



Altoona Water Authority

Standards of Construction

Last Revised April 17, 2019

TABLE OF CONTENTS

WATER DISTRIBUTION PIPING SYSTEMS - GENERAL PROVISIONS	1
PIPELINE EARTHWORK.....	4
CITY OF ALTOONA PAVING SPECIFICATIONS	14
DUCTILE IRON PIPE.....	15
PIPE JACKING/PIPE BORING	18
GATE VALVES.....	21
FIRE HYDRANTS	24
TAPPING SLEEVES AND VALVES	26
COMBINATION AIR RELEASE/AIR VACUUM VALVES	27
PRESSURE REDUCING VALVES	29
BACKFLOW PREVENTER.....	30
WATER SERVICE CONNECTION	32
METERS AND METER PITS	33
COUPLINGS.....	35
BLOWOFF ASSEMBLIES.....	36
JOINT THRUST RESTRAINT SYSTEMS	37
POLYETHYLENE ENCASEMENT.....	38
CONCRETE ENCASEMENT, CONCRETE CRADLE AND CONCRETE THRUST BLOCKING	39
MANHOLES AND VAULTS	40
INDICATOR POSTS	45
FIRE SERVICE REQUIREMENTS	46
WATER SYSTEM EXTENSIONS	47
PIPING SYSTEM STERILIZATION AND TESTING	49
PLAN SUBMITTAL CHECKLIST	51

WATER DISTRIBUTION PIPING SYSTEMS - GENERAL PROVISIONS

1.01 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 these Specifications and the Drawings.
- C. The interior surface of all pipe and fittings shall be free from fractures, crazing, and roughness.

1.02 Storage and Handling

- A. All pipe, fittings, etc. shall be carefully handled and protected against damage, impact shocks, and free fall in accordance with AWWA C600. 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 the 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.

1.03 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, valves, 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 a cold chisel, standard iron pipe cutter, or any other 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. Cut ends and rough edges should be ground smooth and for push-on connections. The cut end should be beveled slightly.

- F. Buried pipe, including couplings and valves, 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. Immediately before installing a section of bell and spigot pipe with rubber gasketed joints, the bell of the pipe section already in place and the spigot of the pipe section to be laid shall be thoroughly cleaned internally and externally. Subsequently after proper insertion of a new gasket, this same surface shall be coated with a thin film of lubricant, as provided by the pipe manufacturer.
- H. Where necessary to adjust the location of pipe due to an unforeseen obstruction or other causes, the Altoona Water Authority may change the alignment and/or the grade. Such change shall be made by the deflection of joints or by the use of additional fittings. In no case shall the deflection in the joint exceed the maximum deflection recommended by the pipe manufacturer.
- J. Pipe shall not be installed upon a 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.
- K. 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 testing, disinfecting, and placing in operation.
- L. 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.
- M. Adequate protection and maintenance shall be provided for all existing underground and surface utility structures, 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.
- N. Particular care shall be exercised so that no high points are established where air can accumulate. In the event field conditions necessitate a high point, an air release valve shall be installed.

1.04 Connections to Existing Water 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 water system, or when it will be necessary to close down a portion of the existing system to carry out the work. Under no circumstances are valves to be manipulated on the existing water system, except under the direct supervision of a representative of the Altoona Water Authority.

- B. The Altoona Water Authority reserves the right to designate the day and time when the existing water 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 water mains, or in other areas where service to customers will be interrupted, be carried out continuously and expeditiously until water 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 Contractor means and methods as Altoona Water Authority cannot control number of shut downs required.
- C. In all cases where connections to the existing water system or other work will require an interruption of water service, carefully plan such work ahead in close coordination with the Altoona Water Authority. Have the Altoona Water Authority approve installation schedule and procedure 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 water 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

1.01 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.

1.02 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 a 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 highway. 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 passageway 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 shutdown any alley.

1.03 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.

1.04 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.

1.05 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.

1.06 Material for Overexcavation

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

1.07 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(c) Aggregates or PennDOT Select Granular Material (2RC) as specified in Section 703.3 of PennDOT Publication 408.

1.08 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 1.05.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.

1.09 General Excavation

- A. The Contractor shall be required to perform all excavation, including pipetrench 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 ledgerock, 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.

1.10 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.

1.11 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 not 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 effected 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.

1.12 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.

1.13 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 excavations 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.

1.14 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 job conditions.

1.15 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; not more than two hundred feet of trench shall be open at any one time.
- 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 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 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 governmental agencies and meeting all of the applicable requirements for soil erosion and water pollution control.

1.16 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 inches of concrete shall be provided under and on each side of the pipe, extending upward to a point two 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.

1.17 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 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.

1.18 Anchoring and Blocking Pressure Piping

- A. All bends, plugs, caps, tees, and wye branches along pipelines shall be adequately blocked or anchored to prevent the pipelines from separating under pressure. Concrete used for blocking and anchoring pipelines shall be as described in PennDOT Publication 408.
- B. Concrete anchors are required to be furnished and installed at the locations in accordance with the details and as directed and approved by the Altoona Water Authority.

1.19 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.

1.20 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 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.

1.21 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.

1.22 Dewatering

- A. The Contractor shall at all 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 plant or equipment ready for immediate use.

1.23 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.

1.24 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 refilled 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 refertilize 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 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.

CITY OF ALTOONA PAVING SPECIFICATIONS

1.01 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 additional 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, sidewalk, 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.

DUCTILE IRON PIPE

1.01 General

- A. Ductile iron pipe shall conform to AWWA C151, subject to the following supplemental requirements. The pipe shall be of the diameter and class indicated, shall be furnished complete with rubber gaskets, and all specials and fittings shall be manufactured or supplied by American Ductile Iron Pipe (a division of American Cast Iron Pipe Company, Birmingham, Alabama), US Pipe Corporation, Clow Corporation, Atlantic States Cast Iron Pipe Company or approved equal.
- B. Pipe laying lengths shall be provided in 20-foot nominal lengths with allowable trim pipe lengths in accordance with AWWA C151. Special shorter lengths may be approved by the Altoona Water Authority when required.

1.02 Pipe

- A. Pipe materials shall be thickness Class 52 (minimum). Class 56 (minimum) shall be used areas of railroad property right-of-way crossing and anywhere casings are required. Materials conform to the requirements of AWWA C150 and AWWA C151. Materials shall be Pressure Class 350 for 3-inch through 16-inch and Pressure Class 250 for 18-inch through 48-inch pipe.
 - 1. **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 fittings 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.
 - 2. **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.
 - 3. **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.
 - 4. **Joint Design:** Ductile Iron pipe shall be furnished with push-on joints or push-on restrained joints. Restrained joints shall be American Fast-rip, Flex-Ring, or Lok-Ring.
 - 5. **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.
 - 6. **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.”

7. **Installation:** Ductile iron pipe shall be loaded, transported, unloaded, installed, and tested in accordance with AWWA C600.
- B. Cement for mortar lining shall be double cement application and conform to the requirements of AWWA C104.
- C. Pipe joints shall be push-on type, except restrained joint pipe shall be used on slopes exceeding 30%. All pipe joint systems shall conform to the applicable provisions of AWWA C111.

1.03 Fittings

- A. Fittings shall be ductile iron mechanical joint fittings in accordance with AWWA C110, AWWA C153 and AWWA C606, latest revisions, and conform to the following:
 1. Joints shall be mechanical joint type, conforming to the applicable provisions of AWWA C111. Fittings shall be double cement lined and bituminous seal coated in accordance with Paragraph's 1.05 of this section. Exterior coatings for fittings shall be in accordance with Paragraph 1.06 of this section and AWWA C153 or AWWA C104 as applicable. Bolts shall be high-strength, low alloy steel per AWWA C111. Unless otherwise noted, gasket material shall be standard styrene butadiene copolymer (SBR) according to AWWA C111.
 2. Size 3-inch through 16-inch - AWWA C153. Class 350 Ductile Iron Compact Fittings for 3-inch through 16-inch with minimum working pressure rating of 350 psi.
 3. Size 18-inch through 48-inch - AWWA C110 Class 350 Ductile Iron Full Body Fittings minimum working pressure rating of 350 psi through 24-inch, and Class 250 Ductile Iron Full Body Fittings with minimum working pressure, 250 psi for 30-inch through 48-inch.

4. Ductile iron fittings larger than 48-inch shall conform to the reference standard, with the necessary modifications for the larger size.
5. Direct connection of mechanical joint fittings shall be bolt-through, restraint type Foster Adaptor fittings by Infact Corp., Fairview, TN(888) 773-9130, or approved equal.

1.04 Restrained Joint Pipe and Mechanical Joint Restraint

- A. Mechanical joint restraints shall be EBAA Iron, Inc. Series 1100 "MEGALUG" mechanical joint restraint or Ford Meter Box Co., Inc. Series 1400 Uni-Flange wedge action retainer gland, working pressure of 350 psi through 16" size and 250 psi, exceeding 16" size with twist-off nuts to insure proper actuating of the restraining devices. Installation shall be per all manufacturers' recommendations.
- B. Restrained Push-on Joint Pipe shall be "Lok-Ring" or "Flex-Ring" restrained joint pipe by American Cast Iron Pipe Co.; "TR FLEX" restrained joint pipe by U.S. Pipe; "Super-Lock" restrained joint pipe by Clow Corporation, or "Tyton" or "Fastite" restrained joint pipe by Atlantic States Cast Iron Pipe Co., or approved equal.

1.05 Exterior Coating Systems

- A. Exterior coating systems for all buried ductile iron pipe and fittings shall be furnished and applied in conformance with a standard 1 mil thickness asphaltic coating application of Section 51-9 (latest revision), of AWWAC151.

1.06 Installation of Ductile Iron Pipe

- A. All ductile iron pipe shall be installed in accordance with ANSI/AWWAC600.
- B. Push-On Joints: Join pipe in accordance with AWWA C600-77, Section 3.4.1, latest revision.
- C. Mechanical Joints: Join in accordance with AWWA C600-77, Section 3.4.2., latest revision.
- D. Restrained Mechanical Joints: Install restrained mechanical joints in the same manner as the mechanical joints, except after the joint bolts are tightened, tighten the wedge actuating screws in the restraint mechanism.
- E. Restrained Joint Pipe: Install in the manner provided for by manufacturer's instructions.
- F. Sacrificial Anodes: One half of all buried bolts on fittings, valves and specials shall be fitted with Mars Zinc Caps, as manufactured by Mars Co., Ocala, Florida (800-782-5268), or approved equal.

PIPE JACKING/PIPE BORING

1.01 Submittals

A. General

1. 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.

1.02 Steel Casing Pipe

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 wrap around casing end seal so as to prevent the entrance of foreign material.

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

1.04 Installation

- A. The jacking/boring equipment shall be of 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 casing 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 wrap-around 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 a projection type with a minimum number of projections 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 voids 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.

1.05 Waterline Through Steel Casing Requirements

- A. Waterline through steel casing shall be Class 56 with field lok gaskets.

1.06 Railroad Requirements

- A. The Contractor shall comply with "CE-8, Specifications for Pipeline Occupancy" while working within Norfolk Southern Railway Corporation property or 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.

GATE VALVES

1.01 Gate Valves

- B. All gate valves and accessories shall be new and of current manufacturer. Gate valves shall be ductile iron, American Flow Control Series 2500, Mueller Series 2361, Kennedy Series 7571, or approved equal, resilient wedge type, MJ x MJ, according to all provisions of AWWA C515, latest revision, rated for 250 psi cold water working pressure. Gate valves shall be NSF Standard 61 certified.
- C. All packing, gaskets, discs, seats, diaphragms, lubricants, etc., shall conform to the recommendations of the gate valve manufacturer and suitable for the intended operating conditions. All valves shall be marked "DI" or "Ductile Iron" as cast on the valve.
- D. Gate valves 3 through 36 inches in size shall be of the ductile iron body, wedge type, non-rising bronze stem, resilient seated wedge type manufactured to equal or exceed the requirements of AWWA Specification C-515, as revised to date, with a working water pressure rating of 250 psi. The wedge shall be ductile iron encapsulated with EPDM.
- E. Valves shall be non-rising stem (NRS) and be provided with a 2" square wrench nut for buried service. End connections shall be mechanical joint ends conforming to ANSI/AWWA C111, with all necessary joint accessories (bolts, glands, and gaskets) supplied by the manufacturer. All gaskets shall be pressure energized O-ring type seals. Bolting materials shall develop the physical strength requirements of ASTM A307 and may have either regular square or hexagonal heads with dimensions conforming to ANSI B18.2.1. Metric size socket head cap screws are not allowed. Valves shall have a full opening flow way of equal diameter of the nominal size of connecting pipe. Valve body, bonnet, stuffing box and wedge castings shall be manufactured of ductile iron according to ASTM A536.
- F. All internal and exterior ferrous metal surfaces shall be fully coated, holiday free with a fully bonded epoxy coating, complying with ANSI/AWWA C-550, applied electrostatically prior to assembly. Coating shall also have NSF Standard 61 certification.
- G. The sealing and seating mechanism shall provide ZERO leakage at working water pressures up to 250 psi and with flow in either direction.
- H. Stem shall be sealed by three (3) O-rings. The top two (2) O-rings shall be replaceable with the valve fully open and while subject to full rated working pressure. O-rings set in a cartridge shall not be allowed.
- I. The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of the AWWA C515 Standard. Stainless steel stems are not acceptable. The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three (3) sides by the wedge to prevent possible misalignment. The operating nut shall be constructed of ductile iron and shall have four (4) flats at the stem connection to assure even input torque to the stem. The valve shall have thrust washers located with one (1) above and one (1) below the thrust collar to assure trouble-free operation of the valve.

- J. The Altoona Water Authority shall determine the direction of valve opening ("RIGHT" or "LEFT"). No valve shall be installed until the direction of the opening has been verified.
- K. Where specified or shown on the Drawings, gate valves shall be bevel geared for horizontal installations with non-rising stems. Bevel gear valves shall employ braided compression packing. Gate valves shall be equipped with two (2) lifting lugs per valve. Where specified on the Drawings, all gate valves shall be installed in a horizontal position and equipped with rollers, tracks, and scrapers. Tracks shall be mounted adjacent to the face of the disc. Non-rising stem, bevel gear with outside packed case and watertight gland enclosure shall be provided for all gate valves.
- L. The manufacturer shall subject each valve to two (2) hydrostatic pressure tests and, if requested, provide written, certified affidavits of compliance in accordance with the following criteria:
 - 1. Seat Test -- there shall be no leakage past the seat from either side of the disc or at the bonnet flange or stem packing at 250 psi.
 - 2. Shell (Bulkhead) Test -- there shall be no leakage through the metal, bonnet flange or stem package at 500 psi.

1.02 Roadway Valve Boxes

- A. Roadway valve boxes shall be furnished and installed for all buried gate valves according to Figure 4905 by Bingham & Taylor, Culpepper, VA. Roadway valve boxes shall be cast iron, two-piece, screw type, 5¼ inch shaft, with cover marked "WATER", Altoona Water Authority standard. Valve box bases shall be round type with bottom diameter as required for the type and size of gate valve.
- B. The lengths of the valve boxes shall be furnished and installed, as required, to meet the actual field conditions encountered. The roadway box shall be installed in conformance with the manufacturer's recommendations. Roadway valve boxes shall be hot bituminous coated, inside and outside, with a coal tar or asphaltic compound.
- C. The Contractor shall provide extended valve operators for all buried valves with indicator disks. The extended valve operator shall be Figure No. 5051 by Bingham & Taylor, Culpeper, VA, Altoona Water Authority standard. The extended valve operator shall be a 1¼" diameter steel shaft extension with 2" square AWWA operating wrench socket to operate the valve operating nut and a 2" AWWA square operating nut for the valve wrench operator key. Wrench sockets welded to shaft pins are not acceptable. A centering disk, ½" minimum less in diameter than the inside diameter of the valve box shall be provided. The indicator disk shall have a directional "OPEN" arrow signifying the correct direction of opening. The lengths of the extended valve operator shall be furnished and installed, as required, to meet the actual field conditions encountered.

1.03 Installation of Valves

- A. All valves, operators, operator extensions, roadway boxes, and other accessories shall be installed as shown on the Drawings or specified. Installation procedures shall also conform to the written instructions of the respective valve manufacturers and the Altoona Water Authority.

- B. Prior to installation, inspect valves for direction of opening, freedom of operation, tightness of pressure-containing bolting, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Correct defective valves or hold for inspection by the Altoona Water Authority.
- C. Set and join to the pipe in the manner specified. Provide valves with special support, such as crushed stone or concrete pads so that the pipe will not be required to support the weight of the valve. Set truly vertical.
- D. Provide all valves with a valve box and operator extension. Set the top of the valve box neatly to the grade of the surface to the existing ground, unless directed otherwise by the Altoona Water Authority. Center and plumb the box over the wrench nut of the valve. Do not use valve to bring misaligned pipe into alignment during installation. Support pipe in such a manner as to prevent stress on the valve.
- E. A Concrete Indicator Pad is required for all valves in non-paved locations, or as required by the Altoona Water Authority, and shall be installed as shown on Standard Detail entitled Concrete Indicator Pad.

FIRE HYDRANTS

1.01 Fire Hydrants

- A. Fire hydrants shall meet or exceed AWWA C502, latest revision. Rated working pressure shall be 200 psig, test pressure shall be 400 psig and hydrants shall include the following specific design criteria. The main valve closure shall be of the compression type, opening against the pressure and closing with the pressure. Traffic feature will be designed for easy 360-degree rotation of nozzle section during field installation. There shall be a sealed lubrication chamber with triple O-Rings to seal operating threads from the waterway and accommodate an anti-friction thrust washer. The main valve opening shall not be less than 5¼" and be designed so that removal of all working parts can be accomplished without excavating. The bronze seat shall be threaded into mating threads of bronze for easy field repair. The draining system of the hydrant shall be bronze and be positively activated by the main operating rod. Hydrant drains shall close completely after no more than three (3) turns of the operating nut. There shall be a minimum of (3) internal ports and (4) drain port outlets to the exterior of the hydrant. Drain shutoff to be by direct compression closure. Friction loss shall not exceed 3.5 psig at 1,000 gpm through 4½" pumper nozzle.
- B. All hydrants shall be American Flow Control American-Darling B62B1, provided with the following components.
1. 5¼" valve opening
 2. Two (2) 2½" hose nozzles (GA6-296)
 3. One (1) 4½" pumper nozzle (GA-NST)
 4. 1½" pentagon operating nut, open "LEFT"
 5. 6" mechanical joint shoe with accessories
 6. Hydrant painted the color "YELLOW"
 7. Threads shall conform to Pittsburgh No. 6 (Altoona Water Authority Standard)
 8. No chains on the caps
- C. Hydrants shall be located as directed by the Altoona Water Authority. Maximum distance between fire hydrants shall be no more than 500 feet. The location shall provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. When placed behind the curb, the hydrant barrel shall be set so that the centerline of the barrel will be not more than eighteen inches from the curb line. All hydrants shall stand plumb with the pumper nozzle facing the curb. Hydrants having two (2) nozzles 90° apart shall be set with each nozzle facing the curb at an angle of 45°. Hydrants shall be set to the established grade, with nozzles at least eighteen inches above the ground as shown on the Drawings or as directed by the AWA. Unless otherwise shown, each hydrant shall be connected to the main with a six (6) inch mechanical joint branch connection controlled by an independent six (6) inch mechanical joint AWWA C515 gate valve. All mechanical joints shall be restrained by mechanical thrust restraint devices (MEGA-LUGS) as specified elsewhere herein.

Unless otherwise directed by the Altoona Water Authority, a drainage pit three (3) feet by three (3) feet by three (3) feet deep shall be excavated below each hydrant. The pit shall be filled and compacted with AASHTO No. 3 course aggregate, under and around the base of the hydrant to a level of 6 inches above the waste opening. No hydrant drainage pit shall be connected to a sanitary sewer.

The drainage pit shall be lined and covered with geotextile fabric and the fabric shall completely isolate the gravel or stone so that no fill material or adjacent earth comes in contact with pit material.

A reaction or thrust backing shall be provided at the base of each hydrant and shall not obstruct the drainage outlet of the hydrant. The size and shape of concrete thrust backing shall be as specified elsewhere herein or as approved by the Altoona Water Authority.

A Concrete Pad is required for all hydrants in non-paved locations, or as required by the AWA.

D. After installation and before backfilling (and after pressure testing the water main, if it has been installed) test the hydrant as follows:

1. Pressure Test

- a. Open the hydrant fully and fill with water; close all outlets.
- b. To prevent caps from being blow off dry-barrel hydrants and to prevent other possible damage, vent air from the hydrant by leaving one of the caps slightly loose as the hydrant is being filled. After all air has escaped, tighten the cap before proceeding.
- c. Apply line pressure.
- d. Check for leakage at flanges, nozzles and operating stem.
- e. If leakage is noted, repair or replace components or complete hydrant until no leaks are evident.

2. Drainage Test for Dry-Barrel Hydrants

- a. Following the pressure test, close hydrant.
- b. Remove one nozzle cap and place pylon or hand over nozzle opening.
- c. Drainage rate should be sufficiently rapid to create a noticeable suction.
- d. After backfilling, operate the hydrant to flush out any foreign material.
- e. Tighten nozzle caps then back them off slightly so that they will not be excessively tight. Leave tight enough to prevent removal by hand.

TAPPING SLEEVES AND VALVES

1.01 Tapping Sleeves and Valves

- A. Tapping sleeves shall be full circumferential all stainless steel flanged outlet style Ford FTSS or Romas SST III.
- B. Tapping valves shall be in conformance with the applicable provisions of AWWA C515. The flanged end of the tapping valve shall be faced and drilled for 250 lbs. standard in accordance with ANSI B16.1. The mechanical joint end of the tapping valve shall be in accordance with the applicable provisions of AWWA C111. Tapping valves shall be furnished with a raised male face on the end flange, which fits into a recess on the tapping sleeve. This fit shall assure proper alignment between the sleeve and valve and facilitate passage of the cutter during the tapping procedure. Tapping valve requires the use of shell cutters ¼-inch smaller than valve diameter sizes 4-inch to 12-inch and shall accept full-size shell cutters for sizes 14-inch to 48-inch. The mating valve flange to the tapping sleeve outlet must have a raised male face, conforming to MSS SP-60, to ensure true alignment of valve and tapping machine. Tapping valves shall open either "RIGHT" or "LEFT" as determined by the Altoona Water Authority. All interior and exterior ferrous surfaces shall be protected against corrosion by fusion-bonded-epoxy coating. Coating shall be applied prior to assembly to assure coverage of all exposed areas, including bolt holes.
- C. The Altoona Water Authority reserves the right to make all taps 4-12-inches in diameter and to approve the subcontractor making all taps larger than 12-inch diameter. After installation of the tapping sleeve and valve assembly, but before making the tap, the assembly shall be pressure tested as specified herein, except the test duration shall be 15 minutes. No leakage shall be permitted.

COMBINATION AIR RELEASE/AIR VACUUM VALVE

1.01 General

- A. Combination air valves shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both air release and air/vacuum valves and furnished as a single body or dual body type as indicated on the Drawings.
- B. Connections
 - 1. Dual body valve sizes 3-inch and smaller and single body valve sizes 4-inch and smaller shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection. Larger sizes shall have bolted flanged inlets and plain outlets and protective hoods to prevent debris from entering the valve. Flanges shall be in accordance with ANSI B16.1 for Class 125 or Class 250 iron flanges and ANSI B16.5 for Class 300 steel flanges. The valve shall have two (2) additional NPT connections for the connection to gauges, testing, and draining.
- C. Design
 - 1. Both single and dual body valves shall provide a through flow area equal to the nominal size. Floats shall be unconditionally guaranteed against failure including pressure surges. The cover shall be bolted to the body and sealed with a flat gasket. A resilient bumper shall be provided on 4-inch and larger sizes to cushion the float during sudden opening conditions. The resilient seat shall be replaceable and provide droptight shut off to the full valve pressure rating.
 - 2. Dual body combination valves shall consist of an air release valve piped to an air/vacuum valve with a quarter-turn, full-ported bronze ball valve. The air release valve shall have a leverage mechanism with sufficient mechanical advantage so that the valve will open under full operating pressure. Simple lever designs shall consist of a single pivot arm and a resilient orifice button. Compound lever designs shall consist of two (2) levers and an adjustable threaded resilient orifice button. The air/vacuum valve sizes 4-inch and larger shall have a cover fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. The float shall be protected against direct water impact by an internal baffle bolted to the cover or integrally cast in the body. The seat shall be a minimum of 5-inch thick on 2-inch and larger valves and secured in such a manner as to prevent distortion. Valves with working pressures above 400 psig shall have metal seat with synthetic seals.
 - 3. Single body combination valves shall have an expanded outlet to provide full flow area around the guide mechanism. The valve shall have a double guided plug on 2-inch and larger sizes, and an adjustable threaded orifice button. The plug shall be protected against direct water

impact by an internal baffle. On valve sizes 4-inch and smaller, the plug shall have a precision orifice drilled through the center stem. On valve sizes 6-inch and larger, air release and air/vacuum mechanisms shall be provided as separate units contained within the same body and meet the same design specifications for the dual body combination valve in Section 3.02 above.

D. Materials

1. The valve body and cover shall be constructed of ASTM A126 Class B cast iron for Class 125 and Class 250 valves. Class 300 ductile iron valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. Dual Body Class 300 steel valves shall be constructed of ASTM A216 Grade WCB cast steel. The float, guide shafts, and bushings shall be constructed to Type 316 stainless steel. Non-metallic floats, linkage, or bushings are not acceptable. Resilient seats shall be Buna-N. Class 300 steel dual body valves shall have a 316 stainless steel seat with Buna-N seal to provide an initial contact to Buna-N with a final metal-to-metal contact to prevent over compression of the resilient seal. A screwed outlet connection shall be provided for vault piping. An optional isolation valve shall be furnished under the combination air valve when specified. For sizes with threaded inlets, the isolation valve shall be a fully-ported brass ball valve. For sizes with flanged inlets, the isolation valve shall be an AWWA Class 150B or 250B Butterfly Valve with quarter-turn gear actuator and handwheel.
2. The valves shall be manufactured and tested in accordance with American Water Works Association Standard (AWWA) C512. The exterior of the valve shall be coated with a universal alkyd primer. Combination air valves shall be Series 201C.2 (Single Body) or Series 100/22-50 (Dual Body) as manufactured by Val-Matic® Valve & Mfg. Corporation, Elmhurst, IL, USA, APCO Series 140C as manufactured by APCO Valves and Primer Co., Schaumburg, IL, or approved equal.

E. Installation

1. One-inch air release shall be installed in screw type, 5¼-inch shaft valve box as specified herein. Two-inch air release shall be installed in a 48-inch diameter manhole with traffic style lids, as specified herein. Manholes shall be insulated with Versi-Foam.

PRESSURE REDUCING VALVES

1.01 Function

- A. The Pressure Reducing Valve shall maintain a constant downstream pressure regardless of changing flow rate and/or inlet pressure.
- B. Valve shall be a Cla-Val Co. Model No. 90-01/690-01 Pressure Reducing Valve as manufactured by Cla-Val Co. Newport Beach, CA 92659-0325 (1-800-942-6326). No others will be accepted.

1.02 Installation

- A. Pressure reducing valves shall be installed in pairs with isolation valves to permit removal and constant unimpeded operation. The pressure reducing valves shall be installed and conform to the operating conditions as shown on Drawings and as specified herein. Pressure reducing valves shall be installed in water proof concrete or steel vaults having a minimum inside dimensions of 6-feet horizontal and 5-feet vertical, with provisions for vault drainage.

BACKFLOW PREVENTION

1.01 ¾ Inch Straight Cartridge Style Dual Check Valve

- A. This specification covers a ¾ inch Straight Cartridge Style Dual Check Valve with ¾ inch female iron pipe thread connections. The valve will allow no more than 10 psi drop at 15 gpm.
- B. The check valve shall conform to AWWA Standard C800 and latest revisions regarding thread types and diameters. All cast components shall be certified waterworks red brass, meeting the latest revision of AWWA Standard C800, ASTM B62, UNS No. C83600. The alloy described by this Standard is 85% copper and 5% each of tin, lead, and zinc (85-5-5-5). The check valve shall be approved by the American Society of Sanitary Engineering under ASSE Standard 1024-94.

The Cartridge Style Dual Check Valve shall contain two cartridge assemblies manufactured from acetyl plastic. The assemblies will contain 302 stainless steel springs, and EPDM rubber O-rings.

Each cartridge assembly shall be so constructed that it can provide backflow prevention even with the other cartridge assembly removed from the valve body. Both cartridges are to be identical and interchangeable.

- C. The ¾ inch Straight Cartridge Style Dual Check Valve shall be the HHC11-333 as manufactured by the Ford Meter Box Company, Inc., Wabash, Indiana, or approved equal.
- D. Watts Series DET Potable Water Expansion Tanks are to be used to prevent plumbing system and/or water heater damage and unnecessary relief valve discharge caused by excessive pressure from thermal expansion (see Control Thermal Expansion detail).

1.02 1 Inch Straight Cartridge Style Dual Check Valve

- A. This specification covers a 1 inch Straight Cartridge Style Dual Check Valve with 1 inch female iron pipe thread connections. The valve will allow no more than 10 psi drop at 25 gpm.
- B. The check valve shall conform to AWWA Standard C800 and latest revisions regarding thread types and diameters. All cast components shall be certified waterworks red brass, meeting the latest revision of AWWA Standard C800 ASTM B62, UNS No. C83600. The alloy described by this Standard is 85% copper and 5% each of tin, lead, and zinc (85-5-5-5). The check valve shall be approved by the American Society of Sanitary Engineering under ASSE Standard 1024-94.

The Cartridge Style Dual Check Valve shall contain two cartridge assemblies manufactured from acetyl plastic. The assemblies will contain 302 stainless steel springs, and EPDM rubber O-rings.

Each cartridge assembly shall be so constructed that it can provide backflow prevention even with the other cartridge assembly removed from the valve body. Both cartridges are to be identical and interchangeable.

- C. The 1 inch Straight Cartridge Style Dual Check Valve shall be the HHC11-444as manufactured by the Ford Meter Box Company, Inc., Wabash, Indiana, or approved equal.
- D. Watts Series DET Potable Water Expansion Tanks are to be used to prevent plumbing system and/or water heater damage and unnecessary relief valve discharge caused by excessive pressure from thermal expansion (see Control Thermal Expansion detail).

1.03 2 Inch Flanged Angle Dual Check Valve

- A. This specification covers a 2 inch Flanged Angle Dual Check Valve with 2 inch female iron pipe thread outlet connections. The valve shall have an inlet flange drilled to allow a direct connection to the outlet of either a 1 ½ inch or 2 inch flanged meter. The valve will be an angle style changing water flow direction by 90 degrees and will allow no more than 7.5 psi drop at 80 gpm. The Dual Check Valve height and laying length dimensions will match the Ford single check dimensions, which will allow retrofitting existing single check meter settings.
- B. The check valve shall conform to AWWA Standard C800 and latest revisions regarding thread types and diameters. All cast components shall be certified waterworks red brass meeting the latest revision of AWWA Standard C800, ASTM B62, UNS No. C83600. The alloy described by this Standard is 85% copper and 5% each of tin, lead and zinc (85-5-5-5). The check valve shall be approved by the American Society of Sanitary Engineering under ASSE Standard 1024-94.

The check valve shall contain two independently-acting acetyl plastic check assemblies, which will incorporate a flat rubber seal for scaling against the internal valve body seats and will include 302 stainless steel springs. The design shall allow backflow protection even with one check assembly removed from the valve body. An accessible end cap will allow replacement of the check assemblies without removing the valve body or the water meter from the service line.

- C. The 2 inch Flanged Angle Dual Check Valve will be suitable for installation as an integral part of a copper setter meter holding device and shall be the HHFA31-777 as manufactured by the Ford Meter Box Company, Inc., Wabash, Indian, or approved equal. Meter support brackets are optional with an “-MSB” added to the end of the catalog number (HHFA31-777-MSB). The valve is suitable for a 1½ inch application by attaching a 2 inch x 1½ inch iron pipe threaded reducer bushing to the outlet.

WATER SERVICE CONNECTIONS

1.01 Water Service Connections

- A. All service lines shall be either/or:
 - a. Type K copper tube in accordance with ASTM B-251 and ASTM B-88 or B-75. Service lines shall be installed at right angles to the main, with a corporation stop Ford FB-800 (no others acceptable), no more than one line per trench with 4 feet minimum cover and hand backfilled.
 - b. High density polyethylene pipe that meets the specifications of NSF-14 and ASSA C901. Service lines shall be installed at right angles to the main, with a corporation stop Ford FB-800 (no others acceptable), no more than one line per trench with 4 feet minimum cover and hand backfilled.
- B. Service laterals installed under paved roadways or roadway areas to be paved shall be encased in SDR21 PVC. For laterals $\frac{1}{2}$ " or $\frac{3}{4}$ ", a 2" casing shall be used. For laterals larger than $\frac{3}{4}$ ", the casing size shall be determined by the AWA. Casing shall extend from edge of right-of-way to edge of right-of-way.
- C. Curb stops shall be Ford Meter Company number B44-333-G. No other is acceptable. Boxes for curb stops shall be Bingham and Taylor (old pattern) 3 inch shaft, size number 2 (24 to 39 inches), with a lid marked "WATER" and a brass lid bolt. Extensions, if used, shall be Bingham and Taylor number 155 (20 inch). Curb stops shall be installed with the operating nut in the vertical position and the curb box centered over the nut. Curb boxes are to be installed and adjusted to be flush with finished grade. Curb boxes shall have lids installed and locked. Excavation, backfilling and surface restorations shall be completed in accordance with these specifications. After completion of service line installation but prior to backfilling, the corporation stop shall be opened slowly to fill the line. When the line is full and all air has been removed, completely open the corporation stop. All piping, fittings and taps shall be visually checked for leakage.
- D. All $\frac{3}{4}$ inch and 1 inch taps will be direct taps. Ford Brass Saddles Style 202B Double Strap Saddles for 1 $\frac{1}{2}$ inch through 2 inch taps. All Brass Saddle with silicon double brass straps and nuts. All taps are AWWA "CC" style thread.
- E. The Altoona Water Authority reserves the right to make all water service connection taps or reserves the right to approve the subcontractor proposed to do the taps. All taps shall be made with a suitable tapping machine (Mueller, Ford, Hayes or Dresser type) using the proper combined drill and tap. Hand held drilling equipment is not acceptable. Corporation stops shall be inspected for damage threads and proper operation of the ball valve prior to installation.

METERS AND METER PITS

1.01 Meter Pit

- A. The meter pit shall be solid smooth wall extruded PVC pipe (ASTM D2241 SDR-PR no more than 50) 20" in diameter by 48" deep, Catalog No. PDBHC-244-20-48 by Ford Meter Box Co., Wabash, Indiana (1-800-826-3487). The pit shall be installed no more than five (5) feet from the easement/propertyline.

1.02 Residential and Small Business Meter Pits

- A. $\frac{3}{4}$ Inch and Smaller Meters
 1. If the water service is to be equipped with a meter $\frac{3}{4}$ inch or smaller, the meter shall be installed in a 20 inch diameter pit, PDBHC-344-2048G. The pit shall be a Ford (Ford Meter Box Company, Inc. PO Box 443, Wabash, IN 46992) plastic pit setter designed for a service line depth of 48 inches, having a 40 inch cylinder and a total depth of 50 inches. The pit shall be fitted with a cast iron ring and cover assembly, Ford Catalog No. 3T-20 frost proof meter pit cover with a touch read opening. The homeowner, upon payment of costs, will furnish the plastic pipe and the cover. The lid shall be flush with the final grade. If the meter is to be supplied with a remote or electronic reading device, the AWA may install a painted post to receive the reading device.
 2. The meter pit shall be installed between 3 feet and 5 feet from the AWA right-of-way line. The pit must be accessible at all times to the AWA meter personal. Exceptions may be made at the discretion of the AWA.
 3. The meter will be installed on a specially designed meter setter integral with the pit. This setter shall be a Ford V HH 72-24-44-33 meter setter.
 4. When the meter is located in the building served the meter shall be accessible at all times, located in the utility area or basement of the structure approximately 3 feet off of the floor, positioned horizontally with no less than a 3' x 3' area for access, removal or repair. The meter is to be installed no more that 3 feet from the closest exterior wall.
 5. All water service lines shall be equipped with straight cartridge styledual check valve.

1.03 1 ½ Inch and 2 Inch Meter Setters

- A. The meter will be installed on a specially designed meter setter integral with the pit.
This setter shall be a Ford VB76-24-44-66G or Ford VB77-24-44-77G meter setter.

1.04 Meter Pit Setter

- A. The meter setter shall be an integral part of the pit. The meter setter riser pipes shall be fastened to the pit wall 2" from the bottom, by means of lock nuts. The lock nut assembly shall not be a part of any other connection and its sole purpose is to hold the meter setter riser pipes to the base of the pit. The copper riser pipes midway from the base to the top shall be braced so as to furnish a completely rigid setting. The service line connections at the base of the meter pit

shall be pack joint for copper tubing. The meter connections shall consist of an inlet and outlet angle ball meter valves with saddle nut and a straight angle dual cartridge check valve (as specified herein) (ASSE 1024) with saddle nut. Both valves shall be furnished with gaskets for water tight connections to the meter. All meter nuts and access caps shall be drilled 3/32 for seal wire. Meter spacing and alignment shall be proper and accurate. The meter setter shall be rigid and set at an optimum height in the pit for easy access to the meter or about 14" from the top of the lid. Telescoping meter setting devices will not be accepted.

1.05 Meter Pit Cover

- A. A meter pit cover shall consist of a full round cast iron flange in a diameter consistent with the meter pit and a cast-iron cover no less than 11-1/4" in diameter. The meter box cover shall be Catalog No. W3-D-T Wabash type, double inset lid with 2" plastic recess inner lid. The inner lid shall be black, high-impact polystyrene plastic. Frame and outer lid shall be ASTM A48-92, Class 52 cast iron. The cover shall be attached to the frame by means of a lifter drive gear assembly. The drive gear assembly shall consist of the necessary parts to insure proper spacing between the lid and drive gear and a shield of inert material to retard electrolysis. The operating nut for the drive gear assembly shall be a standard water works pentagon and be made of Forged silicon bronze. When operated, the drive gear shall be capable of lifting at least 200 pounds. The operating nut and drive gear shall be pressure punched so as to form an integral unit. The style type of cover shall be double inset due to freezing possibility. The 11-1/4" lid shall be marked "WATER METER" cast in raised letters. The 11-1/4" lid shall be supplied with provisions for an in-lid remote reading device. The lid shall be specially cast and reinforced both circumferentially and radially. Finish coating shall be black E-coating.

COUPLINGS

1.01 Repair Couplings

- A. For repairs or connections on pipes of the same diameter but different pipe material, the repair coupling shall be manufactured in accordance with the design testing and performance standards of AWWA 219-01. The center sleeve and end rings shall be fusion bonded epoxy coated ductile iron; all hardware shall be stainless steel. Repair clamps such as Smith-Blair style 256 or Romac SL1 will be accepted. Couplings that range from 4"-12" such as Smith-Blair style 461 or Romac XR501 will be accepted. Couplers 14" and above will be Smith-Blair 441, Ford FC2A or Romac 501.

1.02 Transition Couplings

- A. For repairs or connections on pipes of different types and outside diameter, the couplings shall be manufactured in accordance with the design testing and performance standards of AWWA 219-01. The center sleeve and end rings shall be fusion bonded epoxy coated ductile iron; all hardware shall be stainless steel. Coupling shall be Ford Meter Box FC2A-ESH, Smith Blair Style 441, Romac 501 or Romac XR501.

BLOWOFF ASSEMBLIES

1.01 Blowoff Assemblies

- A. Blowoff Assemblies
 - 1. Refer to Altoona Water Authority Construction details, Page 1, '2" Blow-Off Assembly.'
 - 2. Above-Grade Blowoff Discharge: The above-grade blowoff assembly shall consist of pipe, valves, fittings and specials arranged according to the detail shown on the Drawings. The pipe, valves, fittings and specials shall be furnished and installed as specified herein.
 - 3. Large Diameter Pipe Blowoff Assemblies: As directed by the Altoona Water Authority, large diameter water distribution and transmission mains shall use 4 or 6-inch diameter blowoff assemblies. The blowoff shall be assembled using valves, fittings, joint restraint devices and appurtenances as shown on the Drawings. Discharge may be above grade or below grade, as shown on the Drawings.
- B. Blowoff discharges shall be installed to minimize velocity disturbance of adjacent land and structures as coordinated and directed in the field by the Altoona Water Authority.
- C. Direct blowoff discharge connections to concrete structures shall be made in a neat, workmanlike manner with all concrete repairs made with suitable epoxy bonded, non-shrink grout.

JOINT THRUST RESTRAINT SYSTEMS

1.01 Joint Thrust Restraint Systems

- A. The joint thrust restraint system where designated for installation shall be concrete deadmen, tie rods, concrete thrust blocking, restrained joint pipe, metal harnessing and/or mechanical restraint devices.
- B. Mechanical restraint devices and restrained joint pipe shall be furnished and installed in conformance with the Ductile Iron Pipe specifications.
- C. The tie rods system shall be high strength, low alloy steel as manufactured by Trumbull Industries, Youngstown, Ohio. Steel tie rods shall be $\frac{3}{4}$ " diameter carbon steel, threaded to receive tie-bolts, nuts and washers. Tie bolts shall be Trumbull Item No. 364-400 low carbon steel. Tie couplings and hardware (nuts, washers, etc.) shall be as provided by the manufacturer. The diameter and quantity of the tie rod system shall conform to the requirements of the Drawings or as directed by the Altoona Water Authority.
- D. Concrete thrust blocking and concrete deadmen shall be placed between undisturbed solid ground and the fittings to be anchored. The thrust blocking and deadmen unless otherwise shown or directed shall be located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair. Concrete thrust blocking and deadmen shall conform to the details shown on the Drawings. Concrete for thrust blocking and deadmen shall be Class "A" and furnished in accordance with Section 704 - Cement Concrete of PennDOT Publication 408. Installation shall be in conformance with the applicable provisions of Section 1000 - Cement Concrete Structures of PennDOT Publication 408.
- E. Provision for temporary thrust restraint at temporary caps or plugs shall be the responsibility of the Contractor. Submit details of temporary restraint to the Altoona Water Authority for approval.
- F. All thrust restraint systems (tie rods, clamps and other components, etc.) shall be protected against corrosion by encasement of the entire assembly with 8-mil thick, loose polyethylene film in accordance with AWWA C105 as specified herein.
- G. The joint restraint system shall be installed in accordance with the manufacturer's printed instructions. Torque limits shall not exceed manufacturer's recommendations during installation of restraint system hardware and appurtenances.

POLYETHYLENE ENCASEMENT

1.01 Polyethylene Encasement

- A. General: All polyethylene encasement material shall be manufactured in accordance with AWWA C105, with the following additional requirements or exceptions.
- B. Materials: The raw material used to manufacture polyethylene film shall be Type I, Class A, Grade E-1, in accordance with ASTM D 1248.
- C. Physical Parameters: The polyethylene film shall meet the following test requirements:
- | | |
|---------------------|---|
| Tensile Strength | 1200 psi minimum |
| Elongation | 300% minimum |
| Dielectric Strength | 800 V/mil thickness minimum |
| Thickness | 8 mils minimum nominal with minus tolerance not exceeding 10% of nominal, shipped in tubular form |
| Flow Rate | 0.4 maximum |
| Color | Black |
- D. Installation: Install polyethylene encasement according to manufacturer's recommendations or as directed by the Authority. Polyethylene wrap shall be used on all cast iron or ductile iron pipe, fittings, rods, and appurtenances where the soil resistivity is greater than 1,000 ohm-centimeters or as directed by the Altoona Water Authority. Twenty-four (24) inch flat width tubing shall be used with 4-inch, 6-inch, and 8-inch pipe. Thirty (30) inch flat width tubing shall be used with all 12-inch pipe. Thirty-six (36) inch flat width tubing shall be used for 16-inch pipe. Fifty-two (52) inch flat width tubing shall be used with 20-inch and 24-inch pipe. Harness rods shall be covered by 4-inch flat width polyethylene tubing. The entire joint shall be covered by a cigarette-wrap of 48-inch wide polyethylene sheet material over each set of lugs. Irregular shaped valves and fittings shall be covered with flat 48-inch wide polyethylene sheet material.

CONCRETE ENCASEMENT, CONCRETE CRADLE AND CONCRETE THRUST BLOCKING

1.01 Concrete Encasement, Concrete Cradle and Concrete Thrust Blocking

- A. Concrete for cradle, 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.
- D. All fittings shall be wrapped with polyethylene encasement to prevent concrete thrust blocking from contacting the mechanical joint fitting.

MANHOLES AND VAULTS

1.01 Manholes

- A. Manholes shall be precast concrete and shall comply with ASTM C478. Manhole frames and covers shall be Catalog No. 1754-A by Neenah Foundry Co., Neenah, WI (1-800-558-5075), or approved equal. Cover shall be lettered as shown on the Drawings. Steps shall be polypropylene plastic, Type PS2-PF, as manufactured by M.A. Industries, Peachtree City, GA. (1-800-241-8250) or approved equal.
- B. 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 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. Eccentric cone tops 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.
- C. 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. 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. Parge exterior brick and concrete masonry surfaces with a minimum of ½ inch of waterproof mortar. Paint with approved bituminous coating. Tighten down manhole frame using bolts long enough to reach insert in cone or flattop section. 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.
- D. All cast iron manhole frames shall be bolted to the precast manhole sections with expansion bolts and anchors. Flat top manholes shall be sufficiently reinforced to withstand the AASHTO H-20 highway loading condition.
- E. All joints in the precast manhole section shall be thoroughly cleaned and premolded bitumastic material (Ram-Nek preformed flexible plastic gaskets by Henry Co. (1-800-231-4549) or approved equal) and shall be placed entirely around the joint immediately before manhole sections are assembled. Alternate product includes Concrete Sealants Inc., New Carlisle Ohio (1-800-662-4495), ConSeal 202 or approved equal.
- F. The Contractor shall use an approved nonshrink grout to neatly patch all holes and irregularities in the concrete. Pipe to manhole penetration gasket sealant system shall be Press Seal Gasket Corp., Fort Wayne, IN (1-800-348-7325) or A-Lok Products, Inc., Tulleytown, PA (1-800-822-2565) or approved equal.
- G. Exterior surfaces of all manholes, both poured and precast sections shall be entirely coated with two (2) coats of an approved bitumastic material. The Contractor shall prepare the surfaces to receive the coating, mix the coating materials, and apply the coating, all in strict accordance with the manufacturer's written instructions. Minimum dry film thickness of the two (2) part coating system shall be 16 mils.

- H. Interior manhole surfaces and pipes, where designated, shall be insulated with a two-component polyurethane, in-place applied, foam system by Insta-Foam Products, Inc., Joliet, Illinois (1-800-800-6800) or Versi-Foam Systems, by RHH Foam Systems, Inc. (1-800-657-0702). Density designation shall be 1.75 and applied to the limits and thicknesses indicated on the Drawings. The insulation system shall be applied in conformance with the manufacturers written instructions.
- I. Approved precast manhole manufacturers are Eagle Concrete Products, Somerset, PA (1-814-443-6494); Fi-Hoff Concrete Products, Johnstown, PA (1-800-733-9649) or Terre Hill Concrete Products, Inc., Terre Hill, PA (1-800-242-1509).

1.02 Concrete Vaults

A. General Requirements

Plan, design and construct the concrete vault with the following parameters:

1. Clearance
 - a. Minimum ceiling height of 7.0 feet;
 - b. Allow clearance for routine maintenance and removal of valve and piping components without interruption of regular service.
2. Codes
 - a. Assure that all work and materials, for this type of facility, are in full accordance with local, state and/or federal ordinances, and with any other prevailing code and regulation regarding potentially hazardous equipment or location.
3. Lifting Hooks
 - a. Provide appropriate number of lifting hooks of sufficient size to facilitate the lifting and handling of the station and insure proper balance. Also provide adjustable spreader type lifting device for unloading the station from trailer. The manufacturer is responsible for structure design and adequacy of lifting hook arrangement.
4. Hatches
 - a. Provide hatches as shown on the drawings. Verify opening size required so that equipment can be lifted up through the hatch opening.
 - b. Fabricated aluminum access hatch. ASTM designation B-209-66 and ANSI designation H-38-2.
 - 1) Cover and curb 11 gauge aluminum.
 - 2) Type J or JC with H20 loading when required.

- 3) All hardware except the lock cadmium or zinc plated.
- 4) Brass lock.
- 5) Insulated.
- 6) Neoprene gasket for complete weathertightness.
- 7) Hatch construction "floats" hatch cover upward on compression springs and automatically locks the cover in the open position.
- 8) Provide a flush mounted, pin tumbler type, dead bolt lock with an inside safety release with two (2) keys on a key ring complete with PAWC identification and telephone number.

c. Manufactured by: The Bilco Company
 37 Water Street
 West Haven, Connecticut 06516
 Phone: (203) 934-6363
 or approved equal

B. Concrete Vault

1. Design Requirements

- a. For round precast boxes or tanks, conform to ASTM C478.
- b. Regardless of amount of reinforcing steel required to withstand specified design loads, provide minimum steel required by ACI 318 to prevent excessive cracking due to shrinkage and temperature stresses.
- e. Bottom of unit shall be four inches thick with minimum reinforcing steel of No. 4 bars spaced 12 inches each way and located two inches from bottom of slab.
- f. Provide No. 4 dowels where required to properly connect top and bottom slabs to walls.
- g. Provide minimum extra steel reinforcing at pipe openings, eight inches and larger, of two No. 4 bars six inches above opening and six inches from each side of opening.
- h. Minimum wall and top thickness
 - 1) Wall: Three inches.
 - 2) Top: Four inches.
- i. Cast in steel pipe sleeve for pipe openings.
- j. Provide waterstops at intersections of wall with top and bottom slabs, unless box or tank is cast monolithically or unless intersection is above grade.

- k. If unit is precast in sections, provide watertight seals between all sections, including grade rings.
- l. Allow provisions for floor drain or sump, as indicated on the detail on the Contract Drawings.

C. Concrete Vault Accessories

1. Floor Matting

- a. Cover the walkway areas (the space from the entrance to the control panel and the entire NEC clearance area) with an industrial safety matting as manufactured by Lancaster Colony or Nortrax. Mat shall be nonconductive, corrugated, which provides a dielectric strength up to 30,000 volts.

2. Aluminum Access Ladder

- a. Provide aluminum ladder from ground level to vault floor.
- b. Include the following features:
 - 1) Meets OSHA requirements
 - 2) Type 1 - Heavy Duty
 - 3) Meets all code requirements of American National Standards Institute for metal ladders
 - 4) Plastic Safety Top Caps
 - 5) 3" Full I-Beam side rail
 - 6) 1¼" serrated rungs
 - 7) Rung spacing 12"
 - 8) Top and bottom supports to attach to the floors in accordance with the manufacturers standard design for the specified type of floor construction (steel, concrete, etc.)
 - 9) Provide ladder top to set below floor hatch for clearance as needed
 - 10) Place ladder at 10° angle
 - 11) Manufactured by Louisville Ladder Co., Louisville, KY, or equal
- c. Provide a compatible ladder safety post as manufactured by the Bilco Co., New Haven, CT, or equal.

D. Concrete Vault Manufacturer

1. A.C. Miller Concrete Products, Inc.

Blairsville, PA
Phone: (724) 459-5950

2. Fi-Hoff Concrete Products
Johnstown, PA
Phone: (800) 242-1509

3. Terre Hill Concrete
Terre Hill, PA
Phone: (800) 242-1509

INDICATOR POSTS

1.01 Indicator Posts

- A. The two-piece indicator post shall consist of a flexible, above ground post made from durable, non-discoloring polyethylene plastic to which reflective sheeting is applied, and a driveable tubular galvanized metal anchor. The post shall be capable of recovering from repeated vehicle impacts. The post shall insert and lock into the metal anchor without any additional fastening hardware. It is required that when the post is no longer serviceable it can be removed and a new post can be manually inserted and locked into the existing in ground anchor without fasteners and without requiring any further digging or anchor driving. The posts are to be of a size and have a locking mechanism compatible with the anchors in service. Posts that are not compatible will be rejected for use.
- B. The post shall be tubular in shape and two and one-quarter inches in diameter. A one and three quarter (1-¾) inch diameter interior reinforcement tube shall be located and secured in the lower portion of the post. The upper fourteen (14) inches shall be flattened to an oval shape at least three (3) inches in width at the major axis by one (1) inch at the minor axis. The total above ground height of the post shall be deliverable as required. The post shall be white and resistant to ultraviolet and infrared radiation. A band of reflective sheeting per Federal Highway Specification FP-92, Type III, Class 2 shall be applied near the top of the post providing 360 degree visibility. The reflective sheeting shall be white (silver) or yellow (amber) in color and applied in the width, height and location on the post as required. The reflective sheeting shall be marked to indicate the appropriate waterline size or location.
- C. Provide a manual installation tool (Model SH-30-6 by Safe-Hit) including a SH-6 drive tool, by Safe-Hit, to assure the correct inside diameter and shape of the soil anchor. Keep the anchor vertically plumb when driving into the ground and ensure the drive ring is facing down. Position anchor so that locking rings are perpendicular to traffic flow. Drive the anchor until the positioning line is ½" below ground level. Position the O-ring so that the post is aligned with the locking tap holes of the anchor.
- D. The indicator posts shall be round, surface flexible, soil anchored indicator posts by Safe-Hit, A Division of Energy Adsorption Systems, Inc., Chicago, IL (1-800-537-8958) or approved equal.

FIRE SERVICE REQUIREMENTS

1.01 Fire Service Backflow and Meter Device

- A. All fire services, wet or dry design, shall incorporate a metered backflow device, unless the Authority determines that a special hazard exists. The backflow device shall be a dual cartridge check valve, WATTS SERIES 709DCDAOSY- RW for 3 inch to 10 inch services and WATTS SERIES 007DCDA2 for 2 inch services or equivalent backflow device as approved by the Authority. Larger sizes will require a similar device selected on a case-by-case basis. The device shall incorporate a detector meter, registering in cubic feet, manufactured by SENSUS Corporation. No unmetered bypass will be acceptable. All materials required for metered bypass must be brass or copper.
- B. The backflow device shall be property of the customer, and shall be maintained in good working order by the customer. Failure to maintain the device, failure to provide access to the device for Authority personnel and failure to maintain the enclosure and environment for the device will result in termination of the fire service.

1.02 Domestic and Fire Service Requirements for Construction

- A. Limited area sprinkler systems serving fewer than 20 sprinklers on any single connection are permitted to be connected to the domestic service where a wet automatic stand pipe is not available. Limited area sprinkler systems connected to domestic water supplies shall comply with each of the following requirements:
 - 1. No manually operated valves shall be installed between the domestic water riser control valve and the sprinklers. However, a dual cartridge check valve shall be required.
 - 2. The domestic service shall be capable of supplying the simultaneous domestic demand and the sprinkler demand required to be hydraulically calculated by NFPA 13, NFPA 13R OR NFPA 13D.
- B. Domestic and fire service for sprinkler systems serving 20 or greater sprinklers shall be installed as separate lines with each service having its own connection, one for domestic and one for fire. The meter for the domestic and the dual check valves with a detect meter for the fire line shall be installed in a properly sized meter vault located at the property line. Exceptions may be made at the discretion of the AWA.
- C. If the domestic service requires a tap larger than 2", domestic and fire service may be installed as a single service line, with the domestic service being tapped off of the fire service after the meter. The meter shall be a Sensus Compact FireLine Fire Service Meter Assembly, Series FM-721. The meter and the dual check valves with a detect meter for the fire line shall be installed in a properly sized meter vault located at the property line. Exceptions may be made at the discretion of the AWA.
- D. All domestic service lines feeding individual homes, single units, apartments, townhouses, and multiple dwellings shall have their own separate service line installed. Each shall have its own meter pit and individual shut off. Service lines ¾ inch to 2 inch shall be Cartridge Style Dual Check Valves, installed after the meter with a ball valve installed before the meter.
- E. Domestic and fire service for all one (1) and two (2) unit residential properties shall be combined on a single service line and both shall be metered.

WATER SYSTEM EXTENSIONS

1.01 General Conditions

- A. In cases where water service is desired in an area not presently serviced by the Authority, an extension to the Authority system may be constructed. Such construction will not be undertaken by the Authority, but may be undertaken by any interested party.
- B. When a system extension is planned, the planner shall contact the Authority to ascertain the availability of adequate pressure and flow for the proposed extension. The initial inquiry must include a map of the proposed extension area with elevations of planned construction areas (a USGS map, properly marked will suffice) and details of the proposed water utilization facilities (houses, mobile home, industrial consumption details, etc). The Authority will review the initial inquiry and reply with a statement of feasibility. There will be no charge for this review.
- C. If the initial review indicates that the extension is hydraulically feasible, the constructor must prepare detailed plans showing all features of the proposed design.
- D. Water system extensions must be constructed to Authority construction standards, with such construction inspected by a designated Authority inspector. The entire system extension, including all water mains, valves, hydrants, master meters, pressure regulating devices, and all appurtenances must be constructed in public right-of-ways or in dedicated Authority right-of-ways. The minimum right-of-way width shall be 20 feet. The constructor shall prepare and have executed all right-of-way agreements for all construction, including construction in "soon to be dedicated" roadways and streets. The Authority will not accept construction in "to-be-dedicated" areas until final grading plans have been approved by the municipality having jurisdiction. The entire system extension, including all water mains, valves, hydrants, master meters, pressure regulating devices, and all appurtenances will become property of the Authority, and the Authority will maintain same, once the construction is approved and filled with water. No customer connection may be made to a system extension until the extension becomes Authority property. The Authority will not assume ownership, nor operate or maintain an extension until all right-of-ways and tests are completed, all materials and labor incorporated in the extensions are demonstrated as being paid and a set of "as-built" plans are provided to the Authority. The Authority will bear no cost for, nor contribute material to any system extension.
- E. The Authority will tap its existing system as required to connect the extension to the system at a cost to the constructor.
- F. The Authority will install service taps on the mains at a cost to the constructor or the Authority will allow the constructor to install service taps to extension to the Authority's Standards. The number and approximate location of all service taps shall be shown on the design drawings.
- G. Customer service connections installed by a constructor will be maintained in perpetuity by the Authority. Customer connection and facility charges will apply for all service connections.
- H. Each service that is placed in operation shall have an installed and operable Authority water meter. These meters shall be obtained from the Authority at the

standard Authority meter cost rate, and installed in accordance with Authority metering standards.

- I. The general guidelines for system extensions are as follows:
 1. The minimum water main size is 8 inch. The Authority may allow, in special cases, no more than 500 feet of 6 inch main to be installed. The Authority will size all water mains in the extension and no financial contribution for any size of main will be made by the Authority.
 2. Valves with boxes will be required at all tees and branches, and valves with boxes and a cap or plug will be required at all ends.
 3. Where the Authority deems feasible, the extension will be “looped”, either internally, externally, or both. Air release valves and blow-off valves shall be provided at locations as determined by the Authority. Authority standard hydrants shall be installed at the rate of one hydrant for every 900 feet of water main.
 4. The extension will be served at existing Authority pressures. In the event that the Authority system pressure is insufficient, in the opinion of the Authority, the extender may elect to build pumping and storage facilities. The pressure must be maintained by a gravity storage tank, no other system will be considered. The minimum size of a storage tank is 250,000 gallons.

PIPING SYSTEM STERILIZATION AND TESTING

1.01 Sterilization

- A. Each unit of completed or repaired water supply lines and distribution system piping shall be thoroughly sterilized with chlorine before it is placed in operation. The amount of chlorine applied shall be such as to provide a dosage of not less than twenty five (25) parts per million for not less than 24 hours. The chlorination shall be introduced to the water supply lines and/or distribution system in a manner approved by the Authority. It may be necessary for the constructor to furnish taps and valves (corporation stops) in the waterlines to sterilize and test the waterlines. Following a contact period of not less than twenty-four (24) hours at a concentration of at least 50 ppm, the heavily chlorinated water shall be safely removed from the system in a manner approved by the Authority with clean water until the residual chlorine content is no greater than the residual normally found in that main, (1.0 ppm). This water shall be discharged from the pipelines at a rate not to exceed 100 GPM from each point of discharge. Care shall be taken so as not to create a nuisance or safety hazard while the line is draining. The system shall be sterilized and drained under the supervision of the Altoona Water Authority. The system shall be dechlorinated by Altoona Water Authority Personnel at a cost to the constructor. There will be a minimum two (2) hour fee based on current rates for equipment and labor and an additional cost based on current rates for every hour thereafter. In addition, there will be a charge per pound for Ascorbic Acid used in dechlorinating. All valves in waterlines being sterilized shall be opened and closed several times during the twenty-four hour period. Liquid Chlorine, if used, shall conform to U.S. Army Specification 4-1. Liquid hypochlorite, if used, shall conform to Federal Specification O-B-441a, Grade D. A 24-hour bacteria test is required before the new line is placed in service. All test samples shall be taken by the Altoona Water Authority.

1.02 Testing

- A. All of the waterlines constructed shall be water pressure tested by the constructor. The constructor shall supply all of the water required for testing. The AWA reserves the right to approve the constructor's source of water to be used for testing. The Authority shall supply a calibrated container for measuring water used during testing. The contractor shall furnish taps and valves (corporation stops), caps and plugs, blocking, manner and means to release air from pipelines as required, testing equipment, pumps, surveillance of tests as required, and all else necessary to perform water "pressure" tests. The pump used shall have all of the proper gauges to show pressure (psi) and flow (gallons per minute).
- B. The water used for testing shall be discharged from the pipelines at a rate not to exceed 100 GPM from each point of discharge. Care shall be taken so as not to create a nuisance or safety hazard while the line is draining. The system shall be tested under the supervision of the Authority. The test pressure shall not exceed the rated working pressure of the "weakest" item in the pipeline system. Before the water pipe is tested, the pipelines and trench shall be properly backfilled (except at the locations where taps are required for the tests). When the entire pipeline, or designated portion thereof, is completed, it shall be tested hydraulically as follows:
1. The pipeline or designated portion thereof shall be filled by the constructor with water. After the system has been filled with water (with no air pockets) for 24 hours, the hydrostatic pressure shall be brought to no less than 1.5 times the stated working pressure at the lowest

elevation of the test section (provided that this test pressure does not exceed the rated working pressure of any item in the water system being tested) and maintained for a period of 8 hours. During the 8 hour period when the system is under test pressure, no section of pipe of uniform diameter shall show a leakage in excess of 10 gallons per inch of diameter per mile per day. During this 8 hour period, the pressure will be maintained at the required test pressure by pumping measured amounts of test water into the main under test. Loss will be calculated by the volume of water required to maintain test pressures. Any leaks shall be repaired in a satisfactory manner by the constructor at his own expense. The entire testing of the system shall be at the cost of the constructor.

PLAN SUBMITTAL CHECKLIST

This checklist is provided as a guideline to make sure that plan submittal to the Altoona Water Authority (AWA) is complete.

Two (2) copies of drawings shall be submitted for review.

A copy of the record plat showing all Easements, dimensions, and other information required to be presented on the record plat shall be submitted along with the plans.

The site plan shall be of a scale not to be greater than one (1) inch equals twenty (20) feet nor less than one (1) inch equals one hundred (100) feet and of such accuracy that the AWA can readily interpret the site plan and shall include more than one drawing where required for clarity.

The following shall be shown on the plans, when applicable:

- The proposed title and street address of the project and the name of the owners, engineer, architect, designer, or landscape architect of the development, north arrow and date
- A vicinity map showing the location of the project in relation to the surrounding community
- The boundaries of the property involved, the location of all existing easements, section lines, and property lines, and other physical and natural features in or adjoining the project
- Names and addresses of all adjoining landowners
- Acreage in total project; acres to be developed
- Existing and proposed grades in 2-foot intervals. The datum for all elevations shall be USGS
- Location of existing and proposed buildings, sanitary and storm sewers, watermains, culverts, and other public utilities in or adjacent to the project, including fire hydrants
- Proposed streets, driveways, sidewalks, and other vehicular and pedestrian circulation features within an adjacent to the site; also, parking spaces in any offstreet parking area, and the identification of service lanes and service parking
- Location and type of buffer strip and other open spaces including recreation areas, if any
- Location, proposed finished floor and grade line elevations, size of proposed principal and accessory buildings, their relation to one to another and to any existing structure on the site, the height of all buildings and square footage of floor space
- Site plans for residential development shall include a density schedule showing the number of dwelling units per net acre, including a dwelling schedule showing the unit type and number of each unit type
- Proposed location, use and size of open spaces and the location of any landscaping, fences, or walls on the site; any proposed alterations to the topography and other natural features shall be indicated
- Flood Hazard zone and boundaries thereof, when applicable.