Compression-Fit PVC Hubs (Inserta Tee) only for service connections into Closed Profile PVC Pipe. Materials and construction as follows:
   1. **PVC Hub**: Manufactured from polyvinyl chloride (PVC) pipe, Type PSM SDR-35, conforming to ASTM D 3034 requirements. The hub shall conform to ASTM D 3212 requirements for push-on style pipe joint with elastomeric gasket; gasket conforming to ASTM F 477 requirements for material specifications, providing a watertight seal.
   2. **Band-Screw Assembly**: Stainless steel band and housing fabricated from AISI Type 301 stainless steel; tightening screw of AISI Type 305 stainless steel.
   3. **Rubber Sleeve**: A molded component of materials composition meeting the requirements of ASTM C 443.
   4. **Acceptable Manufacturers**:
      a. Inserta Fittings Company; Inserta Tee.
      b. Or equal.

E. **Pipe outlets (RCP or PCCP)**: Factory fabricated integrally cast pipe outlets incorporating saddle plates for additional support at the outlet, with outlet neck adequately reinforced in manner similar to the sewer pipe.
   1. Outlet neck of mechanical joint bell end and incorporating special shaped steel joint rings and round rubber gasket.

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

2.04 **CONTRACTOR OPTIONS IN PRODUCTS**

A. **Sewer Pipe and Fitting Options**: Unless indicated otherwise on the Drawings, provide one type of pipe in the Project for a particular pipe size range listed herein. However, use only the one type of pipe, as selected, to construct the pipe sewer mains for which pipe material options are allowed.
   1. 6-inch Through 15-inch Diameter Sewer:
a. Polyvinyl Chloride pipe (PVC), SDR-35 or PS-46.
b. Ductile Iron pipe (DIP). 16-inch diameter allowed where 15-inch diameter is indicated on Drawings.

2. 18-inch Through 27-inch Diameter Sewer:
   a. Polyvinyl Chloride pipe (PVC): Solid Wall, PS-46 or Ribbed Wall.
   b. Ductile Iron pipe (DIP) 20-inch diameter DIP allowed where 21-inch diameter pipe is indicated on Drawings.
   c. Reinforced Concrete pipe (RCP), rubber and steel joint.
   d. Prestressed Concrete Cylinder pipe (PCCP); 20-inch diameter PCCP allowed where 21-inch diameter pipe is indicated on Drawings.

3. 21-inch Through 48-inch Diameter Sewer:
   a. Polyvinyl Chloride pipe (PVC): Solid Wall, PS-46 or Closed Profile or Ribbed Wall.
   b. Ductile Iron pipe (DIP) 20-inch diameter DIP allowed where 21-inch diameter pipe is indicated on Drawings.
   c. Reinforced Concrete pipe (RCP), rubber and steel joint.
   d. Prestressed Concrete Cylinder pipe (PCCP); 20-inch diameter PCCP allowed where 21-inch diameter pipe is indicated on Drawings.

4. Required Pipe Material Exception: Where DIP is indicated on the Drawings no option is permitted because of prevailing site conditions, or DIP is required by utility companies or local governmental bodies, or where the sewer main is laid in fill material.

B. Service Connections (RCP and PCCP) Options: For Service connections on RCP and PCCP use either Cast Iron Saddles or Precast Concrete Pipe Outlets. A mixture of types not acceptable.

C. Pipe Connections to Existing Manholes or Structures Options: The option is allowed to construct one type of connection in the Project of the types listed herein, except where required otherwise on the Drawings.
   2. Core-drilled opening utilizing Sleeve Type Pipe Seal.
   3. Core-drilled opening utilizing Modular, Mechanical Type Pipe Seal.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Rejected Products: Remove rejected Products from the Project site and replace with new Products.

3.02 PREPARATION
A. General Requirements: Clean piping interior prior to laying pipe and following pipe laying and keep open ends of piping and pipe attachment openings capped or plugged until actual connection or actual pipe testing.
   1. Provide the protective means to prevent water and debris from washing into the pipe.

B. Earthwork: Perform earthwork for gravity sewer installation as specified in Section 02221.
   1. Bedding materials and concrete work for pipe bedding as specified in Section 02221.
   2. Excavate trenches in rock at least 25-feet in advance of pipe laying. Protect pipe ends from blasting, if blasting is allowed in the Project.

3.03 SEWER CONSTRUCTION

A. General Requirements: Use proper and suitable tools and appliances for the proper and safe handling, lowering into trench and laying of pipes.
   1. Lay pipe proceeding upgrade true to line and grades given. Lay bell and spigot pipe with bell end upgrade. Lay tongue and groove pipe with groove end upgrade. No wedging or blocking permitted in laying pipe unless by written order of Engineer.
   2. Exercise care to insure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs along inside bottom half of pipe line.
   3. Before joints are made, bed each section of pipe full length of barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place. Dig bell holes sufficiently large to permit proper joint making and to insure pipe is firmly bedded full length of its barrel.
   4. Walking or working on the installed pipe line, except as necessary in tamping and backfilling, is not permitted until trench is backfilled one-foot deep over top of pipes.
   5. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.
   6. Take up and replace with new, such in-place pipe sections found to be defective.

B. Pipe Laying and Joining: Perform pipe laying and joining in strict accordance with manufacturer's installation instructions, reference standards as included, and such additional requirements as specified herein.
   1. Arrange and pay for pipe manufacturer's representative to be present for first installation of pipe to instruct workmen on proper installation methods.
   2. Make joints absolutely watertight and immediately repair detected leaks and defects. Methods of repair subject to Engineer's approval.
   3. Laying/Joining Specified Types of Plastic Pipe: Installation and joint assembly
according to ASTM D 2321 requirements and for Class I bedding material as included therein.

4. Laying/Joining Ductile Iron Pipe: Installation and joint assembly according to AWWA C 600, and as follows:
   a. Pipe Cutting: Where necessary to field cut pipe use approved pipe cutter, milling cutter or abrasive wheel saw.

5. Laying/Joining Reinforced Concrete Pipe: In addition to previously specified reference standard specification requirements, the Rejection requirements of ASTM C 76 govern acceptance of RCP prior to and following installation. Make-up Rubber and Steel joints as follows:
   a. Joint Make-up: During joint make-up check the gasket position using the pipe manufacturer provided feeler gauge, or similar procedure as recommended by the pipe manufacturer. If the gasket is not in place, open the joint and re-make the joint using a new gasket.
   b. Finishing the Joint: Position the inverted factory installed grouting diaper properly over the entire joint in accordance with the manufacturer's instructions. Pour the flowable grout mixture into the opening at the top of the diaper so that it completely fills the external joint recess. Rod or puddle the grout to ensure complete filling of the joint recess. Apply a stiff grout mix over the diaper opening to form a grout seal.

6. Laying/Joining Prestressed Concrete Cylinder Pipe: In addition to previously specified reference standard specification requirements, the Rejection requirements of AWWA C 301 govern acceptance of PCCP prior to and following installation.
   a. Joint Make-up: During joint make-up check the gasket position using the pipe manufacturer provided feeler gauge, or similar procedure as recommended by the pipe manufacturer. If the gasket is not in place, open the joint and re-make the joint using a new gasket.
   b. Finishing the Joint: Position the inverted factory installed grouting diaper properly over the entire joint in accordance with the manufacturer's instructions. Pour the flowable grout mixture into the opening at the top of the diaper so that it completely fills the external joint recess. Rod or puddle the grout to ensure complete filling of the joint recess. Apply a stiff grout mix over the diaper opening to form a grout seal.

C. Service Connection Fittings:
   1. Wyes or Tees: Make connections to sewer using wye or tee fittings of same material and joint configuration as the sewer at planned point of branch connection.
      a. Use commercially manufactured wye or tee fittings and one-eighth bends.
      b. Set wye or tee branches at proper vertical angles as required to bring service connections to the proper depth.
      c. Fittings locations determined by the Engineer with respect to service connections to existing house or building location.
   2. Saddles: Make connections to sewers, which incorporate a saddle connection, by
machine cutting a hole in the sewer of proper size to accommodate the saddle. Use a machine specifically designed for the purpose; no other means of making the hole permitted.
a. Install saddle in accordance with manufacturer's installation instructions.

3. Compression-Fit PVC Hub: Use only for service connection into Closed Profile PVC pipe; install in accordance with manufacturer's installation instructions.

4. Pipe Outlet: Connect service connection piping to outlet in manner specified for joining pipe.

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

D. Drop Connections: Make drop connections where indicated on the Drawings, where drop in invert is two feet or more or as required by the Engineer. 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 Detail Drawing.

E. Connections to Existing Manholes or Structures: Make pipe connections to existing manholes or structures by the previously selected option and in accordance with the appropriate requirements as follows:
1. Cut-In Opening Utilizing PVC Waterstop and Grout: Cut required opening or openings by such methods so as to prevent cracking and spalling concrete. Make openings of sufficient size to accommodate the pipe with PVC Waterstop installed and one inch of annular grout space. Grout annular space using Non-Shrink Non-Metallic Grout as specified in Section 03600. Make connection watertight.

2. Core-Drilled Opening Utilizing Pipe Seal: Core-drill the required opening or openings using the proper equipment for the work. Make openings of sufficient size to accommodate the pipe and the Sleeve Type Pipe Seal or Mechanical Type Pipe Seal.

3. New Invert Channel: Regardless of the connection to existing manhole option selected, form a new invert channel in the existing manhole base to properly conduct the flow through the existing manhole. Do not permit ground water, surface water or debris to enter the existing facilities through the new connection.

F. Reconnection of Existing Service Connections: Use wye or tee fittings, or cast iron tee saddles, or PVC wye or tee saddles for connection to the sewer main. Use pipe if required as specified previously. Make connection to existing piping with flexible pipe couplings.
1. Service connection fittings as specified previously.

2. Use commercially manufactured wye or tee fittings and one-eighth bends.

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

4. Fittings locations determined by the Engineer with respect to existing service connection location.

5. PVC Saddles: Place saddle in position on pipe and mark guide for hole cut-in,
using saddle as a template. Remove saddle from pipe and using hole guide mark, cut hole through pipe wall 1/2-inch outside the hole guide mark.

a. Install saddle in accordance with manufacturer's installation instructions.

6. Cast Iron Saddles: Make connections to sewers, which incorporate a saddle connection, by machine cutting a hole in the sewer of proper size to accommodate the saddle. Use a machine specifically designed for the purpose; no other means of making the hole permitted.

a. Install saddle in accordance with manufacturer's installation instructions.

7. Pipe Outlet: Connect service connection piping to outlet in manner specified for joining pipe.

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

G. Storm Sewer Obstructions: When it is necessary to construct a pipe sewer beneath an existing or proposed storm sewer in a location where the vertical separation between the top of the pipe sewer piping and the bottom of the storm sewer piping is 18 inches or less, the pipe sewer piping shall be DIP.

H. Stream Crossing: Construct stream crossing in accordance with the requirements of Section 02221 and the following:

1. Pipe: Construct stream crossing using only Ductile Iron Pipe, concrete encased as specified in Section 02221.

3.04 SERVICE CONNECTION CONSTRUCTION

A. General Requirements: Build service connections (house or other service lines) to such points indicated on Drawings, or to such other points designated by the Engineer. Build service connections at such location as selected by the Engineer. Lay and join service connections in every respect as specified for Sewer Construction Methods except as follows:

1. Line and Grade: Lay service connections true to line and grade furnished by Engineer, and unless otherwise required by Engineer, at a 90 degree angle to curb line.

2. Test Tees: Install a six by six by six inch test tee on upper free end of service connections (test tee for Owner's use in testing house or building sewer lines connected to service connection). Provide test tees of same material as service connection. Close two outlets of test tee with Plugs. Type of plug used and method of installation subject to Engineer's approval. Installed plugs shall successfully pass Line Acceptance Test.

3. Deep Sewer Service Connection: In general, where depth of sewer invert is 12-feet or more, or elsewhere as designated by the Engineer, install service connections to enter the sewer as shown on Drawings for Service Connection-Deep Sewer. Construct of same material used for service connections.

4. Where DIP, RCP or PCCP is used for pipe sewer mains, use PVC pipe for service
connection piping. Provide suitable adaptor.

5. Do not connect service connections to manholes unless the requirement is waived in writing by the Owner.

3.05 FIELD QUALITY CONTROL

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

1. Notification: The Contractor shall give the Engineer a minimum of 48 hours advance notification of the date of the testing specified herein.

B. Testing Equipment: Provide tools, materials (including water), apparatus and instruments necessary for pipeline testing. Use air compressing apparatus equipped with a control panel with necessary piping, control valves and gauges to control air flow rate to piping section under test, and also the air pressure within the test seal plugs.

1. To prevent accidental overloading of piping test section, provide air compressing apparatus with an approved pressure relief device set to relieve at ten psi.

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

3. Provide GO-NO-GO Mandrel and incidental equipment for Deflection Test. Mandrel to conform to following requirements:
   a. Cylindrical in shape with not less than nine arms spaced evenly around the mandrel.
   b. Minimum contact length of mandrel arms with pipe wall not less than the nominal diameter of the pipe being tested.
   c. Mandrel diameter 95 percent of inside pipe diameter.

4. Provide all other equipment, materials, and labor necessary to conduct Contractor required tests.

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

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

D. Initial Section Test: To demonstrate acceptability of installed pipe materials and workmanship, construct and air test one sewer section from manhole to manhole using the pipe provided in the Contract. Pretesting such section prior to actual Initial Section Test not permitted.

1. Conduct Initial Section Test in same manner as Line Acceptance Test specified in a following paragraph.

2. Conduct the Initial Section Test for each size and type pipe material used in the Project prior to continued installation of same pipe.

3. Provide pipe manufacturer's representation during laying, backfilling and testing of Initial Sections Tests.

4. The Engineer has the option to order the same Initial Section Test for a section of
sewer in each 3,000 lineal feet of sewer line of a particular size and material.

5. Conduct same Initial Section Test for one manhole to manhole sewer section of each 3,000 lineal feet of sewer.
6. Failure of an Initial Section Test will be sufficient cause for the Engineer to reject manufacturer and supplier of pipe regardless of cause of failure.
7. Sewer sections successfully tested as Initial Section Test will be retested under Line Acceptance Test.

E. Line Acceptance Test: After a section of sewer and its service connections is constructed between adjacent manholes, backfilled and successfully cleaned, perform a low pressure air Line Acceptance Test in accordance with the following and the Standards listed therein:

1. Plug free ends of branches and service connections.
2. Seal Sewer piping at upstream and downstream manholes with pneumatic type plugs. Test plug seal before actual use by testing plugs outside the trench in one length of pipe pressurized to maximum anticipated testing pressure. Plugs shall hold without bracing and show no movement.
3. Introduce low pressure air slowly into sealed sewer section until internal air pressure is four psig greater than the average ground water pressure acting on the pipe.
4. Allow two minutes minimum for air temperature to stabilize, adding only required air to maintain pressure.
5. After stabilization period (3.5 psig minimum in pipe) disconnect air supply and determine rate of air loss by measuring time interval required for 3.5 psig to decrease to 2.5 psig greater than the average groundwater pressure acting on the pipe.
6. To determine the groundwater pressure acting on the pipe being tested, divide the height in feet of the groundwater above the invert of the pipe by 2.3. Add the result to the previously specified test pressures (i.e., If maximum groundwater height is 11.5 feet above the pipe invert, the groundwater pressure is five psig. This increases the 3.5 psig and 2.5 psig to 8.5 psig and 7.5 psig, respectively.) Test pressure not to exceed ten psig regardless of height of groundwater over the pipe.
7. Consider sewer line Acceptable when a 1.0 psig pressure drop does not occur within the test time specified in the AIR TEST TABLES immediately following this Section.
8. Test Standards:
   a. PVC Pipe, Solid Wall: Test according to UNI-B-6.
   b. PVC Pipe, Profile Wall: Test according to UNI-B-9.
   c. DIP, RCP, PCCP: Test according to ASTM C 924.
9. For sections of sewer containing service connections which service existing buildings, perform Line Acceptance Test by testing one joint at a time.
   a. Equipment: Use joint testing apparatus such as the Cherne Joint Tester, Cherne Industrial, Inc., Edina, Minnesota or equal.
   b. Consider joint acceptable when the pressure loss is less than one pound in
c. Use air pressure for testing joint as previously specified.

F. Deflection Test: In addition to air tests and infiltration test, conduct deflection tests on PVC pipe. Test each PVC pipe sewer main installed.
   1. Conduct deflection testing not less than 30 days after section of pipe sewer main and service connection between adjacent manholes is backfilled.
   2. Pull mandrel through pipe section manually; powered pulling devices not permitted.
   3. Consider sewer line section which mandrel cannot pass through, to have more than maximum allowable deflection of five percent.

G. Infiltration Test: In addition to air tests and deflection test specified previously, conduct infiltration tests at such time and manner required by Engineer.
   1. Infiltration rate of groundwater or other water into the sewer line, including manhole bases and walls, exceeding 200 gallons per inch diameter per mile of sewer per day during periods of high groundwater levels will be considered evidence of defective material or improper workmanship.
   2. Make repairs and replacements as required, if rate of infiltration exceeds allowable maximum rate.
   3. Regardless of whether the rate of leakage exceeds or is below the allowable maximum rate, repair leaks in pipe sewer lines.

H. Repair and Retest: When section or sections of sewer fails to meet test requirements specified previously, determine source or sources of leakage, repair or replace defective material, and if as result of improper workmanship, correct such.
   1. Take up and relay pipe sewer line section that has more than the maximum allowable deflection.
   2. Conduct additional tests required to demonstrate that sewer line meets specified tests requirements.

I. Owner’s Tests: The Owner reserves the right to retest any piping throughout the duration of the Construction Period.
   1. Make repairs as Work of this Section to piping found defective by such Owner conducted tests.

END OF SECTION
SECTION 02724

FORCE MAINS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: This Section specifies construction of the piped wastewater force mains and appurtenances therein, and connecting into the various structures within the pipeline.

B. Related Sections:
   1. Trenching, Backfilling and Compacting: Section 02221.
   3. Cast-In-Place Concrete: Section 03300.
   4. Grout: Section 03600.

1.02 REFERENCES

A. American National Standards Institute:
   1. ANSI A 21.10, Gray-Iron and Ductile-Iron Fittings, 2 through 48 inches, for Water and Other Liquids.
   2. ANSI A 21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.
   5. ANSI A 21.51, Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
   7. ANSI B 16.1, Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
   8. ANSI B 16.21, Nonmetallic Gaskets for Pipe Flanges.
   9. ANSI B 18.2.1, Square and Hex Bolts and Screws, Including Askew head Bolts, Hex Cap Screws, and Lag Screws.
   10. ANSI B 18.2.2, Square and Hex Nuts.

B. American Society for Testing and Materials:
9. ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
11. ASTM B 371, Specification for Copper-Zinc-Silicon Alloy Rod.
12. ASTM B 438, Specification for Copper-Base Sintered Bearings (Oil-Impregnated).
18. ASTM D 2774, Standard Recommended Practice for Underground Installation of Thermoplastic Pressure Pipe.

C. American Water Works Association:
2. AWWA C 151, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
3. AWWA C 509, Resilient-Seated Gate Valves, 3 Through 12 NPS, for Water and Sewage Systems.
4. AWWA C 550, Protective Interior Coatings for Valves and Hydrants.
5. AWWA C 600, Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.
6. AWWA C 900, Polyvinyl chloride (PVC) Pressure Pipe, 4-inch Through 12-inch, for Water.

1.03 SUBMITTALS

A. Shop Drawings and Product Data: Submit completely dimensioned shop drawings, catalog cuts and such other data as required to provide complete descriptive information for the following:
   1. Force Main Pipe and Fittings
   2. Piping Specialties
   3. Sewage Valve
   4. Gate Valves
   5. Air Release and Cleanout Chambers

B. Certificates: Submit certified records or reports of results of shop tests, with such records or reports containing a sworn statement that shop tests have been made as specified. Sworn certifications shall bear the seal of a Registered Professional Engineer.
   1. Provide manufacturer's sworn certification stating that the pipe will be manufactured in accordance with specified reference standards for each pipe type.

1.04 QUALITY ASSURANCE

A. Design Criteria: In addition to the design requirements of the Pennsylvania Department of Environmental Protection (DEP), comply with the following:
   1. Use only one type and class of pipe in any continuous force main between structures, unless otherwise indicated on the Drawings.
   2. Use pipe and fittings designed to withstand imposed trench loadings and conditions at the various locations.

B. Source Quality Control:
   1. Shop Tests: In accordance with Article 1.06 of the General Instructions, factory test pipe materials listed in the following. Each pipe manufacturer shall have facilities to perform listed tests. The Engineer reserves the right to require the manufacturer to perform such additional number of tests as the Engineer may deem necessary to establish the quality of the material offered for use.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>TEST METHOD</th>
<th>NUMBER OF TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyvinyl Chloride PVC Pipe</td>
<td>ASTM D 2241</td>
<td>As specified in ASTM D 2241</td>
</tr>
<tr>
<td>Polyvinyl Chloride PVC Pipe</td>
<td>AWWA C 900</td>
<td>As specified in AWWA C 900</td>
</tr>
</tbody>
</table>
2. Certificates: The Engineer reserves the right to accept certified test records or reports of previously conducted tests covering the above stated tests.

3. Laboratory Tests: The Engineer reserves the right to require that laboratory tests also be conducted on materials that are shop tested certified. The Contractor shall be fully responsible for collecting, packaging, and identifying representative samples of materials to be tested and the shipping of such samples to the Testing Laboratory.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport, handle and store pipe materials and precast reinforced concrete manhole components and the associated materials specified herein, in a manner recommended by the respective manufacturers to prevent damage and defects.

1.06 SITE CONDITIONS

A. Environmental Requirements:
   1. Keep trenches dewatered until pipe joints have been made and concrete cradle 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 for pipe laying work, as determined by the Engineer.

PART 2 PRODUCTS

2.01 FORCE MAIN PIPE AND FITTINGS

A. Elastomeric Gaskets: For pipe joint gasket material, provide elastomeric gaskets that have been tested as suitable for continuous contact with domestic sewage.

B. Ductile Iron Pipe (DIP): Provide pipe conforming to ANSI A21.50 and ANSI A21.51 requirements and the following:
   1. Wall Thickness Class, Buried Pipe: As indicated on Drawings or as determined by the Engineer.
   2. Wall Thickness Class, Exposed Pipe: Class 53 except as noted otherwise on Drawings.
   3. Fittings: Gray iron or ductile iron conforming to ANSI A21.10 requirements, rated for 250 psi working pressure.
   4. Rubber-Gasket Joints, Buried Pipe: Conforming to ANSI A21.11 requirements. For buried pipe installation, provide either push-on or mechanical joints except where other types of joints are indicated on the Drawings or required by the Specifications.
5. **Restrained Joints**: Conforming to requirements of ANSI A21.11 and designed for a working pressure equal to connected pipe rating. Provide joints for pipe and fittings similar to the following:
   a. American Cast Iron Pipe Company; Lok-Fast or Lok-Set.
   b. Clow Corporation; Super-Lock.
   c. United States Pipe and Foundry Company; TRFLEX.
   d. Or equal.

   a. Gaskets: 1/16 in. thick cloth insertion rubber full face type conforming to ANSI B16.21 requirements.
   b. Bolts: Conforming to ANSI B18.2.1 requirements.
   c. Nuts: Conforming to ANSI B18.2.2 requirements.

7. **Retainer Glands**: Designed for pipe joint retaining through the use of a follower gland and set screw anchoring devices which impart multiple wedging action against the pipe. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of two to one. Material components as follows:
   b. Restraining Devices: Manufactured of ductile iron heat treated to a minimum hardness of 370 BHN. Restraining devices shall incorporate a set screw/twist off nut bolt to insure the proper actuating of the restraining device. The twist off nut shall be designed to come off at the torque limit desired to anchor the restraining device in place on the pipe.
   c. Joint Deflection: Retainer Gland joint deflection shall be limited to a two degree maximum. Joint deflection shall be applied before the set screws are torqued.
   d. Acceptable Manufacturers:
      1) EBAA Iron, Inc.; Megalug 1100 Series.
      2) Or equal.

8. **Pipe and Fitting Lining**: Manufacturer's standard cement-mortar lining in accordance with AWWA C 104, single thickness. Lining shall include an asphaltic seal coat to prevent moisture loss in cement-mortar curing sequence.

9. **Pipe and Fitting Coating**: Manufacturer's standard asphaltic coating, approximately one mil thick in accordance with AWWA C 151, applied to the outside of pipe and fittings.

C. **Polyvinyl Chloride (PVC), 4-Inch Through 8-Inch Diameter Pipe**: Provide pipe which is permanently marked with manufacturer's trademark, size and AWWA conformance designation. Pipe design and material requirements shall conform to AWWA C900 requirements for DR 18, 150 psi pressure class.
   1. **PVC Pipe Joints**: Push-on or compression type, rubber gasket, conforming to
2. **Fittings:** Gray iron or ductile iron conforming to ANSI A21.10 requirements, rated for 250 psi working pressure.
   a. **Fitting Joints:** Rubber-gasket push-on or mechanical type conforming to ANSI A21.11 requirements.
   b. **Fitting Coating:** Manufacturer's standard asphaltic coating, approximately one mil thick in accordance with AWWA C 151.

3. **Retainers for PVC Pipe:** Manufactured from 60-42-10 ductile iron conforming to ASTM A 536 requirements, including the glands and tie bolts. The retainers shall have a sufficient number of tie bolts to restrain the working and test pressures established by the retainer manufacturer.
   a. The glands shall have serrations on the inside diameter sufficient to hold against both the working and test pressures.
   b. **Acceptable Manufacturer:**
      1) EBAA Iron Sales, Inc.
      2) Or equal.

4. **Restraints for PVC fittings:** Manufactured from 60-42-10 ductile iron conforming to ASTM A 536 requirements, including the bell ring, restraint ring and tie bolts.
   a. A split ring shall be utilized behind the bell of the fitting outlets. A serrated ring shall be used to grip the pipe and a sufficient number of bolts shall connect the bell ring and the serrated gripping ring. The combination shall restrain continuously against a working pressure rating of 150 psi.
   b. **Acceptable Manufacturer:**
      1) EBAA Iron Sales, Inc.
      2) Or equal.

**D. Polyvinyl Chloride (PVC) 1 1/2-Inch Through 3-Inch Diameter Pipe:** Provide pipe which is permanently marked with manufacturer's trademark, size and ASTM conformance designation. Pipe design and material requirements shall conform to ASTM D 2241, SDR-21 for 200 psi pressure. PVC material shall conform to ASTM D 1784 requirements for Cell Classification 12454B.

1. **Pipe Joints:** Push-on or compression type, rubber gasket, conforming to ASTM D 3139 and F 477 requirements; rubber gasket that have been tested as suitable for continuous contact with domestic sewage.

2. **Pipe Fittings:** Manufactured in one piece of injection molded PVC compound meeting ASTM D 1784 requirements.
   a. Fittings shall be Class 200 and conform to requirements of DR 21.
   b. Fittings shall withstand a minimum of 630 psi quick burst pressure at 73 degrees F. when tested in accordance with ASTM D 1599 requirements.
   c. Bells shall be gasketed joint conforming to ASTM D 3139 with gaskets conforming to ASTM F 477 requirements.
   d. **Acceptable Manufacturer:**
      1) The Harrington Corporation.
      2) Or equal.
3. Retainers for PVC Pipe: Manufactured from 60-42-10 ductile iron conforming to ASTM A 536 requirements, including the glands and tie bolts. The retainers shall have a sufficient number of tie bolts to restrain the working and test pressures established by the retainer manufacturer.
   a. The glands shall have serrations on the inside diameter sufficient to hold against both the working and test pressures.
   b. Acceptable Manufacturer:
      1) EBAA Iron Sales, Inc.
      2) Or equal.

4. Restraints for PVC fittings: Manufactured from 60-42-10 ductile iron conforming to ASTM A 536 requirements, including the bell ring, restraint ring and tie bolts.
   a. A split ring shall be utilized behind the bell of the fitting outlets. A serrated ring shall be used to grip the pipe and a sufficient number of bolts shall connect the bell ring and the serrated gripping ring. The combination shall restrain continuously against a working pressure rating of 150 psi.
   b. Acceptable Manufacturer:
      1) EBAA Iron Sales, Inc.
      2) Or equal.

E. Polyethylene (PE) Pipe and Fittings: Provide pipe which is permanently marked with manufacturer's trademark, size and ASTM conformance designation. Pipe design shall conform to ASTM F 714 for SDR 17 performance requirements.
1. Pipe Construction: The polyethylene material shall have a PE 3408 designation and shall conform to ASTM D 1248 requirements for a Type III, Class C, Category 5, Grade P34 material. Pipe material shall also have a cell classification of 345434C as defined in ASTM D 3350, and have a hydrostatic design value basis of 1600 psi when tested in accordance with ASTM D 2837.
2. Fittings: Molded from polyethylene compound equal to the compound used in the PE pipe construction. Fabricated fittings shall conform to ASTM D 3261, SDR 17 requirements and shall be pressure rated to match the system piping in which they are installed.
3. Joining: Both pipe and fittings joined to one another by thermal butt fusion, saddle fusion, or socket fusion in accordance with procedures developed by the pipe manufacturer.
4. Flanged Joints: PE pipe and fittings joined to other materials by means of flanged connections composed of PE flange (fusion joined to pipe) and type 316 stainless steel back-up rings rated for the same pressure service as the pipe.

2.02 PIPING SPECIALTIES

A. Flanged Adapters: Fabricated from high strength steel (Style 128), or cast iron (Style 127), and designed for joining DIP plain-end pipe to flanged fittings, valves, and flanged end equipment.
   1. The compression-end of the adapter shall have the Dresser-Coupling type pack
utilizing a Grade 27 wedge gasket for positive, watertight sealing. The flanged-end shall match the flange of the proposed fitting, valve or equipment connection.

2. Acceptable Manufacturers:
   a. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Style 128 and 127.
   b. Rockwell-International.
   c. R. H. Baker & Co., Inc.
   d. Or equal.

B. PVC Waterstop: Use PVC waterstop in making a grouted connection of piping to existing manholes or structures. Waterstop construction as follows:
   2. Acceptable Manufacturers:
      a. FERNCO Inc., CMA Concrete Manhole Adapter, Distributed by the General Engineering Company.
      b. Or equal.

C. Sleeve Type Pipe Seal: Use sleeve type pipe seal in making a core-drilled connection of piping to existing manholes or structures. Pipe seal construction as follows:
   1. In general, the pipe seal shall conform to the requirements of ASTM C 923 and shall incorporate a positive compression fit of the gasket to both the manhole and the pipe.
   2. Acceptable Manufacturers:
      a. Press-Seal Gasket Corp., Concrete Products Supply Co.; PSX Seal.
      b. Or equal.

D. Modular, Mechanical Type Pipe Seal: Use modular, mechanical type pipe seal in making a core-drilled connection of piping to existing manholes or structures. Pipe seal construction as follows:
   1. The seal shall consist of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.
   2. The elastomeric element of the seal shall be sized and selected in accordance with the seal manufacturer’s recommendations. Elastomeric element shall conform to ASTM D 2000 requirements for EPDM material.
   3. The hardware provided in the seal shall be as recommended by the seal manufacturer for buried service such as will exist at the project site.
   4. Acceptable Manufacturers:
      a. Thunderline Corporation; Link-Seal.
      b. Or equal.

E. Wall Sleeves: Cast gray iron or ductile iron conforming to ANSI A21.10 requirements, rated for 250 psi working pressure, and provided with intermediate anchoring flange in
1. Joints: Joint requirements shall match that of the connected piping except where indicated otherwise on the Drawings.

2. Acceptable Manufacturers:
   a. McWane Incorporated
   b. American Cast Iron Pipe Co.
   c. U.S. Pipe and Foundry Co.
   d. Or equal.

F. Flexible Pipe Coupling: Coupling shall consist of a steel middle ring or sleeve, two steel or malleable iron flange or follower rings, two wedge shaped resilient gaskets and sufficient number of track-head bolts and nuts.

1. Middle Ring or Sleeve: Steel construction conforming to ASTM A 283, (Grade A) requirements, fabricated in a true circular section and free of surface defect.

2. Follower Rings or Flanges: Steel construction conforming to ASTM A 47 (Grade 32510) requirements, fabricated in a true circular section and free of surface defect, and tested and sized after welding by cold expanding a minimum of one percent.

3. Bolts and Nuts: Steel bolt conforming to ASTM A 183 requirements, double radius head or buttonhead track type with rolled threads, conforming to ANSI B1.1 requirements; and steel nuts conforming to ANSI B 18.2.2 requirements, American Standard Heavy Dimension Series.


5. Shop Paint: Middle and follower rings shop painted with primer compatible with specified field coat for piping where coupling is located.

6. Acceptable Manufacturers:
   a. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Style 38 or 138.
   b. Rockwell-International.
   c. R. H. Baker & Co., Inc.
   d. Or equal.

G. Stainless Steel Pipe Supports: Fabricate pipe supports and pipe straps for exposed piping using AISI Type 304 stainless steel conforming to ASTM A 167. Individual pipe support and pipe strap designs are as indicated on the Drawings.

1. Anchors and Fasteners: Provide drilled-in type expansion anchors incorporating a one-piece stud (bolt) with integral expansion wedges, nut and washer as a UL Listed assembly and meeting physical requirements of Federal Specification FF-S-325, Group II, Type 4, Class 1. Stud of AISI Type 303 or 304 stainless and nut and washer of Type 316 stainless.

H. Concrete: As specified in Section 03300 for Class B (3,000 psi.) Concrete.

2.03 SEWAGE VALVE

A. Sewage Air Release Valve: Valve design shall 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, conforming to ASTM A 48, Class 35 requirements.
2. Inlet Size: 2-inches, NPT.
3. Outlet Size: 1/2-inch, NPT.
6. Discharge Orifice Seat, Mechanism and Valve Stem: Stainless Steel.
7. Orifice Button: Stainless steel and Buna-N, Nitrile Rubber conforming to ASTM SB 800 requirements.
9. Backflushing and Cleaning Accessories: Factory assembled to the valve and consisting of a 2-inch shut-off valve at bottom inlet, a 1-inch blow-off valve near the bottom of the valve body, quick disconnect couplings and ½-inch shut-off valve at top of valve, and a section of rubber hose with quick disconnect coupling.
10. Acceptable Manufacturers:
   a. Val-Matic Valve And Manufacturing Corp.; Model No. 48 Series.
   b. Or equal.

B. Sewage Air and Vacuum Valve: Valve design shall automatically exhaust large quantities of air during the filling of a system and shall 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, conforming to ASTM A 48, Class 35 requirements.
2. Inlet Size: 2-inches.
3. Discharge Orifice: 2-inches.
4. Float Stem and Guide: Bronze, conforming to ASTM B 584 requirements.
5. Floats: Stainless Steel, conforming to ASTM A 240 requirements.
6. Orifice Seat: Buna-N, Nitrile Rubber, conforming to ASTM SB 800 requirements.
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 ½-inch shut-off valve at the top of valve, and a section of rubber hose with quick disconnect coupling.
8. Acceptable Manufacturers:
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, conforming to ASTM A 48, Class 35 requirements.
2. Inlet Sizes: 2-inches.
3. Air Release Outlet Size: 1/2-inch, NPT.
8. Air Release Valve Orifice Button: Stainless Steel and Buna-N, Nitrile Rubber conforming to ASTM SB 800 requirements.
10. Air and Vacuum Valve Float Stem and Guide: Bronze, conforming to ASTM B 584 requirements.
11. Air and Vacuum Valve Floats: Stainless Steel, conforming to ASTM A 240 requirements.
12. Air and Vacuum Valve Orifice Seat: Buna-N, Nitrile Rubber, conforming to ASTM SB 800 requirements.
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.

2.04 GATE VALVES

A. Hose End Gate Valve: Class 125 bronze gate valve having screw-in bonnet, non-rising stem, tapered solid wedge, and rated 200 psi non-shock cold water, oil or gas. Valve body shall indicate ratings and manufacturer identification. Design of valve stuffing box of such that repacking under pressure is possible. Valve construction requirements as follows:

1. Ends: Female standard pipe size to national standard hose.
2. Handwheel: Aluminum alloy conforming to ASTM B 85 requirements, with zinc plated steel nut and aluminum identification plate (opening direction indicated).
3. Valve Stem: Silicon bronze alloy conforming to ASTM B 371 requirements.
4. Packing Nut/Packing Gland: Sintered bronze conforming to ASTM B 438 Grade I Type II requirements.
5. Packing: TFE impregnated asbestos.
6. Stuffing Box, Bonnet, Valve Body, Wedge and Hose Cap: Bronze conforming to ASTM B 62 requirements.
9. Acceptable Manufacturers:
   a. NIBCO, Inc.; Cat. No. T-113-HC.
   b. Crane Company.
   c. Wm. Powell Company.
   d. Or equal.

B. Iron Body Gate Valve: Designed for working water pressure of 200 psi for valves 12-inch in diameter and smaller. Valve construction requirements as follows:
1. General Requirements:
   a. Markings factory cast on the bonnet or body of each valve indicating manufacturer's name or mark, year of valve casting, size of valve, directional flow arrow and designation of working water pressure.
   b. Valves shall open to the left (counterclockwise). Valves operated by nut, handwheel, or otherwise as indicated on the Drawings. Operating nuts or wheels shall have cast thereon an arrow indicating the direction of opening.
   c. Valve ends as indicated on the Drawings and unless indicated otherwise shall conform to the following:
      1) Flanged: Conforming to ANSI B16.1 requirements.
      2) Mechanical: Conforming to ANSI A21.11 requirements.
   d. Valves of rising stem type except when installed underground; or otherwise indicated on Drawings.
   e. Valve stuffing box of such design that valve can be packed under pressure when in fully open position.
2. Design Working Water Pressure: 200 psi for valves 12 inches diameter and smaller, and 150 psi (high pressure) for valves 14 inches diameters and larger.
3. Design Working Water Pressure: 200 psi for valves 12 inches diameter and smaller, and 100 psi (medium pressure) for valves 14 inches diameters and larger.
4. Valves 3-inches Through 12-inches in Diameter: Iron body, outside screw and yoke design, bronze mounted, with resilient-seated wedge conforming to requirements of AWWA C 509.
   a. Resilient Seat: Composed of SBR or Urethane Rubber bonded to cast iron wedge.
   b. Stem Seals: O-ring type.
   d. Finish Coatings: Exterior asphalt varnish or epoxy coated and interior
ferrous metal parts epoxy coated, according to AWWA C 550.

5. Acceptable Manufacturers:
a. Clow Corporation.
b. American Darling Valve.
c. Kennedy Valve.
d. Or equal.

C. Tapping Valve: Provide valve of same basic construction as Iron Body Gate Valve with exceptions as follows:
1. Oversized seat rings to accommodate tapping machine.
2. Raised male face on flanged end for bolting to tapping sleeve.
3. Mechanical or push-on joint with slotted holes for bolting to tapping machine.
4. Tapping Sleeve: AWWA approved construction, of split sleeve design, having mechanical joint ends, and designed for 250 psi working pressure.

D. Tapping Sleeve: Provide 18-inch size, AWWA approved construction, split type sleeve, designed for 250 psi working pressure.
1. Body: Carbon steel conforming to ASTM A 283, Grade C.
2. Flanges: AWWA C207 Class D; ANSI 150 pound drilling.
3. Gasket: Grade 60 Concave Wedge Gasket; gasket compounded to resist oil, natural gas, acids, alkalies, most (aliphatic) hydrocarbon fluids, water and many chemicals. Designed for operating temperatures up to 2123 degrees F.
5. Finish: Manufacturer's standard fusion bonded epoxy, coated to 12 mills dry film thickness.
6. Acceptable Manufacturers:
a. Rockwell International.
b. Or equal.

E. Valve Boxes: Cast iron extension roadway type, three-piece construction, and of screw adjustment design.
1. Boxes shall have 4 1/4-inch minimum shaft diameter and cover marked SEWER.
2. Boxes hot coated inside and out with a tar or asphalt compound.
3. Box design shall be capable of receiving increment cast iron rings to raise the box in the future.

2.05 AIR RELEASE AND CLEANOUT CHAMBERS

A. Precast Concrete Chambers: As specified in Section 02601.
1. Sump Frame and Grate: Light duty cast iron construction, conforming to ASTM A 48 requirements.

2.06 CONTRACTOR OPTIONS IN PRODUCTS
A. Force Main Pipe and Fitting Options: The Contractor is allowed the option to provide DIP or PVC pipe, and PE pipe for a certain size range, to construct the force mains. However, use only the one type of pipe, as selected, to construct the force mains for which the pipe material options are allowed.

1. Through 3-inch diameter:
   a. Ductile Iron Pipe (DIP).
   b. Polyvinyl Chloride Pipe (PVC).

2. 4-inch through 8-inch diameter:
   a. Ductile Iron Pipe (DIP).
   b. Polyvinyl Chloride Pipe (PVC).
   c. Polyethylene Pipe (PE).

3. Required Pipe Material Exception: Provide only ductile iron pipe and ductile iron or cast iron fittings within the air release and cleanout chambers.

B. Thrust Restraint Option: The option is allowed to provide concrete thrust blocks or restrained joints at changes of directions in the pipeline. Use only the types of restraints as specifically manufactured for use with the pipe option selected.

C. Pipe Connections to Existing Manholes or Structures Options: The option is allowed to construct one type of connection in the Project of the types listed herein, except where required otherwise on the Drawings.

2. Core-drilled opening utilizing Sleeve Type Pipe Seal.
3. Core-drilled opening utilizing Modular, Mechanical Type Pipe Seal.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Rejected Products: Remove rejected Products from the Project site and replace with new Products.

3.02 PREPARATION

A. General Requirements: Clean piping interior prior to laying pipe and following pipe laying, keep open ends of piping and pipe attachment openings capped or plugged until actual connection or actual pipe testing.

1. Provide the protective means to prevent water and debris from washing into the pipe.

B. Earthwork: Perform earthwork for force main installation as specified in Section 02221.
1. Bedding materials and concrete work for pipe bedding as specified in Section 012221.
2. Excavate trenches in rock at least 25-feet in advance of pipe laying. Protect pipe ends from rock removal operations.

3.03 FORCE MAIN CONSTRUCTION

A. General Requirements: Use proper and suitable tools and appliances for the proper and safe handling, lowering into trench and laying of pipes.
   1. Lay pipe proceeding upgrade true to line and grades given. Lay bell and spigot pipe with bell end upgrade. No wedging or blocking permitted in laying pipe unless by written order of Engineer.
   2. Unless indicated otherwise, piping shall be installed with not less than _____ feet of cover.
   3. Exercise care to insure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs along inside bottom half of pipe line.
   4. Before joints are made, bed each section of pipe full length of barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place. Dig bell holes sufficiently large to permit proper joint making and to insure pipe is firmly bedded full length of its barrel.
   5. Walking or working on the installed force main, except as necessary in tamping and backfilling, not permitted until trench is backfilled one-foot deep over top of pipes.
   6. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.
   7. Take up and replace with new, such in-place pipe sections found to be defective. Replacement work at Contractor's expense.
   8. Concrete Thrust Blocks: Provide concrete thrust blocks for each fitting, and at those locations where horizontal and vertical deflections are made in the joints of the force mains. Use Class B concrete. Provide thrust blocks of the design indicated on the Detail Drawing.

B. Pipe Laying and Joining: Perform pipe laying and joining in strict accordance with manufacturer's installation instructions, reference standards as included, and such additional requirements as specified herein.
   1. Arrange and pay for pipe manufacturer's representative to be present for first installation of pipe to instruct workmen on proper installation methods.
   2. Make joints absolutely watertight and immediately repair detected leaks and defects. Methods of repair subject to Engineer's approval.
   3. Laying/Joining Ductile Iron Pipe: Installation and joint assembly according to AWWA C 600, and as follows:
      a. Pipe Cutting: Where necessary to field cut pipe use approved pipe cutter,
milling cutter or abrasive wheel saw.

b. Push-on Joints: To make ductile cast iron pipe push-on joints, properly seat sealing gasket, evenly and sufficiently lubricate the spigot end of pipe, and fully enter joint until joint line is visible. Make deflection, if required, only after the joint has been assembled properly.

c. Mechanical Joints: To make ductile iron pipe mechanical joint, position sealing gasket and gland for bolting and then enter the spigot into pipe bell end until joint line is visible. Tighten bolts evenly maintaining approximate distance between gland and face of flange at all points around the socket. Do not exceed pipe manufacturer’s specifications for maximum torque applied to bolts.

d. Flanged Joints: For DIP shall be faced true, fitted with gaskets, and drawn up square and tight to ensure full gasket flow and satisfactory seal.

e. Joint Restraints: Install on buried DIP at changes in direction of pipe runs, and at terminal ends of pipe runs in accordance with the following table:

**DUCTILE IRON PIPE RESTRAINED JOINT**

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>(In feet of straight pipe for each leg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fitting Type</strong></td>
<td><strong>6-Inch Dia.</strong></td>
</tr>
<tr>
<td>Plug</td>
<td>25</td>
</tr>
<tr>
<td>Tee</td>
<td>25</td>
</tr>
<tr>
<td>Lateral</td>
<td>25</td>
</tr>
<tr>
<td>90 Deg.</td>
<td>25</td>
</tr>
<tr>
<td>45 Deg.</td>
<td>15</td>
</tr>
<tr>
<td>22 ½ Deg.</td>
<td>15</td>
</tr>
<tr>
<td>11 1/4 Deg.</td>
<td>15</td>
</tr>
</tbody>
</table>

4. Laying/Joining Specified Types of Plastic Pipe: Perform installation and joint assembly according to ASTM D 2774 for Class I bedding material.

a. Push-on Joints. To make PVC pipe push-on joints, properly seat sealing gasket, evenly and sufficiently lubricate the spigot end of pipe, and fully enter joint until joint line is visible.

C. Connections to Existing Manholes or Structures: Make pipe connections to existing manholes or structures by the previously selected option and in accordance with the appropriate requirements as follows:

1. Cut-In Opening Utilizing PVC Waterstop and Grout: Cut required opening or openings by such methods so as to prevent cracking and spalling concrete. Make openings of sufficient size to accommodate pipe with PVC Waterstop installed and one of annular grout space. Grout annular space using Non-Shrink and Non-Metallic Grout as specified in Section 03600. Make connection watertight.

2. Core-Drilled Opening Utilizing Pipe Seal: Core-drill the required opening or
openings using the proper equipment for the work. Make openings of sufficient size to accommodate the pipe and the Sleeve Type Pipe Seal or Mechanical Type Pipe Seal.

3. New Invert Channel: Regardless of the connection to existing manhole option selected, form a new invert channel in the existing manhole base to properly conduct the flow through the existing manhole.

4. Drop Connections: Make drop connections as indicated on the Drawings, where drop in invert is two feet or more or as required by the Engineer.

D. Setting Valves and Boxes: Unless otherwise directed by the Engineer, set valves and boxes truly vertical.
   1. Set valve and boxes neatly to grade and in such a way that the box does not transfer shock or stress to the valve.
   2. Exercise care to center the box over the wrench nut of the valve.

3.04 AIR RELEASE AND CLEANOUT CHAMBER CONSTRUCTION METHODS

A. As specified in Section 02601.

3.05 FIELD QUALITY CONTROL

A. General Requirements: Conduct tests specified herein so that each force main installed in the Project is tested to the Engineer's satisfaction. Conduct tests in the presence of and to the satisfaction of the Engineer.
   1. Notification: The Contractor shall give the Engineer a minimum of 48 hours advance notification of the date of the testing specified herein.
   2. The Contractor may elect to make a leakage test prior to backfilling the trenches, for his own purposes. However, the leakage tests of the force mains or sections thereof for acceptance, shall be conducted after the backfilling of the trenches has been completed.
   3. When the length of the force main exceeds 1000 feet, test the force main in sections, the length of each section to be determined by the Engineer.

B. Testing Equipment: Provide tools, materials (including water), apparatus and instruments necessary for force main testing. Use air compressing apparatus equipped with a control panel with necessary piping, control valves and gauges to control air flow rate to the piping section under test, and also the air pressure within the test seal plugs.
   1. To prevent accidental overloading of piping test section, provide air compressing apparatus with an approved pressure relief device set to relieve at ((____)) psig.
   2. Provide an extra pressure gauge of known accuracy to frequently check test equipment and apparatus.
   3. Provide GO-NO-GO Mandrel and incidental equipment for Deflection Test. Mandrel to conform to following requirements:
      a. Cylindrical in shape with not less than nine arms spaced evenly around the
mandrel.
b. Minimum contact length of mandrel arms with pipe wall not less than the
nominal diameter of the pipe being tested.
c. Mandrel diameter 95 percent of inside pipe diameter.

4. Provide all other equipment, materials, and labor necessary to conduct Contractor
required tests.

C. Cleaning Prior to Tests: Before tests are conducted, flush piping with clean water until
free of all forms of dirt and construction debris.
1. The water for the flush cleaning operation shall be from the Contractor's source.

D. Line Acceptance Test: After a force main or section thereof is constructed, backfilled,
and successfully cleaned, perform a hydrostatic Line Acceptance Test as follows:
1. Seal force main at downstream end with a suitable pipe plug.
2. Fill force main with clear water.
3. Raise hydrostatic pressure to 100 psi. or one and one-half times the working
pressure, whichever is greater; measured at the low point of the particular section
of main being tested.
4. A preliminary test period for the removal or absorption of air from the lines before
measuring the leakage will be permitted.
5. Maintain test pressure for a period of not less than four hours.
6. Consider force main Acceptable when measured leakage does not exceed ten
gallons per day per mile per inch of pipe diameter.

E. Deflection Test: In addition to the Line Acceptance Test, conduct deflection tests on
PVC pipe. Test each PVC pipe sewer main installed.
1. Conduct deflection testing not less than 30 days after section of pipe line is
backfilled.
2. Pull mandrel through pipe section manually; powered pulling devices not
permitted.
3. Consider pipe line section which mandrel cannot pass through, to have more than
maximum allowable deflection of five percent.

F. Repair and Retest: When force main or sections of force main fails to meet test
requirements specified previously, determine source or sources of leakage and repair or
replace defective material, and if a result of improper workmanship, correct such
workmanship.
1. Conduct such additional tests required to demonstrate that force main meets
specified test requirements.

G. Owner’s Tests: The Owner reserves the right to retest any piping throughout the
duration of the Construction Period.
1. Make repairs as Work of this Section to piping found defective by such Owner
conducted tests.
SECTION 02725

LOW PRESSURE WASTEWATER SEWER

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: This Section specifies constructing of the piped low pressure wastewater sewers and appurtenances therein, and connecting into the various structures within the pipeling.

B. Related Sections:
   1. Trenching, Backfilling and Compacting: Section 02221.
   3. Cast-In-Place Concrete: Section 03300.

1.02 REFERENCES

A. American National Standards Institute:
   1. ANSI A21.10, Gray-Iron and Ductile-Iron Fittings, 2 through 48 inches, for Water and Other Liquids.
   2. ANSI A21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.
   5. ANSI A21.51, Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
   7. ANSI B 1.1, Unified Inch Screw Threads.
   8. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
   9. ANSI B16.21, Nonmetallic Gaskets for Pipe Flanges.
   10. ANSI B18.2.1, Square and Hex Bolts and Screws, Including Askew head Bolts, Hex Cap Screws, and Lag Screws.
   11. ANSI B18.2.2, Square and Hex Nuts.

B. American Society for Testing and Materials.
   1. ASTM A 36, Specification for Structural Steel.
12. ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
13. ASTM B 140 Specification for Copper-Zinc-Lead (Leaded Red Brass or Hardware Bronze) Rod, Bar, and Shapes.
19. ASTM D 1785, Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80 and 120.
24. ASTM D 2774, Recommended Practice for Underground Installation of Thermoplastic Pressure Piping.
27. ASTM F 477, Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. American Water Works Association:
1. AWWA C 151, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-
Lined Molds, for Water or Other Liquids.
2. AWWA C 600, Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances.

D. Federal Specifications:
   1. Fed. Spec. FF-S-325, Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge Expansion Anchors) Class 1 (One-Piece Steel Expander with Cone Taper Integral with Stud).

1.03 SUBMITTALS

A. Shop Drawings and Product Data: Submit completely dimensioned shop drawings, catalog cuts or other data as required to provide a complete descriptive information for the following:
   1. Pipe and Fittings.
   2. Piping Specialties.
   3. Sewage Valve.
   4. Gate Valves.
   5. Precast Concrete Chambers

B. Certificates: Submit certified records or reports of results of shop tests, with such records or reports containing a sworn statement that shop tests have been made as specified. Sworn certifications shall bear the seal of a Registered Professional Engineer.
   1. Provide manufacturer's sworn certification that pipe will be manufactured in accordance with specified reference standards for each pipe type.

1.04 QUALITY ASSURANCE

A. Design Criteria: In addition to the design requirements of the Pennsylvania Department of Environmental Protection (DEP), comply with the following:
   1. Use only one type of class of pipe in any continuous sewer between structures.
   2. Use pipe and fittings designed to withstand imposed trench loadings and prevailing site conditions at the various locations.

B. Source Quality Control:
   1. Shop Tests: In accordance with Article 1.06 of the General Instructions, factory test pipe materials listed in the following. Each pipe manufacturer must have facilities to perform listed tests. The Engineer reserves the right to require the manufacturer to perform such additional number of tests as the Engineer may deem necessary to establish the quality of the material offered for use.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>TEST METHOD</th>
<th>NUMBER OF TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lebanon General Sanitary Sewer</td>
<td>02725-3</td>
<td>Low Pressure Wastewater Sewer</td>
</tr>
<tr>
<td>Construction Specifications</td>
<td></td>
<td>©Gannett Fleming Inc. 2017</td>
</tr>
</tbody>
</table>
--4/99
Polyvinyl Chloride (PVC) Pipe
- ASTM D 2241
- As specified in ASTM D 2241

Polyvinyl Chloride (PVC) Pipe
- ASTM D 1785
- As specified in ASTM D 1785

Ductile Iron Pipe
- ANSI A 21.51
- As specified in ANSI A 21.51

2. Certificates: The Engineer reserves the right to accept certified test records or reports of previously conducted tests covering the above stated tests.

3. Laboratory Tests: The Engineer reserves the right to require that laboratory tests also be conducted on materials that are shop tested certified. The Contractor shall be fully responsible for collecting, packaging, and identifying representative samples of materials to be tested and the shipping of such samples to the Testing Laboratory.

1.05 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.

1.06 SITE CONDITIONS

A. Environmental Requirements:
1. Keep trenches dewatered until pipe joints have been made and concrete cradle 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 Engineer, for pipe laying work.

PART 2 PRODUCTS

2.01 PIPE AND PIPE FITTINGS

A. Elastomeric Gaskets: For pipe joint gasket material, provide elastomeric gaskets that have been tested as suitable for continuous contact with domestic sewage.

B. Polyvinyl Chloride (PVC) SDR Pipe, 1 1/2-Inch Through 3-Inch Diameter, Buried Pipe: Provide pipe which is permanently marked with manufacturer's trademark, size and ASTM conformance designation. Pipe design and material requirements shall conform to ASTM D 2241, SDR-21 for 200 psi pressure. PVC material shall conform to ASTM D 1784 requirements for Cell Classification 12454B.
1. Pipe Joints: Push-on or compression type, rubber gasket, conforming to ASTM D 3139 and F 477 requirements; rubber gasket that have been tested as suitable for continuous contact with domestic sewage.
2. Pipe Fittings: Manufactured in one piece of injection molded PVC compound meeting ASTM D 1784 requirements.
a. Fittings shall be Class 200 and conform to requirements of DR 21.
b. Fittings shall withstand a minimum of 630 psi quick burst pressure at 73 degrees F. when tested in accordance with ASTM D 1599 requirements.
c. Bells shall be gasketed joint conforming to ASTM D 3139 with gaskets conforming to ASTM F 477 requirements.
d. Acceptable Manufacturer:
   1) The Harrington Corporation.
   2) Or equal.
3. Retainers for PVC Pipe: Manufactured from 60-42-10 ductile iron conforming to ASTM A 536 requirements, including the glands and tie bolts. The retainers shall have a sufficient number of tie bolts to restrain the working and test pressures established by the retainer manufacturer.
   a. The glands shall have serrations on the inside diameter sufficient to hold against both the working and test pressures.
   b. Acceptable Manufacturer:
      1) EBAA Iron Sales, Inc.
      2) Or equal.
4. Restraints for PVC fittings: Manufactured from 60-42-10 ductile iron conforming to ASTM A 536 requirements, including the bell ring, restraint ring and tie bolts.
   a. A split ring shall be utilized behind the bell of the fitting outlets. A serrated ring shall be used to grip the pipe and a sufficient number of bolts shall connect the bell ring and the serrated gripping ring. The combination shall restrain continuously against a working pressure rating of 150 psi.
   b. Acceptable Manufacturer:
      1) EBAA Iron Sales, Inc.
      2) Or equal.
C. Polyvinyl Chloride (PVC) SCH-40 Pipe and Fittings, Exposed Pipe: Provide pipe which is permanently marked with manufacturer's trademark, size and ASTM conformance designation. Pipe design and material requirements shall conform to ASTM D 1785 Schedule 40, pressure Class 160, and manufactured from Class 1245-B Rigid PVC Compounds with a hydrostatic design stress of 13.8 MPa (2000 psi) designated as PVC 1120.
1. Socket-Type Joints: Socket-Type conforming to ASTM D 2564. Solvent cement for joint making shall conform ASTM D 2564.
2. Flanges: PVC Schedule 40 150-lb. flanges manufactured from Rigid PVC Compounds conforming to ASTM D 1784.
   a. Gaskets: Soft rubber full face flat type.
3. Socket Type Fittings: ASTM D 2466 manufactured from Class 12454-B Rigid PVC Compound.
4. Provide adaptors, nipples, caps, etc., as required.
D. Ductile Iron Pipe (DIP), Exposed and Buried Pipe: Conforming to ANSI A21.50 and ANSI A21.51 requirements.
1. Wall Thickness Class, Buried Pipe: As indicated on Drawings or as determined by the Engineer.

2. Wall Thickness Class, Exposed Pipe: Class 53 except as noted otherwise on Drawings.

3. Fittings: Gray iron or ductile iron conforming to ANSI A21.10 requirements, rated for 250 psi working pressure.

4. Rubber-Gasket Joints, Buried Pipe: Conforming to ANSI A21.11 requirements. For buried pipe installation, provide either push-on or mechanical joints except where other types of joints are indicated on the Drawings or required by the Specifications.

5. Restrained Joints: Conforming to requirements of ANSI A21.11 and designed for a working pressure equal to connected pipe rating. Provide joints for pipe and fittings similar to the following:
   a. American Cast Iron Pipe Company; Lok-Fast or Lok-Set.
   b. Clow Corporation; Super-Lock.
   c. United States Pipe and Foundry Company; TRFLEX.
   d. Or equal.

   a. Gaskets: 1/16 in. thick cloth insertion rubber full face type conforming to ANSI B16.21 requirements.
   b. Bolts: Conforming to ANSI B18.2.1 requirements.
   c. Nuts: Conforming to ANSI B18.2.2 requirements.

7. Retainer Glands: Designed for pipe joint retaining through the use of a follower gland and set screw anchoring devices which impart multiple wedging action against the pipe. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of two to one. Material components as follows:
   b. Restraining Devices: Manufactured of ductile iron heat treated to a minimum hardness of 370 BHN. Restraining devices shall incorporate a set screw/twist off nut bolt to insure the proper actuating of the restraining device. The twist off nut shall be designed to come off at the torque limit desired to anchor the restraining device in place on the pipe.
   c. Joint Deflection: Retainer Gland joint deflection shall be limited to a two degree maximum. Joint deflection shall be applied before the set screws are torqued.
   d. Acceptable Manufacturers:
      1) EBAA Iron, Inc.; Megalug 1100 Series.
      2) Or equal.

8. Pipe and Fitting Coating: Manufacturer's standard asphaltic coating, approximately one mil thick in accordance with AWWA C151, applied to the outside of pipe and fittings.
2.02 PIPING SPECIALTIES

A. Flanged Adapters: Fabricated from high strength steel (Style 128), or cast iron (Style 127), and designed for joining DIP plain-end pipe to flanged fittings, valves, and flanged end equipment.
   1. The compression-end of the adapter shall have the Dresser-Coupling type pack utilizing a Grade 27 wedge gasket for positive, watertight sealing. The flanged-end shall match the flange of the proposed fitting, valve or equipment connection.

   2. Acceptable Manufacturers:
      a. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Style 128 and 127.
      b. Rockwell-International.
      c. R. H. Baker & Co., Inc.
      d. Or equal.

B. Valve Boxes: Cast iron extension roadway type, three-piece construction, and of screw adjustment design.
   1. Boxes shall have 4 1/4-inch minimum shaft diameter and lock cover marked SEWER.
   2. Boxes hot coated inside and out with a tar or asphalt compound.
   3. Provide box compatible with valve for operating clearances.

C. Flexible Insulation For Piping: Insulation manufactured by closed cell, 5 to 6 pounds cubic feet density foamed plastic with thermal conductivity of 0.26 BTUH per sq. ft. per degree per inch at 70 degrees F. mean temperature, water vapor transmission rating of less than 0.1 perms. per inch, and a self-extinguishing fire-rating; ASTM E 84. Insulation manufactured to meet requirements of ASTM C 534. Use insulation manufacturer's companion joint making/sealing adhesive to make permanent insulation joints.
   1. Flexible Insulation For Fittings: Insulate fittings and valve bodies with sleeves of same insulation thickness used on adjacent piping and having an inside diameter large enough to fit over the insulation on adjacent piping.
   2. Acceptable Manufacturers:
      b. Owens-Corning Fiberglas.
      c. Armstrong Industry Products Division.
      d. Or equal.

D. Curb Stop and Box: Designed to conform to AWWA Standard C800.
   1. All bronze construction, inverted key stop.
   2. Extension type arch pattern base of two-piece cast iron construction coated inside and out with tar base enamel and topped with cast iron lid secured by bronze bolt. Provide box compatible with T-wrench and stop. Provide cover marked SEWER.
E. Flexible Pipe Coupling: Coupling shall consist of a steel middle ring or sleeve, two steel or malleable iron flange or follower rings, two wedge shaped resilient gaskets and sufficient number of track-head bolts and nuts.

1. Middle Ring or Sleeve: Steel construction conforming to ASTM A 283, (Grade A) requirements, fabricated in a true circular section and free of surface defect.

2. Follower Rings or Flanges: Steel construction conforming to ASTM A 47 (Grade 32510) requirements, fabricated in a true circular section and free of surface defect, and tested and sized after welding by cold expanding a minimum of one percent.

3. Bolts and Nuts: Steel bolt conforming to ASTM A 183 requirements, double radius head or buttonhead track type with rolled threads, conforming to ANSI B1.1 requirements; and steel nuts conforming to ANSI B 18.2.2 requirements, American Standard Heavy Dimension Series.


5. Shop Paint: Middle and follower rings shop painted with primer compatible with specified field coat for piping where coupling is located.

6. Acceptable Manufacturers:
   a. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Style 38 or 138.
   b. Rockwell-International.
   c. R. H. Baker & Co., Inc.
   d. Or equal.

F. Stainless Steel Pipe Supports: Fabricate pipe supports and pipe straps for exposed piping using Type 304 stainless steel conforming to ASTM A 167. Individual pipe support and pipe strap designs are as indicated on the Drawings.

1. Anchors and Fasteners: Provide drilled-in type expansion anchors incorporating a one-piece stud (bolt) with integral expansion wedges, nut and washer as a UL Listed assembly and meeting physical requirements of Federal Specification FF-S-325, Group II, Type 4, Class 1. Stud of Type 303 or 304 stainless and nut and washer of Type 316 stainless.


G. Concrete: As specified in Section 03300 for Class B (3,000 psi.) Concrete.

H. Modular, Mechanical Type Pipe Seal (LINK-SEAL): Modular, mechanical type pipe seal used for core-drilled connection of piping to existing manholes. Seal component construction as follows:

1. The seal shall consist of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.

2. The elastomeric element of the seal shall be sized and selected in accordance with the seal manufacturer's recommendations. Elastomeric element shall conform to
ASTM D 2000 requirements for EPDM material.

3. The hardware provided in the seal shall be as recommended by the seal manufacturer for buried service such as will exist at the project site.

4. Acceptable Manufacturers:
   a. Thunderline Corporation; Link-Seal.
   b. Or equal.

2.03 SEWAGE VALVE

A. Sewage Air Release Valve: Valve design shall 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, conforming to ASTM A 48, Class 35 requirements.
   2. Inlet Size: 2-inches, NPT.
   3. Outlet Size: ½-inch, NPT.
   6. Discharge Orifice Seat, Mechanism and Valve Stem: Stainless Steel.
   7. Orifice Button: Stainless steel and Buna-N, Nitrile Rubber conforming to ASTM SB 800 requirements.
   9. Backflushing and Cleaning Accessories: Factory assembled to the valve and consisting of a 2-inch shut-off valve at bottom inlet, a 1-inch blow-off valve near the bottom of the valve body, quick disconnect couplings and ½-inch shut-off valve at top of valve, and a section of rubber hose with quick disconnect coupling.
   10. Acceptable Manufacturers:
       a. Val-Matic Valve And Manufacturing Corp.; Model No. 48 Series.
       b. Or equal.

B. Sewage Air and Vacuum Valve: Valve design shall automatically exhaust large quantities of air during the filling of a system and shall 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, conforming to ASTM A 48, Class 35 requirements.
   2. Inlet Size: 2-inches.
   3. Discharge Orifice: 2-inches.
   4. Float Stem and Guide: Bronze, conforming to ASTM B 584 requirements.
   5. Floats: Stainless Steel, conforming to ASTM A 240 requirements.
   6. Orifice Seat: Buna-N, Nitrile Rubber, conforming to ASTM SB 800 requirements.
   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 ½-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, conforming to ASTM A 48, Class 35 requirements.
   2. Inlet Sizes: 2-inches.
   3. Air Release Outlet Size: ½-inch, NPT.
   8. Air Release Valve Orifice Button: Stainless Steel and Buna-N, Nitrile Rubber conforming to ASTM SB 800 requirements.
   10. Air and Vacuum Valve Float Stem and Guide: Bronze, conforming to ASTM B 584 requirements.
   11. Air and Vacuum Valve Floats: Stainless Steel, conforming to ASTM A 240 requirements.
   12. Air and Vacuum Valve Orifice Seat: Buna-N, Nitrile Rubber, conforming to ASTM SB 800 requirements.
   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.

D. Valve Support work: Provide steel support as indicated on the Standard Details.
   1. Miscellaneous Metals: Steel conforming to requirements of ASTM A 36 and galvanize finished according to ASTM A 123.
   2. Drilled-In Expansion Anchors and Fasteners: UL Listed stainless steel anchor and fastener incorporating a one-piece stud (bolt) with integral expansion wedges, nut
and washer, and meeting physical requirements of Federal Specification FF-S-325, Group II, Type 4, Class 1. Stud of Type 303 or 304 stainless and nut and washer of Type 316 stainless.


2.04 VALVES

A. General Requirements: Provide valves of the same type by same manufacturer; suitable for the intended service. Markings shall be cast on the bonnet or body of the valve indicating manufacturer's name or mark, the year the valve casting was made, the size of the valve, directional flow arrow and designation of working water pressure.

1. Valve pressure-temperature ratings of valve shall be not less than the design criteria applicable to the system components.

2. Valves shall open to the left (counterclockwise). Valve shall be operated by handwheel or operating nut as indicated on the Drawings. Operating wheel shall have cast thereon an arrow indicating the direction of opening.

3. Provide extension stems with bronze bushed stem guides where required.

4. Valve ends as indicated on the Drawings and unless indicated otherwise shall conform to the following:

B. Gate Valves: Provide valves designed for working water pressure of 200 psi., and having rising stem operation except when installed underground, or where indicated otherwise on Drawings. Valves shall contain stuffing box of such design that allow repacking under pressure when valve is in fully open position.

1. Valves Smaller Than 3-inches In Diameter: Provide valves of solid bronze construction with tapered split wedge disc.
   b. Physical properties of brass pressure containing parts shall conform to ASTM B 62.
   c. Stems fabricated of Alloy A (rolled silicon brass) conforming to ASTM B 371, or Copper Alloy No. 876 (silicon bronze + silicon brass) conforming to ASTM B 584, or other material equally resistant to dezincification.

2. Hose End Type: Bronze construction, tapered solid wedge disc, nonrising stem, female inlet and outlet having American Standard Taper Pipe thread. (Provide quick disconnect couplings in polypropylene material as manufactured by Plastic Piping Systems.)
   a. Acceptable Manufacturers:
      1) Crane Company; No. 451 with cap and chain.
      2) Wm. Powell Company.
      3) Or equal.

C. Plug Valves (Straightway Type): Provide valves designed for a minimum working water pressure of 175 psi for valves through 12 in.
1. Provide non-lubricated eccentric type plug valve with valve bodies of cast iron conforming to ASTM A 126 Grade B, or valve bodies of semi-steel with coated plug suitable for wastewater and corrosion resistant seats.
2. Provide valves with port areas sized at least 80 percent of full pipe area.
3. Provide T-wrench for operation.
4. Acceptable Manufacturers:
   a. DeZurik; Series 100 Eccentric Valves.
   b. Henry Pratt Company.
   c. Homestead Industries, Inc.
   d. Dresser Industries, Inc.
   e. Or equal.

D. Bronze Ball Valves: Valve body of solid bronze material conforming to ASTM B 584, and having a straight-through flow passage.
   1. Seats and O-rings of Buna-N.
   2. Valves of quarter-turn operation with a T-handle or round handle suitable for use in confined spaces, and which will allow sufficient clearance whether valve is in open or closed position.
   3. Threaded end valves available in sized 1/4 inch through 2 inch shall be rated 200 psi.
   4. Ball and Stem: Brass chrome finish conforming to ASTM B 140.
   5. Acceptable Manufacturers:
      a. Crane Co.
      b. Or equal.

E. PVC Ball Valves: Provide PVC ball valves rated non-shock to 150 psi at 70 degrees water temperature, and of the following construction:
   1. Double union type manufactured from PVC Class 12454-B conforming to ASTM D 1784 with Vitron O-ring seals and self-lubricating Teflon seats.
   2. Valve stem of blow-out proof design and equipped with double O-ring seals and double lever handle.
   3. Acceptable Manufacturers:
      a. Chemtrol by NIBCO, Inc.; True-Bloc True Union Ball Valve.
      b. Hayward Manufacturing Company, Inc.; True Union Ball Valve.
      c. GF Plastic Systems, Inc.; Type 342.
      d. Or equal.

F. PVC Ball Check Valve: Provide ball check valve designed for a minimum water working pressure of 150 pounds per square inch and factory tested to double that pressure prior to shipment.
   1. Construction: Double union type with the valve body shaped to provide excess area through the valve to assure full delivery of the pipe line size capacity.
   3. Acceptable Manufacturers:
2.05 PRECAST CONCRETE CHAMBERS

A. General Requirements: Terminal cleanout chambers, in-line cleanout chambers, junction cleanout chambers, and air release chambers shall be of materials and construction conforming to precast concrete manhole requirements specified in Section 02601, with the following additional requirements:
1. Manhole covers (lids) do not require cover hold-down bolts on air release chambers.
2. Sump Frame and Grate: Cast iron conforming to ASTM A 48.

B. Piping In Chambers: The Contractor shall have the option to provide Polyvinyl Chloride (PVC) SCH-40 Pipe and Fittings (as specified previously), or Ductile Iron Pipe (DIP) and Fittings (as specified in the following) within the chambers except where other type of pipe is indicated on the Detail Drawings.
   a. Wall Thickness: Class 50, except threaded flanged ductile iron pipe for pressure service shall have a Class 53 wall thickness.
   b. Fittings: Ductile iron conforming to ANSI A21.10 requirements 150 psi class.
   c. Flanged Joints: Conforming to ANSI A21.15 requirements.
      1) Gaskets: 1/16 in. thick cloth insertion rubber full face type conforming to ANSI B16.21 requirements.
      2) Bolts: Conforming to ANSI B18.2.1 requirements.
      3) Nuts: Conforming to ANSI B18.2.2 requirements.
2. Sewage Valve Support Work: As specified previously.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Rejected Products: Remove rejected Products from the Project site and replace with new Products.

3.02 PREPARATION

A. General Requirements: Clean piping interior prior to laying pipe, and following pipe laying, keep open ends of piping and pipe attachment openings capped or plugged until actual connection or actual pipe testing.
1. Provide the protective means to prevent water and debris from washing into the pipe.

B. Earthwork: Perform earthwork for sewer installation as specified in Section 02221.
1. Bedding materials and concrete work for pipe bedding as specified in Section 02221.
2. Excavate trenches in rock at least 25-feet in advance of pipe laying. Protect pipe ends from blasting, if blasting is allowed in the Project.

3.03 CONSTRUCTION

A. General Requirements: Use proper and suitable tools and appliances for the proper and safe handling, lowering into trench and laying of pipes.
1. Lay pipe proceeding upgrade true to line and grades given. Lay bell and spigot pipe with bell end upgrade. No wedging or blocking permitted in laying pipe unless by written order of Engineer.
2. Unless indicated otherwise, install piping with not less than four feet of cover.
3. Exercise care to insure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs along inside bottom half of pipe line.
4. Before joints are made, bed each section of pipe full length of barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place. Dig bell holes sufficiently large to permit proper joint making and to insure pipe is firmly bedded full length of its barrel.
5. Walking or working on the installed pipe line, except as necessary in tamping and backfilling, not permitted until trench is backfilled one-foot deep over top of pipes.
6. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.
7. Take up and replace with new, such in-place pipe sections found to be defective.

B. Pipe Laying and Joining: Perform pipe laying and joining in strict accordance with manufacturer's installation instructions, reference standards as included, and such additional requirements as specified herein.
1. Arrange and pay for pipe manufacturer's representative to be present for first installation of pipe to instruct workmen on proper installation methods.
2. Make joints absolutely watertight and immediately repair detected leaks and defects. Methods of repair subject to Engineer's approval.
3. Threaded Joints: Cut pipe ends square, deburr and ream to size of original bore. Cut threads to American Standard tapered pipe threads, free of oil and cuttings. Use an approved joint tape or joint paste to aid in joint lubrication and sealing. After fabrication, paint exposed threads with red lead paint.
4. Laying/Joining Specified Types of Plastic Pipe: Perform installation and joint assembly according to ASTM D 2774 for Class I bedding material.
   a. Push-on Joints. To make PVC pipe push-on joints, properly seat sealing
gasket, evenly and sufficiently lubricate the spigot end of pipe, and fully enter joint until joint line is visible.

b. Solvent-Weld Joints: Use chemical solvent welding components to join PVC pipe. Use the type of solvents specified in manufacturer's printed recommendations.

5. Laying/Joining Ductile Iron Pipe: Installation and joint assembly according to AWWA C 600, and as follows:
   a. Pipe Cutting: Where necessary to field cut pipe use approved pipe cutter, milling cutter or abrasive wheel saw.
   b. Push-on Joints. To make ductile cast iron pipe push-on joints, properly seat sealing gasket, evenly and sufficiently lubricate the spigot end of pipe, and fully enter joint until joint line is visible. Make deflection, if required, only after the joint has been assembled properly.
   c. Mechanical Joints: To make ductile iron pipe mechanical joint, position sealing gasket and gland for bolting and then enter the spigot into pipe bell end until joint line is visible. Tighten bolts evenly maintaining approximate distance between gland and face of flange at all points around the socket. Do not exceed pipe manufacturer's specifications for maximum torque applied to bolts.
   d. Flanged Joints: To make ductile iron pipe flanged joint, face flanges true and fit with gaskets, and draw flanges up square and tight to insure full gasket flow and satisfactory seal.
   e. Concrete Thrust Blocks: Provide concrete thrust blocks for each fitting, and at those locations where horizontal and vertical deflections are made in the joints of the force mains. Use Class B concrete. Provide thrust blocks of the design indicated on the Detail Drawing.
   f. Joint Restraints: Install on buried DIP at changes in direction of pipe runs, and at terminal ends of pipe runs in accordance with the following table:

<table>
<thead>
<tr>
<th>DUCTILE IRON PIPE RESTRAINED JOINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIMENSIONS</td>
</tr>
<tr>
<td>(In feet of straight pipe for each leg)</td>
</tr>
<tr>
<td>Fitting Type</td>
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<tr>
<td>Plug</td>
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<tr>
<td>Tee</td>
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<td>Lateral</td>
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<tr>
<td>90 Deg.</td>
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<tr>
<td>45 Deg.</td>
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<tr>
<td>22 ½ Deg.</td>
</tr>
<tr>
<td>11 1/4 Deg.</td>
</tr>
</tbody>
</table>

C. Pipe Connections to Existing Manholes: Make pipe connections to existing manholes in accordance with the appropriate requirements as follows:

1. Core-drill the required opening or openings using the proper equipment for the
work. Make openings of sufficient size to accommodate the pipe and the Pipe Seal (LINK-SEAL). Install the Pipe Seal in accordance with the manufacturer's installation instructions. Do not permit ground water, surface water or debris to enter the existing facilities through the new connection.

2. Run the exposed pipe (Drop Connection) within the manhole using SCH-40 PVC Pipe with Solvent Weld Socket Type joints. Run piping within the manhole as indicated on the Drawings.

3. Anchor the exposed pipe in place within the manhole as indicated on the Drawings using Exposed Pipe Support Work. Embed the Drilled-In Expansion Anchors to four and one-half bolt diameters.

3.04 PRECAST CONCRETE CHAMBER INSTALLATIONS

A. Chamber Installation: As specified in Section 02601 for precast manholes and as shown on the Drawings.


   1. Installation: Install flexible insulation on piping according to manufacturer's instructions, using specific adhesive to seal both longitudinal and butt joints. Insulate in-line appurtenances to the same thickness as adjoining insulation. Install insulation in \( \frac{1}{2} \)-inch thickness.

   2. Weatherizing Installation: Weatherize flexible insulation using those protective and moisture impervious materials as recommended by the insulation manufacturer.

3.05 FIELD QUALITY CONTROL

A. General Requirements: Conduct tests specified herein so that each pressure wastewater sewer installed in the Project is tested to the Engineer's satisfaction.

   1. The Contractor may elect to make a leakage test prior to backfilling the trenches, for his own purposes. However, the leakage tests of the pressure wastewater sewers, or sections thereof, for acceptance shall be conducted after the backfilling of the trenches has been completed.

   2. Provide tools, materials (including water), apparatus and instruments necessary for pressure wastewater sewer testing.

   3. When the length of the pressure wastewater sewer exceeds 1000 feet, test the sewer in sections, the length of each section to be determined by the Engineer.

   4. Conduct tests of every kind in the presence of and to the satisfaction of the Engineer.

B. Testing Equipment: Provide tools, materials (including water), apparatus and instruments necessary for pipeline testing. Use air compressing apparatus equipped with a control panel with necessary piping, control valves and gauges to control air flow rate.
to the piping section under test, and also the air pressure within the test seal plugs.
1. to prevent accidental overloading of piping test section, provide air compressing apparatus with an approved pressure relief device set to relive at ten psi.
2. Provide an extra pressure gauge of know accuracy to frequently check test equipment and apparatus.

C. Cleaning Prior to Tests: Before tests are conducted, flush piping with clean water until free of all forms of dirt and construction debris.
1. The water for the flush cleaning operation shall be from the Contractor's source.

D. Line Acceptance Test: After the pressure wastewater sewer or section thereof is constructed, backfilled, and successfully cleaned, perform a hydrostatic Line Acceptance Test as follows:
1. Seal pressure wastewater sewer at downstream end with a suitable pipe plug.
2. Fill pressure wastewater sewer with clear water.
3. Raise hydrostatic pressure to one and one-half times the operating pressure; measured at the low point of the particular section of sewer being tested.
4. A preliminary test period will be permitted for the removal or absorption of air from the sewer before measuring the leakage.
5. Maintain test pressure for a period of not less than four hours.
6. Consider pressure wastewater sewers acceptable when measured leakage does not exceed ten gallons per day per mile per inch of pipe diameter.

E. Repair and Retest: When the pressure wastewater sewer, or sections thereof, fails to meet test requirements specified previously, determine source or sources of leakage and repair or replace defective material, and if a result of improper workmanship, correct such.
1. Conduct such additional tests required to demonstrate that pressure wastewater sewers meet specified test requirements.

F. Owner’s Tests: The Owner reserves the right to retest piping throughout the duration of the Construction Period.
1. Make repairs as Work of this Section to piping found defective by such Owner conducted tests.

END OF SECTION
SECTION 02855

WORK ON RAILROAD PROPERTY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Data for informational purposes listing special requirements for work on railroad property (Norfolk Southern). Authority will submit Contractor prepared general plans for work on railroad property and will execute necessary agreement with Railroad Company for installation. Authority will pay fees charged by Railroad Company for preparation of agreement.

B. Related Sections:
   1. Shoring: Section 02151.
   2. Trenching, Backfilling and Compacting: Section 02221.

1.02 SUBMITTALS

A. Shop Drawings and Certificates: As specified in Sections 01300.

B. Insurance: Submit evidence of required insurance coverage to railroad company.

C. Notice of Start of Work: Submit written notice to railroad company a minimum of (7) days prior to starting work on railroad property. Provide copies of notice to Authority. Contractor may not start work, however, until he has permission from railroad company to do so.

D. Detail Plans: If requested by railroad company, submit detailed plans as to methods of construction and materials to be employed when working on railroad company property. Approval of plans and methods of doing work by railroad company will not be considered by railroad company as a release from responsibility for any damage to railroad company by acts of Contractor or those of his employees.

1.03 QUALITY ASSURANCE

A. Source Quality Control:
   1. Shop Tests: As specified in Sections 02314, and Section 02722.

B. Workmen Qualifications:
   1. Use personnel thoroughly trained and experienced in installation of pipe by boring or similar methods.
C. Requirements of Regulatory Agencies:
1. Authority will execute an Agreement with Norfolk Southern Corporation for work to be carried out on their property. It shall be Contractor's responsibility to inform himself of terms and conditions surrounding his work on Norfolk Southern Corporation property and to make allowance in his bid for such costs which may arise therefrom.
2. All correspondence shall be addressed to:
   Mr. Karl R. Autenrieth
   Manager Contract Services
   Norfolk Southern Corporation
   2001 Market Street, 29th Floor
   Philadelphia, PA 19103-7044
   Telephone (904) 359-3665
3. Technical or engineering questions may be referred to Mr. Paul Kaufman at 260 South Broad Street, Suite 1500, Philadelphia, PA 19102, Telephone number for Mr. Kaufman is 215-735-0832.
4. All correspondence and questions pertaining insurance requirements should be addressed to:
   Mr. David Fries
   Director of Insurance
   Norfolk, VA
   Telephone: 757-629-2701

1.04 PROJECT CONDITIONS

A. Scheduling:
1. Notify Railroad Company seven days in advance of beginning work on railroad property.
2. Time Requirements: Railroad company reserves right to designate acceptable time for constructing railroad crossing. Boring and jacking operations, once started, must be conducted continuously until completed.

B. Environmental Requirements:
1. As specified in Sections 02221, 02270, and 02722.

C. Protection: As specified in Sections 02151, 02221, 02314 and 02722 and such added requirements included herein.
1. Contractor shall be responsible for providing, installing and maintaining such shoring, sheeting and bracing as may be required by railroad company for protection of tracks and embankments in a safe and satisfactory manner, and to remove and dispose of such protective facilities upon completion of work.
2. Railroad Company may require Contractor to furnish temporary track supports. Temporary track supports are normally installed and removed by railroad company personnel.
3. Blasting will not be permitted on railroad company property without prior approval of Railroad Company.
4. No work may be done over any high tension wires or within 10 feet on each side or below such wires. When it is necessary to work or place equipment within these limits, arrangements shall be made with railroad to furnish electrical clearance men, and deenergize wires contingent upon railroad operations.

D. Materials and methods of construction used on railroad company property shall be subject to approval of Railroad Company and Contractor shall at all times conduct his work and operations fully within railroad company's rules, regulations and requirements. Every bidder is required to ascertain from Railroad Company its rules, regulations and requirements, and what, if any, delays to which he may be subjected. Cost of performing work in accordance with railroad company's rules, regulations and requirements shall be included in price bid for applicable item in Schedule of Prices.

E. Railroad company reserves right to employ their personnel and equipment when and where required in opinion of railroad company or their duly authorized representatives, during periods Contractor is working within or adjacent to railroad property.
   1. Railroad Company may require flagmen, or other protective personnel, to be on duty to protect its operation of trains.
   2. Railroad Company may assign inspectors and/or engineers during time Contractor is engaged in construction work on railroad property for general inspection of construction operations to ensure adherence to Plans and Specifications, and to ensure use of approved construction methods.
   3. Railroad may employ additional forces to repair any damage to railroad facilities which may be caused by Contractor's operations. If, during course of construction, it is necessary to remove and replace track, this work is normally done by railroad personnel.
   4. All costs to railroad in connection with flagging and protective personnel, engineering inspection, removal and replacement of tracks, and repair to railroad facilities damaged by Contractor's operations, and all other costs to railroad company, shall be reimbursed by Contractor.
   5. Due to above requirement, Contractor shall maintain a record and file of all railroad company personnel participation during his construction operations carried out on railroad property. Include, as a minimum, date railroad company personnel were present, number of hours spent on site and type of work performed, that is, flagging, inspection, etc.
   6. Authority reserves right to make direct payment to railroad company, if Contractor does not reimburse railroad within 30 days from date of invoice, deducting such costs from monies due or to become due Contractor. Final payment to Contractor will not be made until Railroad Company has been reimbursed in full for all their costs in connection with installation of water main.

F. If a temporary crossing of Railroad Company's tracks is necessary, Contractor shall apply to railroad company, in writing, for such crossing, and, if required by Railroad Company, execute its regular form of private grade crossing Agreement, covering crossing desired, paying all construction, maintenance, removal, protection, and other
costs, and affording contractual liability insurance in amounts required by Railroad Company.

PART 2 PRODUCTS

2.01 ENCASING CONDUIT

A. Steel Pipe: As specified in Section 02314.

2.02 SANITARY SEWER MAIN PIPE

A. PVC: As specified in Section 02722.

PART 3 EXECUTION

3.01 INSPECTION

A. Boring Operation: As specified in Section 02314.

3.02 PREPARATION

A. Boring Operation: As specified in Section 02314.

3.03 INSTALLATION

A. Construct railroad crossings to be installed by boring method in accordance with requirements specified in Sections 02314.

B. Trenching, Backfilling and Compacting: As specified in Section 02221.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Informational data listing special requirements for work on highway property.
   1. If work is to be done at the request of the Authority, the Authority will submit general plans for the work on highway property and will obtain the necessary permit from the Pennsylvania Department of Transportation (PennDOT) for the installation.
   2. If work is to be done at the request of an Applicant, the Applicant shall be responsible for obtaining the necessary permit from the Pennsylvania Department of Transportation (PennDOT) for the installation.

B. Related Sections:
   1. Shoring: Section 02151.
   2. Trenching, Backfilling and Compacting: Section 02221.
   4. Bored Pipe: Section 02314.
   5. Paving and Surfacing: Section 02500.
   6. Overlay Paving: Section 02510.
   7. Sanitary Sewer System: Section 02722.

1.02 REFERENCES


1.03 SUBMITTALS

A. Shop Drawings and Certificates: As specified in Sections 02221, 02314, 02500, and 02722.

B. Insurance: Submit evidence of required insurance coverage to Pennsylvania Department of Transportation if requested.

C. Start of Work Notice: Submit written notice to PennDOT a minimum of seven days prior to starting work on highway property. Provide copies of notice to Authority. Does not start work until permission from PennDOT is obtained.
D. Detail Plans: If requested by PennDOT, submit detailed plans as to methods of construction and materials to be employed while working on PennDOT property. Approval of plans and methods of construction by PennDOT is not considered by PennDOT as a release from responsibility for damage to PennDOT property by acts of Contractor or employees.

1.04 QUALITY ASSURANCE

A. Quality Control:

B. Workers Qualifications:
   1. Use personnel thoroughly trained and experienced in construction of sanitary sewer mains by specified methods.

C. Requirements of Regulatory Agencies:
   1. Authority or Applicant will obtain permit from PennDOT for work to be carried out on PennDOT property. It is Contractor's responsibility to become familiar with terms and conditions surrounding work on PennDOT property and to make allowance in bid for costs associated with PennDOT.
   2. Address correspondence to:
      a. Pennsylvania Department of Transportation
         Engineering District 8-0
         2140 Herr Street
         Harrisburg, PA 17103-1699
         Telephone: (717) 787-6653

1.05 PROJECT CONDITIONS

A. Photo Documentation:
   1. At least 20 calendar days prior to work being performed in State Highway Right-of-Way, provide two copies of photo documentation to Authority verifying preconstruction condition of all pavement and shoulder surfaces that might be disturbed. Photo documentation consists of color videotape (VHS format) or color film compatible with PennDOT District viewing equipment.
   2. Color slides or color prints may be submitted in lieu of videotape or film, if each slide or print is clearly labeled and arranged to verify surface condition of each successive 25 linear feet of pavement and shoulder that might be disturbed.
   3. Establish pavement and shoulder stations to PennDOT requirements prior to photo documenting. Photo documentation to conform to PennDOT requirements.
   4. Identify date of photo documentation on each cartridge, reel, slide, or print.
   5. If in opinion of Authority or PennDOT photo documented pavement and shoulder surface conditions or locations are not discernible, complete or otherwise acceptable, Authority will either return photo documentation for resubmission or Authority will create its own photo documentation record and deduct costs from monies owed to Contractor.
6. Assume responsibility for delays in commencing work on State Highways because of unacceptable or late photo documentation.

B. Scheduling:
   1. Notify PennDOT seven days in advance of beginning work on PennDOT property.
   2. Time Requirements: Conduct boring and jacking operations continuously once started, until completed.

C. Environmental Requirements:
   1. As specified in Sections 02221, 02270, and 02722.

D. Protection: As specified in Sections 02151, 02221, 02314, 02722, and as follows:
   1. Provide, install and maintain shoring, sheeting and bracing required by PennDOT for protection of embankments in a safe and satisfactory manner, and remove and dispose of protective facilities at completion of work.
   2. Blasting is not permitted on PennDOT property without prior approval of PennDOT.

E. Materials and methods of construction used on PennDOT property are subject to approval of PennDOT. Conduct work and operations fully within PennDOT's rules, regulations and requirements. Ascertain from PennDOT its rules, regulations, requirements, and subjected delays. Include cost of performing work in accordance with PennDOT's rules, regulations and requirements in price bid for applicable item in Schedule of Prices.

F. PennDOT reserves right to employ their personnel and equipment during periods Contractor is working within or adjacent to PennDOT property.
   1. PennDOT may assign inspectors and engineers during time Contractor is engaged in construction work on PennDOT property for general inspection of construction operations to ensure adherence to plans and specifications, and to ensure use of approved construction methods.
   2. Reimburse costs to PennDOT in connection with engineering, inspection, and repair to highway facilities damaged by operations, and other costs to PennDOT.
   3. Due to above requirement, maintain a record and file of PennDOT personnel participation during construction operations carried out on PennDOT property. Include, as a minimum, date PennDOT personnel were present, number of hours spent on site and type of work performed.
   4. Authority reserves right to make direct payment to PennDOT if Contractor does not reimburse PennDOT within 30 days from date of invoice, deducting costs from monies due or to become due Contractor. Final payment to Contractor will not be made until PennDOT is reimbursed in full for their costs in connection with installation of water main.
G. Insurance Requirements: Following insurance requirements are for information only, and need verified.

1. Indemnification: Fully indemnify and save harmless, if requested, Commonwealth of Pennsylvania, its agents and employees, of and from liability for damages or injury occurring to person or persons or property through or in consequence of act or omission of Contractor, agent, servant, employee or person engaged or employed in, about, or upon work, by, at instance, or with approval or consent of Contractor; from failure of Contractor or any person to comply with permit or provisions of Pennsylvania Code, Title 67, Chapter 459, and, for a period of one year after completion of permitted work, from failure of highway in immediate area of work performed under permit where there is no similar failure of highway beyond area adjacent to area of permitted work.

2. Insurance: Upon request, submit to district office a certificate or certificates of insurance for public liability and property damage, in form and amount satisfactory to PennDOT, to cover loss that may be incurred for or on account of matter, or cause arising out of construction, reconstruction, repair, relocation or installation of permitted structures or facilities.

PART 2 PRODUCTS

2.01 ENCASING CONDUIT

A. Steel Pipe: As specified in Section 02314.

2.02 SANITARY SEWER MAIN PIPE

A. PVC: As specified in Section 02722.

PART 3 EXECUTION

3.01 INSTALLATION

A. Construct highway crossing to be installed by boring method in accordance with requirements specified in Section 02314.

B. Construct highway crossing to be installed by open cut method in accordance with requirements specified in Section 02221.

END OF SECTION
SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Provision for cast-in-place concrete materials, mixes, formwork and reinforcing.

1.02 REFERENCES

A. American Concrete Institute:
   1. ACI 301, Specifications for Structural Concrete for Buildings.
   2. ACI 347, Formwork for Concrete.

B. American Society for Testing and Materials:
   1. ASTM A615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented.
   1. PDT Section 704 Cement Concrete.
   2. PDT Section 1001 Cement Concrete Structures.

1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Unless otherwise indicated on Drawings or Specifications, use Class A concrete for structures, sidewalks, and cast-in-place manhole or chamber components. Provide Class A concrete air entrained with a minimum compressive strength of 4,000 pounds per square inch at 28 days.
   2. Class B concrete may be used for backfilling overexcavated foundations, fill concrete, foundation voids and cavities, and concrete cradle and encasement. Provide Class B concrete air entrained with a minimum compressive strength of 3,000 pounds per square inch at 28 days.
   3. Use H.E.S. concrete for reaction backings. Provide H.E.S. concrete air entrained with a minimum mix design compressive strength of 3,000 psi at 3 days, and minimum compressive strength of 3,500 psi at 28 days.
1.04 SUBMITTALS

A. Samples: Submit samples of materials being used as specified and when requested by Authority. Include names, sources and descriptions.

B. Certificates: Furnish Authority and local authorities if required, certificates originated by batch plant certifying ready mixed concrete as manufactured and delivered to be in conformance with ASTM C94.

C. Delivery Tickets: Delivery tickets to accompany each load of concrete from batch plant. Information presented on ticket to include tabulation covered by ASTM C94, 15.1.1 through 15.2.8, as well as any additional information local codes require. Tickets required to be signed by Contractor's representative, noted as to time and place of pour and kept in a record at site. Make records available for inspection upon request by Authority.

D. Test Reports: Submit test reports specified.

E. Design Mix: Prior to production of concrete, submit a design mix for approval.

F. Schedule: Submit schedule indicating methods and sequence of pouring before concrete is placed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide concrete materials conforming to ACI 301 except as noted.

B. Provide H.E.S. concrete materials conforming to PDT Section 704.

C. Reinforcement: New billet steel conforming to ASTM A615, Grade 60, deformed. Rail-steel bars not allowed.

D. Formwork: Provide formwork designed and constructed in accordance with ACI 347 to required dimensions, plumb, straight, and mortar tight.

E. Concrete Support Forms: Spirally constructed of laminated plies of fiber with a non-water sensitive adhesive and wax impregnated exterior surface.
   1. Sonoco Products Company, Sonotube Fibre Form.

F. Admixtures:
   1. Provide concrete with water reducing and retarding admixture when placed at ambient air temperatures above 75 deg. F. When temperatures are below 75 deg. F., use a water reducing admixture. Water reducing and retarding admixture to
conform to ASTM C494 for Type D, and water reducing admixture for Type A. Proportioning and mixing as recommended by manufacturer.
2. Do not use admixtures causing accelerated setting of cement in concrete.
3. Do not use admixtures containing sugar, calcium chloride or other chlorides.
4. Store admixtures in a manner to prevent contamination, evaporation or damage.
5. Air-entrainment admixtures to conform to ASTM C260.
6. Calcium Chloride is not permitted.

G. Epoxy Bonding Compound: Use product such as A.C. Horn "Epoxtite Binder," Sika Chemical "Sikadur Hi-Mod," Dural International "Duralbond" or approved equal.

H. Patching Cement: Use product such as Sika Chemical "Sikatop 123" or approved equal.

PART 3 EXECUTION

3.01 PLACEMENT OF NEW CONCRETE

A. Mix, place, cure and finish Class A and B concrete as specified in ACI 301 except as noted.

B. Mix, place, and cure H.E.S. concrete as specified in PDT Section 704 and PDT Section 1001.

B. Notify Authority at least 24 hours prior to proposed placement of concrete.

C. Field Tests: One slump test for each batch of concrete performed prior to placement in forms. An allowable slump of 2 inches to 4 inches allowable if consolidation is by vibration or 2 inches to 5 inches allowable if consolidation is by methods other than vibration.

D. Do not weld reinforcing bars.

3.02 REPAIRS TO CONCRETE SURFACES

A. Cut out concrete found to be cracked or spalled to a sound surface. Remove loose concrete and rust on exposed reinforcement and clean surface of dust, dirt, and foreign matter using stiff nylon or bristle brushes and clean water.

B. Prepare cut away portions according to manufacturer's instructions.

C. Fill deteriorated areas with approved patching cement in successive layers not exceeding manufacturer's instructions for application.

D. Final patching to restore original surfaces and profile.

END OF SECTION
SECTION 03600

GROUT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: This Section specifies providing the grout required for the uses stated in other Sections of the Specifications and where indicated on Drawings, or required in the work.

B. Related Sections:
   1. Cast-In-Place Concrete: Section 03300.

1.02 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM C 109; Test Method for Compressive Strength of Hydraulic Cement Mortars (Using two inch or 50-mm Cube Specimens).
   3. ASTM C 596; Test Method for Drying Shrinkage of Mortar Containing Portland Cement.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive product data and current specifications covering named manufactured products specified in this Section. Include placing instructions. Submit product data for the following:
   1. Non-Shrink Non-Metallic Grout.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Furnish the grout manufacturer's current independent laboratory test results indicating the grout as non-shrink from time of placement as conforming to the Following:
   1. Indicating no expansion after final set, according to ASTM C 827.
   2. Indicating 4,000 psi strength developed with a trowelable mix within 24 hours, according to ASTM C 109.
   3. Indicating placement time based on initial set of not less than 60 minutes, according to ASTM C 191.
1.05  DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling: Provide protective covering over materials to prevent moisture damage and contamination of grout materials during delivery and handling.

B. Storage: Store grout materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

1.06  PROJECT CONDITIONS

A. Environmental Requirements: Protect against high and low temperatures and unfavorable environmental conditions in accordance with American Concrete Institute standards for placement of concrete.

PART 2 PRODUCTS

2.01  MATERIALS

A. Non-Shrink Non-Metallic Grout: Provide a factory premixed material containing no corrosive irons, aluminums, chemicals or gypsums and complying with the following limitations:
   1. Grouts containing water reducers, accelerators, or fluidifiers shall have no drying shrinkage greater than the equivalent sand cement and water mix when tested according to ASTM C 596.
   2. Grout shall exhibit no shrinkage before initial set and show no expansion after set when tested according to ASTM C 827.
   3. Initial set of grout shall occur in not less than 60 minutes according to ASTM C 191 Test.
   4. Use Type I (Normal) cement for grout applications not in contact with sewage.
   5. Use Type II (Sulfate Resistant) cement for grout applications in contact with sewage.
   6. Acceptable Manufacturers:
      a. U.S. Grout Corporation; FIVE STAR.
      b. Or equal.

B. Water: Clear and free from deleterious amounts of acids, alkalis, and organic substances.

2.02  GROUT QUALITY

A. Non-Shrink Grout: Use ready-mix type requiring only the addition of water. Do not add other materials. Water requirement proportions shall conform to manufacturer's specifications for the desired mix consistency.
PART 3 EXECUTION

3.01 PREPARATION

A. Preparation of Surface: Clean surfaces to be grouted to be free of oil, grease, laitance, dirt and other contaminants. Remove loose material. Remove rust, paint, and oil from metal components in contact with grout.
   1. Non-Shrink Grout: Perform additional surface preparation in accordance with manufacturer's instructions.

B. Formwork: Use forming procedures that allow proper and complete placement of grout.
   1. Pre-treat wood forms with forming oils so that they do not absorb moisture.
   2. Anchor Support elements of formwork so no movement is possible. Remove supports only after grout has hardened.

C. Grout Mixing: Use power operated mechanical mixer of sufficient capacity to carry out batch mixing without interruption.
   1. Mix Non-Shrink Grout in accordance with manufacturer's instructions.

3.02 INSTALLATION

A. Non-Shrink Non-Metallic Grout: Perform grout placement in accordance with the recommendations of ACI and the manufacturer's published specifications for mixing and placing. Place Non-Shrink Non-Metallic Grout only where indicated on Drawings.

END OF SECTION