



Altoona Water Authority

Wastewater Construction Specifications

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SANITARY SEWER PIPING SYSTEMS – GENERAL PROVISIONS

1 GENERAL

- A. All material must be manufactured in the U.S.A.
- B. All material and construction shall conform to reference standards, specifications, and codes, and to the provisions of the Specifications and the Drawings.
- C. The interior surface of all pipe and fittings shall be free from fractures, crazing, and roughness.

2 STORAGE AND HANDLING

- A. All pipe, fittings, etc. shall be carefully handled and protected against damage, impact shocks, and free fall. Pipe shall not be placed directly on uneven ground but shall be supported in a manner that will protect it against injury, whether stored at a trench or elsewhere. Stockpiled pipe shall be supported upon suitable wooden or metal supports, as recommended by the pipe manufacturer. Pipe shall not be rolled and shall be secured in a manner that will prevent accidental rolling.
- B. All pipe assemblies containing bends, tees, or similar items shall be sealed at all openings when manufactured and stored with seals intact.
- C. Pipe shall be handled by the use of wide slings, padded cradles, or similar devices, acceptable to the Altoona Water Authority, which have been designed to prevent damage to the pipe and any interior or exterior pipe coatings. The use of chains, hooks, or other equipment, which may injure the pipe or pipe coatings, will not be permitted. All pipe handling equipment and methods must be acceptable to the Altoona Water Authority.
- D. Any pipe exhibiting damage shall be repaired or replaced with new pipe, as determined by the Altoona Water Authority. The Contractor shall be fully liable for the cost of repairing or replacing damaged pipe.

3 INSTALLATION OF PIPING

- A. Piping shall be installed true to line and grade in strict regard to applicable reference standards, specifications, and codes, and the requirements set forth in these Specifications and on the Drawings.

- B. All pipe, fittings, couplings, and other components of each pipe system shall be thoroughly examined prior to installation. Any item found to be damaged or otherwise defective shall be rejected and removed from the Project site immediately, unless the Altoona Water Authority deems that the item can be properly repaired and approves the provisions for restoration and utilization.
- C. Prior to installation, all pipe system components shall be cleaned to remove all foreign substances that may have collected thereon.
- D. Proper implements and tools shall be provided and used by the Contractor to ensure safe, effective, and efficient pipe installation.
- E. Pipe shall not be cut with any method that may fracture the pipe or produce ragged, uneven edges. Carry out the cutting of pipe only with equipment specifically designed for that purpose.
- F. Buried pipe, including couplings, shall be laid directly on approved bedding material. No blocking will be permitted. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid.
- G. Pipe shall not be installed upon foundation containing ice or exhibiting frost penetration, nor shall installation take place at any time that there is a danger of ice formation or frost penetration at the bottom of the excavation.
- H. During pipe laying operations, the Contractor shall endeavor to keep the pipe interior free of all debris. The Contractor shall completely remove all sand, soil, rock, and other debris from piping prior to placing it in operation.
- I. Care shall be taken to avoid contact between pipe and compaction equipment. Compaction of backfill shall be performed such that impact type compaction equipment is not used directly above the pipe until sufficient backfill has been placed to ensure that such equipment will not damage the pipe in any manner.
- J. Adequate protection and maintenance shall be provided for all existing underground and surface utility structure, such as conduits, ducts, water and sewer lines, and drainage piping, which are encountered during the progress of the work. Furthermore, where the grade or alignment of pipe is obstructed by existing utility structures, the obstruction shall be supported permanently. Relocated, removed entirely or in part, or reconstructed by the Contractor, as required by the Altoona Water Authority of such utility structures and the Altoona Water Authority.

4 CONNECTIONS TO EXISTING SEWER MAINS AND INTERRUPTIONS OF SERVICE

- A. Notify the Altoona Water Authority a minimum of ten (10) working days in advance of the time the Contractor anticipates installing a connection to the sanitary sewer system, or when it will be necessary to close down a portion of the existing system to carry out the work.
- B. The Altoona Water Authority reserves the right to designate the day and time when the existing sewer main may be removed from service. The Contractor is warned that the Altoona Water Authority may require that this work be done at night or on a weekend. The Altoona Water Authority further reserves the right to require that work on the installation of connections between the existing and new sewer mains, or in other areas where service to

customers will be interrupted, be carried out continuously and expeditiously until sanitary sewer service is restored. Give adequate and timely notice to affected customers of any construction that will require the interruption of service to these customers including the provision for notices in the printed, visual, and audible media at no additional cost to the Altoona Water Authority. The Altoona Water Authority shall approve the actual wording of the notices. Notices are dependent on the Contractor means and methods.

- C. In all cases where connections to the existing sewer system or other work will require an interruption of sanitary sewer service, carefully plan such work ahead in close coordination with the Altoona Water Authority. Have the Altoona Water Authority approve installation schedule and procedures such as bypass pumping, before the work is started, and have on hand all necessary materials, tools and equipment before work is started. Make provision in prices bid for adequate personnel to be available for continuous operations and the payment of premium time. No additional or extra payment shall be made for extra personnel and overtime for the installation of connections; the cutting and capping of existing sewer mains; whether or not the Altoona Water Authority directs that such work be continuous, without interruption, and that this work be at night or on a weekend or holiday.

PIPELINE EARTHWORK

1 QUALITY ASSURANCE

- A. All earthwork shall comply with applicable specifications set forth in the latest edition of Publication 408, "Specifications," of the Commonwealth of Pennsylvania, Department of Transportation.

2 PROJECT CONSIDERATIONS

- A. The Contractor shall provide adequate and suitable means of support to prevent failure of any excavation wall and to protect personnel working in and adjacent to the excavation.
- B. All open excavation and other construction which presents a hazard to personnel or equipment on the Project area shall be adequately barricaded and posted with appropriate warning lights, barricades, signs, etc., as required by any local, State, or Federal regulations, or by the Altoona Water Authority.
- C. Excavations near existing structures will not be allowed closer to the structure than the depth of the excavation below the bottom of the foundation, without adequately shoring the excavation. The right is reserved by the Altoona Water Authority to require that such buildings or structures be underpinned or supported and protected, special sheeting be driven or that short lengths of trenches be opened at one time.
- D. Verification of existing utilities and their locations shall be the sole responsibility of the Contractor.
- E. Contractor shall conduct operational and maintenance activities such that the creation and dispersion of dust is minimized.
- F. The Contractor shall maintain existing access roads and all other facilities free of mud, dirt, and debris.
- G. The Contractor shall keep gutters, sewers, drains and ditches open at all times for surface drainage. No damming or ponding of water in drainage courses or waterways will be permitted, except where stream crossings are necessary and then only to an extent that the Altoona Water Authority shall consider necessary. The Contractor shall not direct water flows across or over pavements except through approved pipes or properly constructed troughs. When so required, provide pipes or troughs of such sizes and lengths and place the same as required. Perform grading in the vicinity of trenches so that the ground surface is properly pitched to prevent water running into the trenches.
- H. The Contractor shall remove, realign or change the direction of above or below ground utilities and their appurtenant supports, if such is required in the opinion of the Altoona Water Authority.
 - 1. The Contractor shall not interfere with persons, firms, corporations or utilities employing protective measures, removing, changing, or replacing their property or structures, but allow said persons, firms, corporations or utilities to take such

measures as they may consider necessary or advisable under the circumstances; which shall not relieve the responsibilities of the Contractor.

2. The Contractor shall break through and reconstruct if necessary, the invert or arch of any sewer, culvert or conduit that may be encountered if the said structure is in such position, in the judgment of the Altoona Water Authority, as not to require its removal, realignment or complete reconstruction.
- I. Where existing utilities or other suspected underground obstructions are within close proximity of proposed pipelines, the Contractor shall uncover and verify the exact location of utilities and other underground obstructions far enough in advance of pipe laying to allow any changes in pipe alignment or grade required to bypass the obstructions to avoid removing sections of pipe already installed.
- J. No right of property in materials is granted the Contractor of excavated materials prior to backfilling. This provision does not relieve the Contractor of his responsibilities to remove and dispose of surplus excavated material.
- K. Where the required quantity of backfill exceeds the quantity of suitable material excavated within the limits of the project site and rights-of-way, the Contractor shall obtain sufficient material to complete the backfill. If borrow excavation is needed, the Contractor shall notify the Altoona Water Authority sufficiently in advance of borrow excavation requirements to permit the Altoona Water Authority to verify the need for such borrow excavation and to view the proposed borrow pit and determine the suitability of the material to be provided. Borrow excavation from outside sources must be suitable in all respects and will be subject to the approval of the Altoona Water Authority.
- L. The Contractor shall not obstruct streets, roads and highways, unless the Municipality or Altoona Water Authority authorizes in writing the complete closing of the street, road or highways. Employ such measures at no expense to the Altoona Water Authority as may be necessary to keep the street, road, or highway open and safe for traffic. Maintain a straight and continuous passage way on sidewalks and over crosswalks, free from obstructions. DO NOT OBSTRUCT FIRE HYDRANTS.
- M. When construction activities involve the closing of alleys between streets, the Municipality must be contacted by the Contractor for any activity that will facilitate its operation and for the permission to shut down any alley.

3 PROTECTION AND RESTORATION OF FACILITIES

- A. Excavation machinery, cranes, and other equipment shall be operated with care to prevent damage to structures, piping, wiring, and other facilities.
- B. On paved surfaces, the Contractor shall not operate any power operated equipment having tracks or wheels which are so constructed that they will cut or otherwise damage such surfaces.
- C. Any property or facilities damaged by the Contractor's operations shall be restored to conditions at least equal to those existing immediately prior to the beginning of construction activities. Suitable materials and methods shall be used to perform the

restoration as promptly as practicable. The Altoona Water Authority shall approve the scheduling of restoration work.

4 GENERAL

- A. On-site materials may be suitable for certain approved backfill materials in accordance with the provisions these specifications. Otherwise suitable materials shall be provided.
- B. On-site materials excavated in the course of construction which are deemed unsuitable by the Altoona Water Authority for certain approved backfill material shall be removed from the site by the Contractor at his expense and properly disposed of, as required.

5 PIPE BACKFILL MATERIALS

- A. Approved Backfill: On-site excavated soil or soil-rock materials free of topsoil, vegetation, organic matter, lumber, metal, refuse, coal waste, slag and cinders. Rock or similar hard objects larger than eight (8) inches in any dimension shall not be utilized or approved.
- B. Select Backfill: Sand, clean dry earth, on-site excavated material free of vegetation, free of organic matter. Rocks or similar hard objects larger than one (1) inch in any dimension shall not be utilized.
- C. Coarse Aggregate Backfill: Select Granular Material (2RC) conforming to Section 703.3 of PennDOT Publication 408 or PennDOT No. 2A coarse aggregate conforming to Section 703.2 of PennDOT Publication 408. This material is required in all paved and stabilized areas, and also within 3 feet of edge of pavement in unimproved, earth shoulders including State, City, Township, Local Municipalities and Private Property.

6 MATERIAL FOR OVEREXCAVATION

- A. Material used to bring over excavations for pipelines to the proper elevations shall be the bedding material specified for respective installation.

7 SPECIAL BACKFILL MATERIAL

- A. Where the regulations of local, State, or other regulatory agencies require that special backfill material be installed, the Altoona Water Authority will specify to the Contractor the type and sources of said special backfill material.
- B. Special backfill material required in PennDOT roadway applications shall be PennDOT No. 2A Coarse Aggregate as specified in Section 703.2© Aggregates or PennDOT Select Granular Material (2RC) as specified in Section 70.3 of PennDOT Publication 408.

8 PIPE BEDDING MATERIALS

- A. Pipe bedding materials shall be AASHTO No. 57 coarse aggregate unless otherwise noted.
- B. Pipe bedding in non-paved or non-stabilized areas may be select backfill as specified under Paragraph 5.B of this Section.
- C. Where the original trench material is rock, the bedding material shall be AASHTO No. 57 coarse aggregate.
- D. Concrete cradle bedding shall utilize PennDOT Class A concrete.

9 GENERAL EXCAVATION

- A. The Contractor shall be required to perform all excavation, including pipe trench excavation, to the lines, grades, and elevations indicated, regardless of the type and character of the materials encountered. All excavation shall be performed on an unclassified basis for rock excavation, quicksand excavation, muck excavation, or any other type of excavation encountered. Rock excavation shall be interpreted as being the removal and disposal of materials which requires drilling and blasting, wedging, sledging, barring, or breaking up with power operated equipment for removal, including ledge rock, concrete or masonry structures, boulders, and other materials of related character.
- B. No frozen or excessively wet material will be permitted as use for backfill or embankment. Suitable or selected backfill or embankment material shall be kept separated from the unsuitable types. If the Contractor allows suitable backfill or embankment material to become frozen, excessively wet, or mixed with unsuitable material, he shall not be allowed to use it as backfill or embankment material and he will be required to provide supplemental approved material.
- C. All excavation materials not used in backfill or final grading operations shall be hauled from the site and disposed of by the Contractor. Contractor shall not dispose of such material on site without permission of the Altoona Water Authority.

10 EROSION AND SEDIMENTATION CONTROL

- A. The Contractor's attention is directed to the Commonwealth of Pennsylvania, Department of Environmental Protection, Rules and Regulations, Chapter 102, Erosion Control. The Contractor shall comply with all of the requirements of this Chapter and amendments thereto.

11 STRIPPING AND SPREADING OF TOPSOIL

- A. Before beginning excavation or filling work, the topsoil from all areas to be affected shall be stripped to a depth as required and shall be either spread on areas already graded and prepared for topsoil or stored at a location designated by the Altoona Water Authority. After completion of the major construction work, the topsoil shall then be replaced as the upper layer of backfill to a depth of nothing less than six inches so that the final grade shall be as required by the Drawings. If additional topsoil beyond that salvaged from the site is required to maintain the minimum six inches of depth specified, the Contractor shall furnish and install the additional topsoil, as required.

- B. On all areas that are to receive topsoil, the compacted subgrade shall be scarified to a minimum depth of two inches for the bonding of topsoil with subsoil. Protruding stones, etc. shall be removed from the subgrade by the Contractor prior to placing topsoil. Topsoil shall then be evenly spread, compacted, and graded to the thickness and to the elevations and slopes specified; the compaction shall be affected by one pass of a flat roller weighing not more than 75 pounds per lineal foot of roller or other suitable compaction methods as approved by the Altoona Water Authority.

12 STRIPPING AND REMOVAL OF UNSUITABLE MATERIAL

- A. There may be areas where there is unsuitable material (decayed vegetation, leaves, trash, debris, brush, ashes, cinders, etc.) at or near the surface of existing ground. The contractor shall be required to remove all of this unsuitable material and to properly dispose of same off the site.

13 SHEETING AND SHORING

- A. Where necessary for safety or to prevent disturbance, damage, or settlement of adjacent structures, pipelines, utilities, paving, etc., excavations shall be sheeted and shored. The Contractor shall repair any damage to new or existing structures occurring through settlement, water or earth pressure, or other causes due to inadequate bracing.

- B. Where trenches or excavations exceed five feet in depth, the Contractor shall, in advance of the start of the Work, provide the necessary and appropriate pipe installation and excavation procedures.

- C. A Professional Engineer licensed to practice in the State of Pennsylvania shall design all sheeting and shoring, trench boxes, and other forms of excavation protection, conforming to the requirements of all applicable laws, codes, and regulations. Copies of this certification shall be submitted to the Altoona Water Authority, upon request.

- D. All sheeting and shoring not to be left in place shall be carefully removed in such a manner as not to endanger the construction or other structures. All voids caused by withdrawal of sheeting shall be immediately backfilled with specified material meeting the herein specified compaction requirements.

- E. The Contractor will be solely responsible and liable for any damage, bodily injuries, or deaths that result from the failure to provide adequate sheeting and shoring or other means of excavation protection.
- F. The Contractor shall be solely responsible and assume complete liability for any and all injuries, death, disability and damages to persons or property resulting from any improper excavation protection methods or facilities.
- G. The shape of all trenches above the pipe zone, trench sidewall supports both above and within the pipe zone, the construction methods employed, the general protection requirements, the general excavation requirements, the general trenching requirements, and the minimum requirements for trench shoring shall conform with the regulations set forth under Subpart P, "Excavation, Trenching, and Shoring," published as part of the Safety and Health Regulations for Construction by the U.S. Department of Labor, as amended. No trench excavation work shall be performed which is not in accordance with said regulations.

14 SHEETING AND SHORING LEFT IN PLACE

- A. In order to protect adjacent property or structures, the Altoona Water Authority may require that sheeting and shoring, or other excavation protection facilities, be left in place to be embedded in backfill or concrete. All other excavation protection facilities may be salvaged when the removal of same will not present a hazard to either the adjacent property and structures or the safety of persons.
- B. Materials used for excavation protection shall be cut off or terminated at specific elevations or otherwise modified to accommodate the job conditions.

15 EXCAVATION FOR PIPELINES

- A. Except when noted by the Altoona Water Authority, all pipelines shall be constructed in open trenches. The depth of trenches shall be such that the location of the proposed pipes shall conform to the determined lines and grades or as revised and established by the Altoona Water Authority in the field during construction. Trenches shall be completed at least thirty feet in advance of pipe laying, unless otherwise directed by the Altoona Water Authority. Minimum amount of trench that needs to be open at any one time should be open, not to exceed 50 feet.
- B. The shape of the trenches in the "pipe zone" shall conform to the configuration shown on the Details. The Contractor is herein advised that if trench widths in the pipe zone exceed the outside diameter of the pipe plus two feet, and if the Altoona Water Authority determines that such excessive widths will result in structural loadings for which the pipe is not designed, the Contractor shall be required to bed the pipe on concrete cradle as directed by the Altoona Water Authority. If stone bedding is not used as bedding material, recesses shall be formed in the bedding material at the ends of the pipe to allow for unobstructed assembly of each joint and to prevent point loading at bells or couplings.
- C. The Contractor shall shape trenches that are located adjacent to existing aboveground or underground structures or facilities or in other confined areas, so that such structures and facilities are properly protected against damage or disturbance from settlement or

displacement. Adequate sheeting and shoring, or disturbance from settlement or other means of excavation protection, shall be installed and maintained to provide such protection and the Contractor shall be responsible for all damages resulting to such proposed and existing structures, pipelines, or facilities as the result of his failure to use and maintain adequate trench wall supports, as well as a result of any other construction activities. The bottoms of all trenches shall be excavated to a depth below the bottom of the proposed lines as required to accommodate the bedding herein specified.

- D. The minimum cover for the pipelines shall be four (4) feet, unless determined otherwise and/or approved by the Altoona Water Authority.
- E. Where solid rock is encountered, the trenches shall be undercut at least six inches and bedded with a layer of AASHTO No. 57 coarse aggregate. Where rock is encountered in excavations in which blank connections are to be left for future extensions of waterlines, the Contractor shall remove rock for a distance of not less than ten (10) feet from the blank connection in the direction of future extension. Excavate trench to specified width, depth and length.
- F. All bituminous paving is to be cut to neat trim lines and all concrete pavement shall be concrete saw cut. Paving that is cut or broken to erratic or irregular lines shall be replaced and repaved to the extent required by the Altoona Water Authority.
- G. All groundwater from any cause whatsoever shall be pumped or bailed so that the trench shall be dry during pipe laying period. All water pumped from the trenches shall be disposed of in a satisfactory manner to the Altoona Water Authority. Water pumped from trenches shall be discharged in a manner acceptable to appropriate government agencies and meeting all of applicable requirements for soil erosion and water pollution control.

16 PIPE BEDDING

- A. Except where concrete encasement or concrete cradle is specifically called for or where the original trench material is rock, all piping shall be laid in specified bedding material.
- B. Pipe bedding consists of a minimum four (4) inch depth of compacted specified material under the pipe for the full width of the trench and at both sides of the pipe (between pipe sides and trench walls) to the horizontal centerline of the pipe.
- C. Where concrete cradle is required by the Specifications or the Drawings, the pipe shall be bedded in PennDOT Class "A" concrete. A minimum of six (6) inches of concrete shall be provided under and on each side of the pipe, extending upward to a point two (2) inches above the horizontal centerline of the pipe.
- D. Where the bottom of the trench is excavated deeper than theoretically required, additional special bedding material (PennDOT No. 2RC or PennDOT No. 2A bedding material, concrete cradle, etc.) shall be furnished as required to backfill the bottom of the trench to the underside of the pipe.
- E. Where the original trench material is rock, the trench shall be undercut at least six (6) inches the pipe bedded in AASHTO No. 57 coarse aggregate.

- F. Where ferrous metal pipelines or casings pass through cinder material, the Contractor shall supply a polyethylene encasement as specified herein.

17 PIPE ALIGNMENT AND GRADE

- A. After the trench has been brought to the proper grade as specified and appropriate pipe bedding material provided, the pipe and specials shall be laid. Pipe laying shall be done in the presence of the Altoona Water Authority and the Contractor shall give ample notice to the Altoona Water Authority before laying pipe so that an inspector may be provided to make proper inspection.
- B. All pipe shall be installed to the lines and grades as determined or as established by the Altoona Water Authority in the field. The Contractor at no additional cost to the Altoona Water Authority shall correct work not conforming to the required grades.

18 BACKFILL FOR PIPELINES

- A. Backfilling shall be done as promptly as is consistent with noninjury of the pipe and joints. However, no backfilling shall be performed before the Altoona Water Authority gives permission.
- B. Backfilling shall be carefully performed and the original surface restored to the full satisfaction of the Altoona Water Authority. After the pipe installation has been approved by the Altoona Water Authority, trenches shall be backfilled with approved backfill material, carefully deposited in layers as specified herein, and thoroughly and carefully compacted between the pipe and the bottom of road sub-bases, topsoil, or other improved surface treatments. Said material shall be used for the full depth of trench where the ground is unimproved.
- C. Backfilling may be done with power equipment. No backfill machine shall be used unless a sufficient number of personnel are employed to spread the backfill in the layers as specified.
- D. Whenever the trenches have not been properly filled or if settlement occurs, they shall be refilled, compacted, leveled, and finally made to conform to the surface of the ground.
- E. Particular care shall be exercised in backfilling trenches located along or crossing streets, shoulders, roadways, parking areas, and other vehicular areas, such that the resumption of normal traffic patterns will occur reasonably soon after the pipe in those areas has been installed.

19 COMPACTION

- A. Material compaction shall be closely controlled during construction to provide minimum densities required for specific use classifications.

- B. The achievement of proper compaction and density for backfill/bedding materials shall generally be visual determinations by the Altoona Water Authority in the field. However, the Altoona Water Authority reserves the exclusive right to request field determination of the density during any phase of the backfill and bedding operation and as may be required by governing agencies (PennDOT, municipality, etc.) having jurisdiction in the project area. An independent soils laboratory shall perform such field density determinations.
- C. In the event that any in-place density test fails (i.e., does not indicate compaction meeting the minimum density requirement), the Altoona Water Authority shall require additional testing and inspections by the soil engineering and testing laboratory to substantiate conditions. If the additional testing and inspections indicate unsatisfactory conditions, the Contractor shall make all corrections and modifications to the methods, materials, moisture content, etc. used in placing and compacting the backfill or embankment.

20 DISPOSAL OF UNSUITABLE OR EXCESS MATERIAL

- A. All materials from excavations not suitable or needed for embankment or backfill shall become the property of the Contractor and shall be removed from the Project site.
- B. In streets, roads and highways or in any other locations where working space is limited, the Contractor shall remove the excavated materials from the first 100-feet of any opening, when required by the Altoona Water Authority, as soon as such is excavated and store and return same for backfilling when required. In no case will the Contractor be allowed to cast excavated material beyond the curb or right-of-way lines or on sidewalks or lawn areas.
- C. Where more material is excavated from trenches than can be backfilled or stored on the street or within rights-of-way limits, leaving space for traffic and drainage, the Contractor shall remove and store excess material and return some for backfilling when required.

21 DEWATERING

- A. The Contractor shall at times when necessary, or when so directed by the Altoona Water Authority, provide and maintain in operation suitable and adequate pumping equipment or well points to dewater excavations in such a manner as to permit successful installation and maintenance of the proposed pipelines.
- B. The Contractor shall at all times have at the Project site sufficient dewatering equipment ready for immediate use.

22 EQUIPMENT

- A. The Contractor may use any type of earth-moving equipment he may desire or has at his disposal, provided the equipment conforms with the requirements set forth in Section 108.05 of PennDOT Publication 408 and meets the qualifications necessary for the proper execution of the Work.

- B. The Contractor shall furnish, operate, and maintain such equipment as is necessary to control uniform layers, section, and smoothness of grade for compaction and drainage.

23 CLEANUP

- A. The Contractor shall surplus excavated material, rubbish and other construction debris and keep such removed to a point not more than two hundred (200) feet from head of the open trench, unless otherwise authorized by the Altoona Water Authority.
- B. After trenches and other excavations are backfilled and the work completed, the Contractor shall remove surplus excavated materials, rubbish or such other materials from the work in such a manner as the Contractor may elect or provide, but subject to the Altoona Water Authority's approval.
- C. The Contractor shall evenly spread and leave in neat, smooth condition excavated material disposed of lawfully on public property.
- D. The Contractor shall furnish and place topsoil, fertilize and seed grassed areas, both within and outside rights-of-way affected by construction. The Contractor shall reseed and fertilize areas that fail to show a uniform stand of grass.
- E. The Contractor shall restore the area covered by both temporary and permanent rights-of-way over private property to as near the original conditions as is practical. The Contractor shall bring up to the original grade, place topsoil, seed, replant or replace shrubbery, repair or replace walks, driveways, fences and other improvements, damaged or removed.
- F. When the repaving over trenches and other excavations have been completed, the Contractor shall sweep paved surfaces having been affected by the work using hand or power sweepers, and if required by the Altoona Water Authority, flush with water to remove dust and small particles.
- G. The Contractor shall assume responsibility for injury or damage resulting from lack of trench maintenance.

SANITARY SEWER PIPE

GENERAL

1 PVC NONPRESSURE PIPE, 4"-15" IN DIAMETER

- A. Scope – This specification designates general requirements for unplasticized polyvinyl chloride (PVC) Plastic Gravity Sewer Pipe with integral wall bell and spigot joints for the conveyance of domestic wastewater.
- B. Materials – Pipe and fittings shall meet the requirements of ASTM Specification D3034 for 4"-15" SDR 35.
- C. Pipe – Pipe shall be suitable for use as a gravity sewer conduit. Provisions must be made for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral wall section with a solid cross-section rubber ring, factory assembled, securely locked in place to prevent displacement during assembly. Sizes and dimensions shall be as shown in this specification. Standard laying lengths shall be 20 feet and 12.5 feet \pm 1 inch. At manufacturer's option, random lengths of not more than 15% of total footage of each size may be shipped in lieu of standard lengths.
- D. Drop Impact Test – Pipe (6" long section) shall conform to impact tests from a free falling tup (20-lb. Tup A.) in accordance with ASTM Method of Test D2444. No shattering or splitting (denting is not a failure) shall be evident when the following energy is impacted:

Nominal Size Inches	Ft.-Lbs.
4	150
6	210
8	210
10	220
12	220
15	220
18	220
21	220
24	220
27	220

- E. Fittings – All fittings and accessories shall be as manufactured and furnished by the pipe supplier of approved equal and have bell and/or spigot configurations compatible with that of the pipe. Materials shall conform with Paragraph 1.B. of this section.
- F. Temperature for Testing – Pipe shall be designed to pass all tests at 73°F (\pm 3°F).
- G. Pipe Stiffness – Minimum "Pipe Stiffness" (F/ Δ y) at 5% deflection shall be tested in accordance with ASTM Method of Test D24-12, "External loading Properties of Plastic Pipe by Parallel-Plate Loading."

- H. Joint Tightness – Two sections of pipe shall be assembled in accordance with the manufacturer's recommendation. Joint shall be tested in accordance with ASTM D3212, "Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals."
- I. Flattening – There shall be no evidence of splitting, cracking, or breaking when the pipe is tested as follows:
 - a. Flatten specimen of pipe, six inches long between parallel plates in a suitable press until the distance between the plates is forty percent of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within two to five minutes.

2 PVC NONPRESSURE PIPE, 18"-36" IN DIAMETER

- A. Scope – This specification designates general requirements for unplasticized polyvinyl chloride (PVC) plastic (spiral wound) gravity sewer pipe with integral wall bell and spigot joints for the conveyance of domestic sewage and storm water.
- B. Materials – All pipe and fittings shall be manufactured and tested in accordance with ASTM F-794 specification for "Poly (Vinyl Chloride) (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter."
 - a. The pipe and fittings shall be made of PVC plastic.
- C. Pipe – All pipe shall be Series 46. Provisions must be made for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral wall section. The solid cross section rubber ring shall be factory assembled on the spigot. Size and dimensions shall be as shown in this specification. Standard laying lengths shall be 13 ft. ± 1 inch. At manufacturer's option, random lengths of no more than 15% of total footage may be shipped in lieu of standard lengths.
- D. Joining System – Integral bell gasketed joint: The joint shall be designed so that when assembled, the gasket will be compressed radially on the pipe spigot to form a watertight seal in accordance with ASTM D3212.
 - a. The joint shall be designed to avoid displacement of the gasket when installed in accordance with the manufacturer's recommendation.
 - b. The assembly of joints shall be in accordance with the manufacturer's recommendations.
- E. Impact Resistance – Determine the impact resistance of the pipe in accordance with ASTM D2444, using the 30 lb. (15kg.) Tup B and flat plate holder B. Ten specimens shall be tested. The specimens should be oriented so that one of the ribs receives the strike essentially centered on the tup face. Failure in the test specimens shall be any shattering or any crack or split extending through the main wall of the pipe that was created by the impact and that can be seen by the naked eye. Nine out of ten specimens passing constitute an acceptable product. The impact strength shall not be less than 220 ft. lbs.

- a. Note: Shorter sections, not less than 12 inches in length, may be tested to accommodate the impact testing machine since this will be a more severe impact resistance test.

- F. All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal and have bell and/or spigot configurations compatible with that of the pipe.
 - a. All fittings are fabricated fittings. Fabricated fittings with solvent cemented components shall be made in accordance with ASTM D 2855 and taking cognizance of ASTM F 402.

- G. Physical and chemical requirements – Pipe shall be designed to pass all tests described here at 73°F (±3°F).

- H. Pipe Stiffness – The pipe stiffness shall equal or exceed 46 psi when tested in accordance with ASTM D 2421. Test three specimens, minimum one diameter long, and determine the average pipe stiffness.
 - a. Note: Pipe may be restrained in flat plate test to prevent twisting in the test apparatus.

- I. Joint Tightness – Two sections of pipe shall be assembled in accordance with the manufacturer's recommendation. Joint shall be tested in accordance with ASTM D 3212, "Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals."

- J. Flattening – Flatten three specimens of pipe, each a minimum of 6 inches long, between parallel plates in a suitable press until the distance between the plates is 40% of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within 2 to 5 minutes. The specimen shall pass if no splitting, cracking, or breaking is observed under normal light with the unaided eye. Small tears initiated at the cut end of the rib shall not constitute failure.

3 EXECUTION

- A. Refer to requirements in Piping System General Provisions: Section 15010.

- B. All PVC nonpressure pipe shall be installed in accordance with ASTM D2321, and the requirements set forth in Piping System General Provisions: Section 15010 and on the Drawings.

- C. All buried PVC pipe shall be marked using underground utility marking tape. Tape shall be placed 9" to 12" below finished grade.

PIPING SCHEDULE

1 PIPING SCHEDULE

A. System 1 – Sanitary Sewer Gravity Piping System

1. Pipe Material: PVC ASTM 3034, SDR 35 (15" Diameter and smaller), PVC ASTM F-794 (18" to 36" diameter) with gasketed O-ring bell spigot joints, or Polypropylene ASTM F2764 (30" – 60" Diameter) and ASTM F2736 (24" Diameter).
2. Manholes: ASTM C478 and as specified in Section 02607.
3. Field Test Requirements: Alignment test, air test and infiltration tests as per Section 15080. Manholes shall be vacuum tested per Section 15080.

B. System 2 – Force Main Piping System

1. Pipe Material: PVC pipe conforming to ANSI/AWWA C905 below ground and where designated on the drawings and as specified in Section 15014. Ductile Iron Pipe Class 52 Mechanical Joint or Class 53 (grooved end) at air release valve assembly locations where designated on the drawings and as specified in Section 15013.
 - a. **Standards:** Ductile iron pipe shall conform to AWWA C150 and C151, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fitting shall be provided as required under the Contract Documents. The ductile iron pipe shall be manufactured or supplied by American Ductile Iron Pipe or pre-approved equal. Joints shall conform to AWWA C111, cement linings to AWWA C104, fittings to AWWA C153 or C110.
 - b. **Markings:** Upon request, the Contractor shall require the Manufacturer to legibly mark specials in accordance with a laying schedule and marking diagram. All other cast marks and other marks shall be in accordance with applicable Standards.
 - c. **Laying Lengths:** Pipe laying lengths shall be provided in 20-foot nominal lengths with allowable trim pipe lengths in accordance with AWWA C151 and special shorter lengths provided as required by the Drawings.
 - d. **Joint Design:** Ductile Iron pipe shall be furnished with push-on joints or push-on restrained joints. Restrained joints shall be American Fast-Grip, Flex-Ring, or Lok-Ring.

- e. **Lining:** Except otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials shall be cleaned and lined at the pipe casting facility with a standard thickness cement mortar lining applied in conformity with AWWA C104. A seal coat shall not be applied to the surface of the cement-mortar lining.
 - f. **Coating:** The exterior of ductile iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m² of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The coating system shall conform in every respect to ISO 8179-1 "Ductile iron pipes- External zinc-based coating – Part 1: Metallic zinc with finishing layer. Second edition 2004-06-01."
 - g. **Installation:** Ductile iron pipe shall be loaded, transported, unloaded, installed, and tested in accordance with AWWA C600.
- 2. Fittings: Ductile Iron: Double cement lined, mechanical joint with restraining style retainer glands (below ground) or grooved end or flanged (above ground) to match pipe where indicated; bituminous seal coated (exterior) as specified in Sections 15013 and 15014.
 - 3. Field Test Requirements: alignment test and hydrostatic pressure test as specified in Section 15080.

LATERALS AND CLEANOUTS

1 LATERALS

- A. Lateral pipe and fittings shall be ASTM D3034, SDR 35 PVC pipe and furnished and installed according to the applicable provision of Division 15.
- B. Where appropriate, 45° bend(s) shall be placed in the lateral and installed to meet the cut-in tee at the main and installed at a constant line and grade.
- C. Laterals, minimum 6-inch diameter, shall extend to the surface, properly capped for a clean-out as shown on the drawings.
- D. Cut-in service connections (Instera-tees by ADS or approved equal) shall be installed with the proper hole saw equipment as per the manufacturer's recommendations.

1. Cut-in Service Connections Product Requirements

- a. Service connections shall consist of a PVC hub, rubber sleeve and stainless-steel band. Connection shall be a compression fit into the cored wall of a mainline pipe. Hub shall be made from heavy-duty PVC material. Stainless steel clamping assembly shall be made from minimum 301 grade steel. Rubber sleeve and gasket shall meet the requirements of ASTM F477. Gaskets shall be installed as recommended by the manufacturer. A water-based solution provided by the manufacturer shall be used during assembly. Pipe lubrication jell is prohibited.

2. Joint Performance

- a. The Product shall include a watertight bell connection meeting the requirements of ASTM D3212.

3. Field Pipe and Joint Performance

- a. To assure water tightness, testing shall be in accordance with Section 15090.

4. Installation

- a. Installation shall be in accordance with manufacturer's recommended installation guidelines. The use of installation methods or hole saws not

purchased from the manufacturer are prohibited. Backfill around the cut-in service connection shall be of the same material type and compaction level as specified for the mainline pipe installation.

2 LATERAL RISERS

- A. Where elevations of main sewers and service connections are such that requires lateral trenching of over 7 feet, a riser connection off the main shall be provided.
- B. Riser assemblies consist of a wye inserted in the main sewer with a 45° elbow for plumb. Place a 6- or 8-inches diameter riser pipe of a length terminating at a height allowing the shallow lateral trenching. Place an elbow on the riser pipe and extend lateral to the property line and cap off.
- C. Where appropriate, place a wye on top of riser pipe and extend to surface, properly capped for a clean-out.
- D. Encase sewer main and riser pipe to height of elbow or wye with Class B concrete, minimum thickness of 6 inches.
- E. Mark ends of all laterals with a 4-inch by 4-inch post of hardwood or pressure treated lumber. Posts shall be sufficient length to extend from lateral end to 3 feet above the ground. Paint exposed end of post with green paint for a minimum length of 1 foot.

3 CLEANOUTS

- A. Cleanouts consist of a wye 45° elbow and riser pipe placed along a sewer lateral or as shown on the Drawings.
- B. Riser pipes shall extend to meet finished grade, capped with an adaptor for a threaded flush plug.
- C. Cleanouts terminating in non-highway areas where damage may occur shall be protected by an 18-inch square of Class A concrete encasement, 8-inches thick, reinforced with 6x6x10 gauge (W1.4) wire fabric.
- D. Cleanouts terminating in highways, streets and shoulders shall be protected by a frame and cover and Class A concrete encasement or as shown on the Drawings.
- E. Where the cleanout is to be used for observation, wye/tee fitting shall be used in lieu of a wye and 45° bend.

PIPE JACKING/PIPE BORING

1 SUBMITTALS

- A. If requested by the Altoona Water Authority, the Contractor shall submit to the Altoona Water Authority, at least twenty-eight (28) days prior to any pipe jacking/pipe boring installation, the following information:
 - a. Details of proposed jacking or boring pits showing locations, dimensions, and details of sheeting and shoring required.
 - b. Capacity and type of boring/jacking equipment to be used.
 - c. Selected method of pipe placement including complete details and information of the boring/jacking process.
 - d. All casing pipe, up to and including 24-inch diameter, shall be new uncoated, steel pipe in accordance with ASTM Specification A-53, Grade B and AWWA C200; diameter as necessary; wall thickness as required; and minimum yield strength of 35,000 psi. Pipe larger than 24-inches shall be fabricated using ASTM, A283, Grade C steel with straight longitudinal welding seams. Casing pipe shall be furnished in 18 or 20-foot lengths. All casing pipe joints shall be butt welded completely around or along the joint by a certified welder in accordance with all applicable provisions of the American Welding Society and the American Water Works Association C-206. The ends of the casing shall be sealed with a wraparound casing end seal so as to prevent the entrance of foreign material.
 - e. Casing pipe shall have a minimum wall thickness as listed below (permit requirements supersede the dimensions below):

Casing Outside Diameter Inches	Highway Crossings Casing Wall Thickness Inches	Railroad Crossings Casing Wall Thickness Inches
8	0.250	0.250
10	0.250	0.250
12	0.250	0.250
14	0.250	0.250
16	0.250	0.281
18	0.250	0.344
20	0.312	0.344
24	0.312	0.375
30	0.370	0.469
36	0.469	0.532
42	0.469	0.625
48	0.625	0.688
54	0.625	0.781
60	0.781	0.844
66	0.875	0.938
72	0.938	1.000

Smooth wall steel plates with a nominal diameter of over 54 inches shall be permitted.

The inside of the casing pipe shall be of a size needed to accommodate casing spacers.

2 INSTALLATION

- A. The jacking/boring equipment shall be sufficient size and capacity to allow the boring to proceed in a safe and expeditious manner. The installation of the pipe and the boring of the hole shall be done simultaneously for the safety of the moving traffic above. The jacking/boring equipment, the jacking/boring pit, all shoring required, and methods of installation must be in accordance with applicable requirements.
- B. At all times when the work is being progressed, a field supervisor shall be present with no less than twelve (12) months experience in the operation of the equipment being used. The boring/jacking machine operator shall also have no less than twelve (12) months experience in the operation of the equipment being used.
- C. When water is known or expected to be encountered, pumps of sufficient capacity to handle the flow shall be maintained at the site. The pumps shall be in constantly attended operation (24-hour) basis until their operation can be safely halted. When dewatering, close observation shall be maintained to detect any settlement or displacement of embankment, roadway, tracks or other surface facilities.
- D. The Contractor shall excavate and construct a jacking/boring pit of a width and length as required for that particular jacking/boring. The Contractor will be required to provide adequate protection for all existing utilities encountered. The Contractor shall provide adequate timber sheeting/shoring on all of the walls of the jacking/boring pits. All sheeting/shoring must be in compliance with all Federal and State Safety requirements.
- E. If an obstruction is encountered during installation and stops the forward action of the pipe, and it becomes evident that it is impossible to advance the pipe, operations will cease and the pipe shall be abandoned in place and filled completely with grout.
- F. The Contractor shall carefully thread the carrier pipeline through the casing pipe being sure to properly plug the threaded end of the carrier pipe. The Contractor shall install sacrificial anodes as stated herein. Where the proposed pipeline is installed across the area of the boring/jacking pit, the Contractor shall backfill the bottom of the pit with suitable non-corrosive material by placing the material in 6-inch lifts and compacting same by mechanical compaction equipment.
- G. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than one (1) inch, grouting shall be employed to fill such voids.
- H. The Contractor shall be required to test those portions of the proposed pipeline within the proposed encasement pipes, in accordance with the applicable specifications contained herein and as directed in the field by the Altoona Water Authority, prior to the backfilling of any boring pit excavation.
- I. Casings shall have both ends blocked in a manner to prevent the entrance of foreign material. The wrap around end seals shall be as manufactured by Public Works Marketing, Inc., Dallas, TX (1-800-517-0395), or approved equal. The wrap around end seals shall consist of 1/8" minimum thickness synthetic neoprene rubber with self-adhesive/self-curing mastic applied rubber and specifically fabricated for the casing

pipe/condition carrier dimensional condition. Stainless steel bands may be used as a method of closing the wraparound casing seal.

- J. Casing spacers shall be used to install the carrier pipe through the casing pipe. The casing spacers shall be RACI, type and size as required by Public Works Marketing, Inc., Dallas, TX (1-800-517-0395), or approved equal. The spacers shall be of protection type with a minimum number of protections equal to the carrier pipe diameter (i.e., 8 projections for 8-inch diameter) spaced circumferencely around the carrier pipe. Casing spacers shall be non-metallic constructed of preformed sections of high-density polyethylene with tensile properties meeting or exceeding ASTM D638. Spacers shall be installed according to manufacturer's recommendations.
- K. If required, the annular space or void area between the disturbed earth and casing pipes (or abandoned casings) shall be filled with grout. The grout mixture shall be a uniform mixture of 1 (cement): 6 (sand) placed under pressure through the grout holes to fill any void that exist between the casing pipe and disturbed earth.
- L. Upon completion of all of the required work, the jacking/boring pit shall be backfilled with suitable material in 6-inch lifts and mechanically compacted. All shoring shall remain in place.

3 RAILROAD REQUIREMENTS

- A. The Contractor shall comply with "CE-8, Specifications for Pipeline Occupancy" while working within Norfolk Southern Railway Corporation property of right-of-way. The Contractor shall be required to furnish at its expense all insurance and bonds that are required by the Norfolk Southern Railway Corporation to work within their property or right-of-way. Protection of rail traffic and protective warning devices to protect railroad employees are the Contractor's responsibility.

CONCRETE ENCASEMENT & CONCRETE CRADLE

1 CONCRETE ENCASEMENT & CONCRETE CRADLE

- A. Concrete for cradle and encasement and thrust blocks shall be Class "A" and furnished in conformance with Section 704 – Cement Concrete of PennDOT publication 408. Reinforcing steel shall be furnished in conformance with Section 709 – Reinforcing Steel of PennDOT Publication 408. Concrete installation shall be in conformance with the applicable provisions of Section 1000 – Cement Concrete Structures of PennDOT Publication 408.
- B. Concrete cradle for existing/proposed pipe system support shall extend six (6) inches (minimum) into undisturbed earth of the trench wall for proper bearing. Concrete cradle shall be installed in accordance with the details shown on the Drawings and as directed in the field by the Owner/Engineer.
- C. Concrete encasement and concrete thrust blocking shall be installed in accordance with the details shown on the Drawings and as directed in the field by the Owner/Engineer.

MANHOLES AND VAULTS

1 PRECAST REINFORCED CONCRETE WALL SECTIONS

- A. Walls of manholes shall be constructed of reinforced concrete ring sections with a minimum inside diameter of 48 inches. The risers and top sections shall be manufactured in compliance with the requirements of the Specifications for Precast Reinforced Concrete Manhole Risers and Tops, ASTM Designation C478. Riser sections shall have tongue and groove ends (tongue on top of section) and a minimum wall thickness of 5 inches. Top sections shall be of eccentric cone or flat slab top design as required by the drawings. Eccentric cones shall have the same minimum wall thickness and area of circumferential steel reinforcement as the round riser sections. Flat slab tops shall have a minimum thickness of 6 inches and shall be sufficiently reinforced to withstand the AASHTO HS-20 highway loading condition. Top sections shall have a top width of such design and dimensions as to properly support the required manhole frame and cover and the lower joint shall be of tongue and groove design.
- B. Top sections of eccentric cones or flat tops shall have an opening of 21 inches and contain 4 anchors, equally spaced to receive ¾-inch from anchor bolts.
- C. Exterior surfaces of all concrete sections, both cast-in-place and precast sections shall be entirely coated with two-coats of bitumastic material. The Contractor shall prepare the surfaces to receive the coating materials and apply the coating all in strict accordance with the manufacturer's written instructions. Minimum dry film thickness of the exterior coating shall be 16 mils.
- D. All sections shall contain factory-installed lifting keys or lugs.
- E. Interior surfaces of manholes, both cast-in-place and precast sections shall be entirely coated with bitumastic material. Minimum dry film thickness of the interior coating shall be 8 mils.

2 REINFORCED CONCRETE MANHOLE BASES

- A. Precast reinforced concrete bases shall normally be used in lieu of cast-in-place concrete bases.
- B. The base, for either type, shall extend 6 inches beyond the outside face of the manhole wall and shall be at least 8 inches thick.
- C. Both precast and cast-in-place bases shall be constructed in accordance with ASTM C478.
 - 1. Cast-in-place bases for up to 15-inch sewers shall have one mat of No. 4 deformed Grade 60 reinforcing steel on 12-inch centers placed midway in minimum 8-inch thick base.

2. Based for pipe larger than 15-inches shall be specifically designed.

D. Precast bases shall have factory installed pipe seals as specified herein.

3 PRECAST CONCRETE RINGS

A. Precast concrete (grade) rings of 2-,3-, and 4-inch thickness shall be manufactured in accordance with ASTM C478. Rings shall have precast bolt holes matching cone or flat top sections and be of diameter to support full manhole frame. Field molding of grade rings is prohibited.

4 MANHOLE STEPS

A. Steps shall be Aluminum Alloy AA Designation 6061-T6 meeting Federal Specifications QQ-A200/8 or Copolymer Polypropylene plastic molded over No. 4, Grade 60 steel reinforcement. Place all steps on 12-inch centers. Portion of steps embedded in concrete shall be given a coat of heavy bodied bituminous paint. Steps and installation shall meet ASTM C478 requirements.

5 PIPE OPENING SEALS

A. Pipe opening seals shall be cast integrally with manhole section, sized to fit pipe specified, set at correct elevation and location. Seals shall meet the requirements of the ASTM C923.

6 PREFORMED PLASTIC SEALING COMPOUND

A. Sealing compound shall be of either bituminous or butyl rubber base and conform to Federal Specification SS-S-210 A, Type I. Material shall be in rope form, supplied with a two-piece cover to preclude adhesion until use. Material shall be a minimum size of 7/8 inch H 1-3/8 inch or equivalent to 13-inch round.

7 CONCRETE MANHOLE ADAPTORS (WATERSTOPS)

A. Waterstops shall be composed of virgin polyvinyl chloride (PVC) sized for respective pipe.

8 BITUMINOUS COATINGS

- A. Manhole coatings (2 coats) shall be bitumastic material as approved by the Altoona Water Authority. Minimum dry film thickness: exterior – 16 mils; interior – 8 mils.

9 MANHOLE BRICK

- A. Brick shall be manufactured using clay or shale, burned and meet the requirements of ASTM C62.

10 CONCRETE MASONRY UNITS FOR MANHOLES

- A. Masonry units shall be manufactured in solid precast segmented units and meet the requirements of ASTM C139.

11 WATERPROOFED MORTAR

- A. Mortar shall meet the requirements of ASTM C270, Type M, 2500 psi.
- B. Mix shall consist of 1-part cement, 3-part lime, and 22 parts sand. Two (2) pounds of waterproofing powder (Sika, BASF, Xypex or equal) shall be added per bag of cement.

12 MANHOLE FRAMES AND COVERS

- A. Castings for frames and covers for manholes shall be composed of best quality, tough, gray iron, free from cold shuts, blow holes, and other imperfections, and shall meet the requirements of ASTM Designation A48 for Class No. 30, designed for AASHTO Highway Loading Class HS-20.
- B. All bearing surfaces shall be machined flat, sandblasted clean, and the entire unit shall receive one coat of asphaltum paint.
- C. Frames shall be bolted to the precast manhole sections with expansion bolts and anchors.
- D. All manhole covers shall bear the word SANITARY and contain two non-penetrating pick holes.

13 WATERTIGHT MANHOLE FRAME AND COVER (IF REQUIRED)

- A. This item shall be same as specified in Subsection 2.13 except cover shall have a neoprene gasket contained in a factory machined dovetail or rectangular groove in the bearing side of cover.
- B. Cover shall have a minimum of two 2" diameter stainless steel bolts installed through the cover into the frame.

14 APPROVED MANUFACTURERS FOR FRAMES AND COVERS

- A. East Jordan Iron Works
 - 1. Standard Frames: 1020Z 6" Tall Frame (Product #00102010)
 - 2. Standard Covers (Sewer): 1020C Vented 1 Hole Cover, Altoona, PA (Product #00102077)
 - 3. Watertight Frame and Covers: 1020 6" Tall Bolted and Gasketed Watertight Manhole Assembly (Product #00102008)

15 EXCAVATION AND BACKFILL

- A. Excavation shall conform to the applicable requirements of Sanitary Sewer Piping System – General Provisions.
- B. Excavate manhole area to allow minimum of 6 inches of bedding of AASHTO No. 57 coarse aggregate properly leveled and compacted prior to settling manholes base.

16 MANHOLE BASES

- A. Cast-in-Place
 - 1. Base shall be to the design and dimensions indicated on the drawings, as appropriate.
 - 2. Bases shall be reinforced as specified in Paragraph 1.02.C. Use PennDOT Class A concrete. Set precast wall section into fresh concrete for integral joint.
 - 3. When using wall sections which contain no integral pipe seals use length of pipe which extends only to outside of base dimension. Place approved water stop on pipe at center point of wall thickness.

4. Flow channels shall be formed directly in the concrete of the manhole base and shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer sections. Changes in the direction of the sewer and entering branches shall have a true curve of as large a radius as the size of the manhole will permit.
 - a. Complete concrete placement around pipe openings, working well into water stop. Finish flush of outside.
 - b. All slopes (benches) outside flow channels shall be sloped gradually toward invert.

B. Precast

1. Precast bases shall be set on aggregate bed as Subsection 3.1 B.
2. Flow channels shall be placed after pipe placement using PennDOT Class A concrete.
3. Flow channels, same size as pipe, may be constructed directly with the precast base at time of manufacture. Submit manufacturer's product data to Altoona Water Authority of approval before placing order.

17 MANHOLE SECTIONS

- A. All precast concrete ring sections and top sections shall fit together readily to permit effective jointing. Joints between adjacent sections of all manholes shall be made with 2 strips of approved preformed joint sealing compound. All material squeezed out on inside of manhole shall be cut off.
- B. Adjoining riser and conical top sections shall be fitted together in such a manner as to assure true vertical alignment of manhole steps.

18 MANHOLE FRAMES AND COVERS

- A. Set manhole frame to proper elevation and to cross section slope where required. Set in a bed of waterproof mortar, bring mortar up over frame.
- B. Where adjustment is required (maximum 1 foot) use precast concrete grade rings. Set in 2 strips of preformed plastic sealing compound, taking care to align bolt holes. Paint exterior surface with 2 coats bituminous paint with a dry film thickness of 16 mils. Recheck elevation due to possible sealant compression.

- C. When using brick or concrete masonry units for adjustment (maximum 4 inches) set units in full mortar bed, with staggered joints. Strike all joints inside and outside.
- D. Parge exterior brick and concrete masonry surfaces with a minimum of 2 inch of waterproof mortar. Paint with approved bituminous coating.
- E. Tighten down manhole frame using bolts long enough to reach insert in cone or flattop section.
- F. Contractor shall be responsible to see that all such items as mentioned under this Section are adjusted to the new paving elevation to provide a smooth, even transition from pavement to manhole cover.

19 DROP MANHOLES

- A. Drop connection shall be made where the invert of any inlet pipe is 2 feet or higher than the invert out of the manhole. Precast manhole sections shall have openings with integrally cast pipe seals to fit design elevations for new installations. When using “doghouse” sections or connecting to existing manholes, refer to construction details of pipe through wall section. Refer to typical drop manhole details of the Authority.

20 LIFTING RECESS SEALING

- A. Seal with tapered rubber plug designed to fit recess. Drive plug home to ensure water and air tightness. Straight through lifting holes of exposed concrete (no hole forming material in place) shall be tightly filled with waterproof mortar and when dry, painted with an approved bituminous coating.

21 PLANNED PIPE OPENINGS

- A. When future pipe connections have been planned for manholes, they shall be plugged to preclude exfiltration and infiltration.
 - 1. With integral pipe seals place a pipe stopper/plug of the size required, properly secured for any thrust caused by testing, etc.
 - 2. Where a “doghouse: opening may occur, lay up cement masonry units with waterproof mortar, parge, and when dry paint with an approved bituminous coating.

22 TESTING

- A. Each manhole shall be tested using the vacuum testing method. Testing of manholes constructed on existing sewer lines where flow must be maintained will not be required. Backfilling of the manhole prior to testing is permitted if the manhole is tested within 24 hours of backfilling.
- B. All testing shall be performed in the presence of the Altoona Water Authority and to his or her complete satisfaction.
- C. Manholes shall be complete in place and frames secured for testing acceptance.
- D. Contractor shall furnish all equipment and tools required for satisfactory vacuum testing to include:
 - 1. Vacuum apparatus equipped with necessary piping, control valves, and gauges to control air removal rate from manhole and to monitor vacuum.
 - 2. Provide an extra vacuum gauge known accuracy to frequently check test equipment.
 - 3. Manhole frame seal plate with vacuum piping connections.
 - 4. Pipe plugs.
- E. Vacuum Test Procedure
 - 1. Clean manholes and plug pipes with properly sized plugs.
 - 2. Perform vacuum testing in accordance with testing equipment manufacturer's written instructions.
 - 3. Draw a vacuum of 10 inches of mercury and close the valves.
 - 4. Manhole shall be acceptable when vacuum does not drop below 9-inches of mercury for the following manhole sizes and times:
 - a. 4-foot diameter – 60 seconds
 - b. 5-foot diameter – 75 seconds
 - c. 6-foot diameter – 90 seconds
- F. Manhole test failures shall require the determination of the leakage source and correction of same. If the Contractor chooses to backfill prior to testing, re-excavation to detect leaks shall be at the Contractor's expense.

1. Repair, replace defective material and workmanship using materials and methods approved by the Altoona Water Authority.
2. Repairs, replacements, and retesting required for acceptance shall be performed with no additional cost to the Altoona Water Authority.
3. Contractor shall be liable for Authority inspection costs for any retesting work.

23 STANDARD MANHOLE DIAMETERS AND WALL THICKNESS

MANHOLE DIAMETER	WALL THICKNESS
4'-0"	5"
5'-0"	6"
6'-0"	7"
7'-0"	8"
8'-0"	9"

CITY OF ALTOONA PAVING SPECIFICATIONS

1 GENERAL

- A. Contractor must secure a street opening permit from the City of Altoona, Bureau of Engineering.
- B. Contractor must supply the City with an Insurance certificate naming the City of Altoona as additionally insured.
- C. Backfill of the trench within the street area will be full depth 2A stone.
- D. Trench restoration in City roadways will require a 1-foot cutback.
- E. 5-inches (minimum) BCBC or Superpave 37.5 mm Wearing Course, 50 Gyration, PG 64-22, 0.0 to 0.3 million ESAL's.
- F. 2-inches (minimum) ID-2 Wearing Course or Superpave 9.5 mm Wearing Course, 50 Gyration, PG 64-22, 0.0 to 0.3 million ESAL's.
- G. Seal all joints of final restoration with AC-20.
- H. All disturbed curb, sidewalks, driveways, yards, etc., must be restored with like material and to original or better condition.
- I. All work within City Right-of-Ways will be subject to City inspection.

PAVING, SURFACING, WALKWAYS AND CURBS

1 BITUMINOUS PAVING/CEMENT CONCRETE PAVING

- A. The base course for bituminous concrete paving where designated shall be installed in accordance with Section 309, "Superpave Asphalt Mixture Design, Standard Construction, HMA Base Course," of PennDOT Publication 408. Base Course shall be the specified minimum thickness after proper compaction.

- B. The base course for cement concrete paving where designated shall be installed in accordance with Section 501 – "Reinforced or Plain Cement Concrete Pavements," of PennDOT Publication 408. Plain Cement Base Course shall be the specified minimum thickness after proper placement; except PennDOT high Early Strength concrete (H.E.S.) shall be placed, depth as required, to match existing base course (minimum thickness as shown on the drawing details) on all designated pavements. Welded wire fabric reinforcement for cement concrete pavements shall be WWF 6x12 – D9xD4 in accordance with Paragraph 709.4 – "Deformed Welded Fire Fabric" of Section 709 – "Reinforcement Steel" of PennDOT Publication 408. Dowel and dowel holes for cement concrete pavements shall be in accordance with Section 705.3 and 1003.A. of PennDOT Publication 408 and RC-26.
 - 1. Cement Concrete Paving, dowels, reinforcing steel, tie bolts and load transfer devices shall be constructed/installed in accordance with PennDOT Roadway Construction Standard (RC) 26 – "Concrete Pavement Rehabilitation".

- C. The binder course shall be installed in accordance with Section 409, "Superpave Mixture Design, Standard and RPS Construction of Plant-Mixed HMA Courses," of PennDOT Publication 408. Binder course shall be the specified minimum thickness, after proper compaction. Prior to placement of the bituminous course on cement concrete base courses, the Contractor shall apply a tack coat in accordance with Section 460 – "Bituminous Tack Coat," of PennDOT Publication 408.

- D. The wearing course shall be installed in accordance with Section 409, "Superpave Mixture Design, Standard and RPS Construction of Plant-Mixed HMA Courses," of PennDOT Publication 408. Wearing Course shall be the specified inches minimum thickness after proper compaction. Prior to placement of the bituminous course on cement concrete base courses, the Contractor shall apply tack coat in accordance with Section 460 – "Bituminous Tack Coat," of PennDOT Publication 408.

- E. All sub-base work shall comply with the requirements set forth in Section 350, "Sub-base," of PennDOT Publication 408.

- F. Placement: After completion of the aggregate base course, place base and wearing courses of types and thickness as shown on the Drawings.

- G. Tack coat all vertical joints between existing and new paving or E-6 or E-8 bituminous material in accordance with Section 460 of PennDOT Publication 408.

- H. Asphalt Receipts of Materials: Do not accept material unless it is covered with tarpaulins until unloaded, when the temperature is more than 15°F below the minimum temperature shown on the bituminous material supplier's Bill of Lading and when exceeding the maximum specified temperature.
- I. Asphalt Placement Temperatures: Do not place asphaltic concrete until the atmosphere and surface temperatures are 35°F (and rising) for base course and 40°F (and rising) for wearing; nor during fog, rain, or other unsuitable conditions.
- J. Asphalt Spreading: Spread material in a manner which required the least handling. Where thickness of finished pavement will be 3 inches or less, spread in on layer.
- K. Asphalt Rolling: After the material has been spread, roll with the specified equipment until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown on the Drawings.
 - 1. Roll the surface in at least two directions until no roller marks are visible.
 - 2. Finished surfaces shall be free from birdbaths, smooth, and shall be free of irregularities.
- L. All subgrades for paving and surfacing activities shall be rough graded and compacted in accordance with the density requirements set forth in Section 210, "Subgrade," of PennDOT Publication 408. Before placing the base and wearing courses, the Contractor shall check the subgrade and do all necessary rolling and vibrating to obtain a firm, even surface. All depressed areas shall be filled and consolidated, and any boulders or ledge rock shall be removed to a minimum depth of six (6) inches below the subgrade. All soft and spongy material shall be removed from the subgrade, replaced with suitable material, and compacted. The subgrade shall be rolled and cross-rolled to the proper cross-section and profile to receive the base and wearing courses. The base course shall not be installed over wet or frozen subgrade.
- M. All joints between the new pavement and existing pavement, curbs/curb gutters and all utility access components shall be sealed with hot bituminous material in accordance with Section 469 of PennDOT Publication 408, of the class and type designated for the wearing courses. Width shall be 12 inches for pavement joints and where curb acts as a gutter. All other locations shall be 6 inches.
- N. The Contractor shall be required to raise and adjust all utility access components affected by construction, including storm inlets, valve boxes, curb boxes, manhole covers, etc. and shall be responsible to coordinate the adjustment of all said utility access components to conform to the new pavement elevation.
- O. The Contractor shall perform trench restoration in order to return the public thoroughfares to a condition that will permit safe, free, and unobstructed movement of vehicular and pedestrian traffic immediately upon satisfactory completion of the laying and backfilling of pipelines in that public thoroughfare or portion thereof as designed by the Engineer. Failure of the Contractor to comply with this requirement shall constitute sufficient cause for the Engineer to order immediate stoppage of the Contractor's operation until minimum trench restoration requirements are completed to the satisfaction of the Engineer.

- P. Prior to repaving, the existing pavement MUST be concrete saw cut in a neat straight line one foot (1') on each side of the trench removed or to the curb line, whichever is the least dimension.
- Q. Backfill material for all pipe trenches in PennDOT highways or rights-of-way and all other paved areas shall be PennDOT No. 2A course aggregate, extending from the top of pipe bedding to the bottom of the proposed pavement structure. Pipe bedding material shall be PennDOT No. 2B or AASHTO No. 57 course aggregate. Backfill material shall be placed and compacted in accordance with the applicable provisions of Section 02200.
- R. Disturbance and/or replacement of traffic signal loop detectors required during the course of the project shall be installed in accordance with Section 1104.07 "Detectors" of PennDOT Publication 408. The Contractor shall thoroughly coordinate disturbance and/or replacement of any traffic signal loop detector with PennDOT or the municipality having jurisdiction prior to the start of construction.
- S. The Contractor shall finish and install ninety (90) day temporary pavement restoration prior to final pavement restoration of all PennDOT roadway surfaces, if required by PennDOT at no additional cost to Owner, in accordance with the details specified in PennDOT Publication 408.
- T. Temporary paving may be required depending on Contractor means and methods that cannot be controlled by the Owner. These costs are at the sole expense and responsibility of the Contractor.
- U. Cold plastic pavement markings or legends (inlaid) shall be in accordance with PennDOT Publication 408, Section 961 and the details shown on the drawings, painted traffic lines and markings shall be in accordance with PennDOT Publication 408, Section 962 and the details shown on the drawings.
- V. Finish all asphaltic surfaces to the following tolerances:
1. Base Course: Surface tolerances shall be as described in PennDOT Publication 408, Section 309.3(L).
 2. Wearing Course: Surface tolerances shall be as described in PennDOT Publication 408, Section 409.3(L).
- W. Asphaltic Core Testing
1. Bituminous Concrete Base Course: The Contractor will have the paving cored by an approved laboratory. Two cores will be taken for each day's production. The cores will be tested for thickness and density and the results given to the Authority. Any deficiencies from specified thickness by ½ inch or more will require the section represented to be replaced by the Contractor. The average density of the course shall be ≥ 88% of the theoretical density. The Contractor will replace any deficient sections. Core holes shall be properly patched and sealed.
 2. Wearing Course: Density testing shall be by nuclear gauge. ≥92% or <97% of theoretical density is required. Deficient sections shall be replaced.

2 OVERLAYING EXISTING PAVEMENT

- A. Where a bituminous surface course is required to be placed over existing pavement, the surfaces to be covered shall be cleaned of all foreign substances and any irregularities shall be removed and/or properly filled to level. A tack coat shall be applied in accordance with Section 460. "Bituminous Tack Coat," of PennDOT Publication 408. The wearing course shall be as specified above less than 3.1 BITUMINOUS PAVING.
- B. Where milling and/or pavement notching of bituminous surface courses is specified or designated on the Drawings, the Contractor shall perform same in accordance with Section 491 – Milling of Bituminous Pavement Surface of PennDOT Publication 408 at no additional cost to the Owner.
- C. Where designated on the Drawings or specified herein, scratch or leveling courses shall be applied for preparation of existing surfaces. Scratch or leveling course material shall be in accordance with paragraph 3.1.C and 3.1.D of Section 02600. No separate payment shall be made for scratch or leveling courses and shall be included in the cost for those items which payment shall be made in the Bid Form.
- D. Where the overlay meets the existing paving, a neat cut shall be made in the existing surface in accordance with the construction details as shown on Standard Rg-26 or as directed by the Altoona Water Authority.
- E. Contractor shall be responsible to see that all such items as mentioned in Section 3.2.A and B are adjusted to the new manhole elevation in such a manner as to provide a smooth, even transition from pavement to manhole cover.

3 REPAVING DISTURBED EXISTING PAVEMENT

- A. The Contractor shall be responsible for the restoration of any existing paving disturbed by his operations. All paving removed, damaged, or destroyed during the construction of the Project shall be replaced to a condition at least equivalent to that which existed prior to construction. The Contractor shall guarantee all paving replaced against defect and settlement for a period of one year following the date of final acceptance by the Owner.
- B. All non-rigid bituminous surface pavement shall be restored by neatly and uniformly cutting the edges and placing base and wearing courses over the entire disturbed area. Base and wearing courses shall be as specified above less than 3.1 BITUMINOUS PAVING.
- C. Driveways, street approaches, sidewalks, parking areas, curb, curb and gutter, etc. shall be replaced to match existing surface material, in accordance with applicable ordinances and as detailed in these Specifications and on the Contact Drawings.

4 CEMENT CONCRETE WALKWAYS AND PEDESTRIAN AREAS

- A. Cement concrete walkways and pedestrian areas shall be constructed in accordance with Section 676, "Cement Concrete Sidewalks," of PennDOT Publication 408. Concrete for walkways and pedestrian areas shall conform to the general technical requirements set forth in Section 704 – Cement Concrete of PennDOT Publication 408.
- B. Walkways shall be cross scored approximately every four feet and furnished with one-half inch pre-molded bituminous expansion joints every 16 feet. Pedestrian areas shall be cross scored approximately every four feet each way and furnished with one-half inch pre-molded bituminous expansion joints every 16 feet each way. Welded wire mesh (6x4 – 4/4) shall be installed in all walkways and pedestrian areas. Pedestrian area slabs shall be sloped to drain away from adjacent structures. Exterior walkway slabs shall be sloped to drain away from adjacent structures. Exterior walkway slabs shall receive alternating light broom finish.
- C. The Contractor shall install cement concrete sidewalk conforming to the details and at the locations shown on the Contract Drawings and conforming to existing lines and grades. The Contractor shall also conform to the applicable construction requirements of Section 676, "Cement Concrete Sidewalks," PennDOT Form 408 Specifications.
- D. PennDOT No. 2A aggregate material shall be spread on the prepared foundation to form a compacted bed 4 inches in depth. The sidewalk shall accommodate existing utility facilities including gas shutoffs, curb stops, utility poles and traffic poles, etc. Where existing driveways are as required. A suitable ¼ "expansion joint material shall be replaced at the contact of the curb and sidewalk and at the contact of the sidewalk and building line where applicable.
- E. The Contractor is advised that any sidewalk affected during construction and not designated for replacement shall be replaced at the Contractor's own expense and shall conform to the herein described specifications. Any excavation of existing sidewalk shall be considered incidental to the installation of cement concrete curb.

5 CEMENT CONCRETE CURBS

- A. Cement concrete curbs shall be constructed in accordance with the Contract Drawings and Section 630, "Plain Cement Concrete Curb," of PennDOT Publication 408 and the details shown on the Drawings. Concrete for the curbs shall conform to the requirements set forth in Section 704 – Cement Concrete of PennDOT Publication 408.
- B. The Contractor shall install cement concrete curb conforming to the details and at the locations shown on the Contract Drawings and conforming to existing lines and grades. The Contractor shall also conform to the applicable construction requirements of Section 630, "Plain Cement Concrete Curb," PennDOT Form 408 Specifications.
- C. The Contractor is advised that any curb affected during construction and not designated for replacement shall be replaced at the Contractor's own expense and shall conform to the herein described specifications.

- D. Cement concrete curb replacement shall include straight, curved and depressed sections as required by existing conditions in the field. Any excavation of existing curb shall be considered incidental to the installation of cement concrete curb.

6 STABILIZATION

- A. Stabilization shall consist of six inches, minimum compacted thickness, placed in accordance with Section 677 – Selected Material Surfacing of PennDOT Publication 408 and the details shown on the Drawings. Stabilization material shall consist of PennDOT No. 2A course aggregate in accordance with Section 703.3 Select Granular Material (2A) of PennDOT Publication 408, or PennDOT No. 2A crushed limestone or other similar aggregate as required to match existing surface.

7 SEALING

- A. All joints between the new paving and the existing paving and where the new paving abuts other materials such as curbs, manhole frames, and inlets shall be sealed with PennDOT Bituminous Material, Class PG64-22. Width shall be 12 inches for pavement joints and where curbs acts as a gutter. Others shall be 6 inches.

8 MAINTENANCE

- A. The Contractor shall maintain the final pavement for a period of 24 months following the date of acceptance of project. In general, depressions in the final pavement in excess of one-half inch below the normal road grade shall be corrected. Corrections in the pavement shall be made within 15 days after the Contractor has been notified of the need for corrective action. In the event of the failure or refusal of the Contractor to make such corrections, the Authority reserves the right to have the necessary work performed and to charge the cost to the Contractor under the Maintenance Bond.