CENTER TOWNSHIP WATER AUTHORITY

TECHNICAL REQUIREMENTS FOR LINE EXTENSION AND DEVELOPER'S CONSTRUCTION

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SECTION 01100

SPECIAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Center Township Water Authority Developers Packet.
- B. Center Township Water Authority Rules, Regulations, Rates for the Water Supply.
- C. Center Township Water Authority Capital Fees Policy for Water System.

1.02 DESCRIPTION OF WORK

A. This section includes work related to special requirements of the Authority.

1.03 OPERATION OF EXISTING FACILITIES

A. The attention of the Contractor is directed to the fact that the work consists of connections to an existing potable water system. Disturbing the system can result in threats to public health and safety. It is of prime importance that the Contractor in performance of his work does not disrupt the operation of the existing facilities in any manner or at any time without the express prior approval of the Authority. The operation of all valves shall be accomplished by the Authority. The Contractor shall notify the Authority seventy-two (72) hours in advance of the anticipated need to interrupt resident water service and shall comply in all respects to instructions issued by the Authority regarding performance of this work. The contractor shall notify the Authority seventy-two (72) hours in advance of the start of work.

1.04 START OF WORK

- A. No work on water system facilities shall begin until the following is satisfied:
 - 1. Developer's engineer states in writing that the site grading work is within 6-inches of final grade.
 - 2. Pre-Construction Meeting is conducted with the Authority.
 - 3. The Authority has approved the construction drawings in writing.

- 4. Shop drawings have been approved by the Authority in writing, and
- 5. All administrative requirements of the Authority have been complied with including payment of tap fees, execution of developers agreement, execution of private line policy (if applicable), payment of review fees, etc.

1.05 CONSTRUCTION OBSERVATION

A. All work relating to water system construction must be observed full time by the Authority or its designated representative. The Contractor shall notify the Authority seventy-two (72) hours in advance of the start of work to arrange for observation services.

1.06 LAYOUT OF WORK

- A. Prior to construction commencement (after layout), the Contractor shall coordinate a "field review" of the layout by the Authority.
- B. Prior to the field review, complete a layout survey and set offset stakes and/or markings to provide an easily observable reference to locate all proposed facilities including line location and size, valve locations, and hydrant locations.

1.07 SPECIAL NOTICE FOR WORK WITHIN PUBLIC RIGHTS-OF-WAYS

- A. The Contractor shall make himself familiar with and comply with any or all ordinances, rules, regulations, policies and specifications of the governmental agency having jurisdiction.
- B. The Developer shall be responsible for obtaining all permits, agreements and bonds required by the Township and/or the Pennsylvania Department of Transportation as they pertain to road openings (excavations).
- C. Surface restoration requirements for excavated and trenched areas shall be obtained from the governmental agency having jurisdiction.

1.08 MATERIALS

A. Technical specifications describe the requirements of material to be installed for water line extensions under Developer's agreements with the Authority and may include materials not required for this agreement. The Developer is referred to the Drawings for the pipe material required for the extension project.

B. The Developer will note that when items such as fire hydrants, valves, etc. are specified to be provided by a specific manufacturer, no other manufacturer will be accepted. All materials shall be new. No used materials will be permitted to be installed in the system.

1.09 RESPONSIBLE EMPLOYEE REQUIREMENT

- A. Provide the Authority with the names and telephone numbers of three employees designated to be available 24 hours per day to remedy emergency situations stemming from the construction activity during non-working hours.
- B. Provide the Authority with the name or names of employees designated the "Responsible Employee" responsible for all aspects of job safety including trenching requirements as defined by OSHA and all agencies having jurisdiction over the work.

1.10 SAFETY REQUIREMENTS DURING CONSTRUCTION

- A. Fence open ditches when not attended during operating hours. After operating hours, or when left unattended, cover open excavation with steel plates designed and placed to support traffic and remain in-place.
- B. Surface temporary walks and roads with crushed stone if they are to be in public use.
- C. Keep walks and roadways used by both Contractor and the public in repair and cleared at least once each day and more often as conditions require.
- D. Place no obstructions on or within 15 feet of fire hydrants. Hydrants must be accessible for fire fighting purposes.
- E. Protect and attend any type of temporary heating units.

1.11 WATCHMEN, FLAGMEN, BARRICADES, DANGER, DETOUR AND OTHER REQUIRED SIGNAGE

A. Place sufficient warning lights on or near the job site and keep them burning from twilight to sunrise. Erect suitable railings, barricades, detour signs, danger signals or signs, bridges, fences, or other protection about open trenches, materials or supplies after delivery. Provide all watchmen on the job by day or night that may be necessary for the preservation of public safety, and for the prevention of accidents during and after delivery of materials and supplies. Take necessary precautions to avoid accidents or injury to persons or property.

1.12 FEDERAL OCCUPATIONAL SAFETY AND HEALTH ACT

A. Comply with the Federal Occupational Safety and Health Act of 1970, and any revisions and/or amendments thereto. Where required by the Act, prepare and implement an appropriate health and safety plan and designate a responsible employee or competent person for maintenance of the same.

1.13 RESPONSIBILITY AND RISK

A. The Contractor shall be solely and fully responsible for the means, methods, techniques, sequences, and procedures of construction and for safety precautions and programs required to complete the work. The Contractor shall assume all risk and bear any loss or injury to property or persons occasioned by neglect or accident during the progress of work, until the same shall have been completed and accepted by the Owner. He shall also assume all blame or loss by reason of neglect or violation of any state law or local ordinance, or encroachment upon neighbors. He shall make good any injury that may have occurred to any adjoining building in consequence of the erection of this work or during its progress.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

Not applicable to this Section.

END OF SECTION 01100

SECTION 02150

EXCAVATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Center Township Water Authority Developers Packet.
- B. Center Township Water Authority Rules, Regulations, Rates for the Water Supply.
- C. Center Township Water Authority Capital Fees Policy for Water System.

1.02 DESCRIPTION OF WORK

- A. The work shall include, but not be limited to, excavation for the installation of the new waterline, service lines, fire hydrants, valves, air release manhole and appurtenances.
- B. All excavated material shall be classified as follows:
 - 1. Unclassified Excavation: Unclassified excavation shall consist of the excavation of all material, regardless of its nature, which is not otherwise classified.
 - 2. Unsuitable Material: Unsuitable material shall include material that contains organic matter (decaying stumps, roots, logs, humus, etc.), coal or coal blossom, or other objectionable matter as determined by the Authority's Representative

1.03 RELATED SECTIONS

- A. Section 01100 Special Requirements
- B. Section 02155 Backfilling and Compaction
- C. Section 02300 Jacked and Bored Casing Pipe
- D. Section 02660 Water Distribution
- E. Section 02665 Fire Hydrants

1.04 **JOB CONDITIONS**

- A. Comply with the requirements of each utility company and Pennsylvania Act 287 of 1974 for the Protection of Underground Installations. Submit Pennsylvania One Call request.
- B. Dig test holes using appropriate methods before trenching operations are initiated, or sufficiently in advance of trenching operations to avoid a delay, to identify and avoid vertical pipe conflicts, determine the type, size, and elevation of existing subsurface utility pipelines, cables or structures prior to laying grade critical pipelines. In Improved areas, backfill and restore areas disturbed by test pit operations with PennDOT 2A material.
- C. In locations where new waterline are to be connected to new and existing waterlines, dig test pits and determine by survey the exact location, elevation, pie size and material of the existing waterline prior to ordering materials or starting trenching operations.
- D. Locate existing underground utilities in the areas of work by test pit before starting excavation operations for utilities. For all underground facilities that are to remain in place, provide adequate means of protection during earthwork operations. This includes, but is not limited to, all underground utilities, sewers, pavements, conduit, overhead utilities, and foundations. Any damage caused by the Contractor during the course of this work shall be repaired by the Contractor to the satisfaction of the utility owner at no additional cost.
- E. Do not interrupt existing utilities serving facilities occupied and used by the Authority or others.
- F. Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractors risk. For work immediately adjacent to or for excavation exposing a utility or other buried obstruction, excavate by hand as required. Start hand excavation on each side of the, obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assumed. Support uncovered lines or other existing work affected by the contract excavation until approved for backfill. Report damage to utility lines or subsurface construction immediately to the Authority's Representative.

1.05 PROTECTION

A. Install shoring and/or bracing when excavating, to protect workers and to guard against caving or collapse as required by the Department of Labor and Industrial Regulations and the Federal Occupational Safety and Health Act of 1970. Remove

shoring as backfilling progresses. Pipe trench shall be excavated only so far in advance of pipe laying as can be constructed, backfilled, and compacted during that day. Shoring shall not be removed until the permanent work is in proper condition to receive the load.

- B. Where excavation is to be made along public roads or traveled ways, the Contractor shall familiarize himself with the requirements of the government body having jurisdiction over said property and shall pattern his operations accordingly. The Contractor shall limit his trench excavation to the limits set forth hereinafter and on the Contract Drawings and shall restore all paved areas as denoted on the Contract Drawings. He shall schedule his operations so that one side of the line of work shall be kept open at all times and the streets shall be kept clean, clear and free for the passage of vehicles or pedestrians, unless otherwise authorized in writing by the governing body or the Authority. The Contractor shall in all cases so arrange his work as to cause the least inconvenience to property owners consistent with the proper prosecution of the work as determined by the Authority.
- C. The Contractor shall not leave any open excavation over night. All open excavation shall be backfilled, covered or barricaded in a secure manner acceptable to the Authority at the end of each work day.
- D. Protect trees, shrubs, lawns, and other features remaining as a portion of the final landscaping.
- E. Protect bench marks and paving from equipment and vehicular traffic.
- F. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- G. Notify Authority of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- H. Protect bottom of excavations and soil from frost or moisture.
- Grade excavation top perimeter to prevent surface water runoff into excavation.
 Dewater utility excavations to keep construction dry. Filter sediment latent water prior to discharge.

1.06 SUBMITTALS

A. Submit material certifications for all materials specified in Part 2 - Products of this Section.

- B. Submit agreements between property owner and Contractor for disposal of excess material and also absolving the owner of responsibility in connection with the disposal.
- C. Submit agreement between adjacent property owner and Contractor for Contractor's use of their property for construction operations and a restoration release signed by property owner signifying the property owner's approval of the final restoration of their property. Agreements and releases shall absolve the Authority of responsibility in connection therewith.

1.07 REFERENCES

- A. The Commonwealth of Pennsylvania, Department of Transportation (PaDOT) Publication 408 Specifications, latest edition, and all subsequent supplements.
- B. PaDEP Erosion and Sedimentation Pollution Control Manual.
- C. PaDEP Water Supply Manual

PART 2 - PRODUCTS

2.01 MATERIAL

A. Select aggregate shall be PennDOT No. 2A Coarse Limestone Aggregate (no slag), meeting the requirements of PennDOT 408, Section 703.2 Type C or better.

PART 3 - EXECUTION

LAYOUT

A. Verify layout information shown on the drawings, in relation to the property survey and existing benchmarks before proceeding to layout the work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction. Do not change or relocate benchmarks or control points relating to water system work without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.

- B. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points. Record benchmark locations, with horizontal and vertical data, on project record documents.
- C. Existing Utilities and Equipment: Before beginning any work, investigate and verify the existence and location of underground utilities and other construction. Dig test holes as required to verify type, size, location and elevation of all underground facilities. Verify vertical locations by survey instrument. Prior to construction, verify the location and invert elevation at points of conflict or connection.
- D. Working from lines and levels established by the construction drawings, establish benchmarks and markers to set lines and levels as needed to properly locate each element of the project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale drawings to determine dimensions.
 - Advise entities engaged in construction activities, of marked lines and levels provided for their use.
 - 2. As construction proceeds, check every major element for alignment, line, slope and plumb.
- E. <u>Surveyor's Log:</u> Maintain a surveyor's log of control and other survey work. Make this log available for reference. Record deviations from required lines and levels, and advise the Authority Representative when deviations that exceed indicated or recognized tolerances are detected. On project record drawings, record deviations that are accepted and not corrected.
- F. <u>Surveys, Alignment, Grade and Layout of the Work</u>: Maintain installation of the waterline to the required lines, grades, and minimum depths as shown on the drawings and at the required locations. Except where specific offset dimensions and/or co-ordinates are shown for services, valves or hydrants, the location shown on the drawings are general and are subject to re-alignment to accommodate conditions encountered in the field, however, any realignment must first be approved by the Authority Representative.
 - 1. Maintain the minimum depth from finished grade to the crown of all pipes at no less than forty-eight inches (48").
 - 2. Establish a series of benchmarks along the routes where the waterline and appurtenances are proposed to be constructed for reference purposes. The proposed line is designed to be installed with continuous uphill grade to high point as shown on the drawings.

- 3. Employ a competent survey crew, to lay out the work from the initial points of instructions. Prior to the start of any construction work, perform a "cut sheet survey" at 25 foot horizontal intervals for all contiguous waterlines to verify grades and elevations. Deliver the cut sheet survey to the Authority Representative for plotting on the construction plans prior to the start of any construction work. Have survey crew set all offset stakes, set, test, and check all elevations and levels and other parts of the construction as the work progresses. Furnish all stakes required for the survey and layout work. Furnish men to assist the Engineer in checking the survey and layout work, if required.
- 4. Set an offset line of stakes every 50 feet, and determine the elevation of said stakes as well as the centerline elevations of existing ground every 25 feet along the proposed waterline. Turn horizontal angles at all appurtenances and obtain elevations of existing facilities, and all existing utility crossing pipes as required to evaluate potential conflicts. Using these elevations, prepare a cut sheet and deliver said cut sheet survey to the Authority Representative for approval before initiating excavation. The Authority Representative will not set batter boards for the Contractor or otherwise provide surveying services to the Contractor. Retain the services of a competent instrument man to perform the required survey work relative to batter boards and other construction functions.
- 5. Reconstruct at no cost to the Owner all waterlines required to be re-laid to meet existing elevations or design grade, elevations or depth.
- G. <u>Existing Utilities</u>: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities have jurisdiction.
- H. "Record Drawing" Construction Information: On a daily basis record via red pencil markings all installed horizontal and vertical field data on a set of full scale construction plans. Maintain the set of "Record Drawings" for review by the Authority Representative.

3.01 <u>SAWCUTTING EXISTING PAVEMENT</u>

- A. Existing bituminous or concrete pavement shall be sawcut in neat straight lines to the limits of the proposed typical trench excavation, as shown on the Drawings.
- B. Any damage to the existing pavement surface outside the limits of the excavation operations shall be sawcut, removed, and replaced as appropriate.

Last Revised 1/1/14 02150-6 Excavation

3.02 TRENCH EXCAVATION

- A. Excavate for underground piping by open cut, unless otherwise indicated on the Drawings. All excavation shall conform to the applicable codes having jurisdiction.
- B. The depth of excavation shall be such that the installed facility will comply with the details shown on the Drawings.
- C. Trenches shall be excavated to a width indicated by trench details as shown on the Drawings. Keep banks as nearly vertical as possible and no wider than indicated on the Drawings to a point at least 12 inches above top of pipe or equipment and do not over-excavate except where necessary to remove unsuitable material or as specified. Grade bottom of trenches to required bedding depth as detailed.
- D. Trenches may be excavated and/or backfilled by machinery or by hand as the Contractor may elect; provided however that the Authority is empowered to direct the Contractor to employ hand excavation, hand backfilling, and/or hand compaction as deemed necessary by the Authority.
- E. Material excavated that is approved by the Authority's Representative for backfill material shall be stored or deposited within the rights-of-way established for this work, unless the Contractor secures, in writing, permission from adjacent property owners to use their property for this purpose.
- F. The governmental agency having jurisdiction shall determine the requirements for blasting, if proposed.

3.03 DISPOSAL OF EXCESS MATERIAL

A. All excess material and any suitable material not approved for use as backfill shall be hauled from the site and legally disposed of by the Contractor. Do <u>not</u> dispose of such material within the project rights-of-way without written permission from the Authority. Agreements between the Contractor and the property owner on which excess material will be disposed of shall be required to be submitted to the Authority prior to disposal of such excess material.

3.04 **DEWATERING**

A. The Contractor shall at all times provide and maintain adequate pumping for the complete dewatering of excavations. No pipe or structure shall be permitted to be installed in any excavation where water is pooled or flowing.

3.05 <u>REMOVAL OF UNSUITABLE MATERIALS</u>

Last Revised 1/1/14 02150-7 Excavation

A. The excavation of unsuitable materials which prevent the firm support of the pipe or structure at the depth shown on the Drawings, shall be removed and replaced only after approval by the Authority's Representative. Replace this material with select aggregate and backfill and compact as required per Section 02155, "BACKFILL AND COMPACTION", at no additional cost to the Authority.

3.06 MISCELLANEOUS EARTH EXCAVATION

A. Test pits shall be dug by the Contractor wherever directed by the Authority. Their depth and size shall be as required by the Authority's Representative. Test pits, dug by the Contractor, along the lines of the work, in advance of the excavation, for the purpose of satisfying himself as to the location of underground obstructions or conditions.

END OF SECTION 02150

SECTION 02155

BACKFILL AND COMPACTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Center Township Water Authority Developers Packet.
- B. Center Township Water Authority Rules, Regulations, Rates for the Water Supply.
- C. Center Township Water Authority Capital Fees Policy for Water System.

1.02 DESCRIPTION OF WORK

- A. The work shall include, but not be limited to, backfilling for the installation of the waterline, service lines, fire hydrants, valves, and air release manhole and appurtenances.
- B. This work shall be coordinated with the work in Section 02150, Excavation, to provide complete coverage of all backfill operations.

1.03 RELATED SECTIONS

- A. Section 02150 Excavation.
- B. Section 02660 Water Distribution.
- C. Section 02665 Fire Hydrants.

1.04 REFERENCES

- A. The Commonwealth of Pennsylvania, Department of Transportation (PennDOT), Publication 408, Specifications, latest edition, and all subsequent supplements.
- B. American Association of State Highway and Transportation Officials (AASHTO).
- C. American Society of Testing Materials (ASTM).

1.05 **SUBMITTALS**

- A. The Contractor shall submit material certification for products listed in Part 2 of this Section.
- B. Submit written request for approval of Independent Testing Agency to perform compaction testing at least fourteen (14) calendar days prior to scheduled commencement of any work under this Section.
- C. One optimum moisture-maximum density curve for each type of material used in backfilling operations.
- D. Submit six (6) copies of certified compaction testing results to the Authority's Representative from the soils testing lab.

1.06 QUALITY ASSURANCE

A. Moisture-density relationship shall be determined in accordance with ASTM D-698. Field density measurements shall be obtained by the sand-cone method (ASTM D-1556), rubber balloon method (ASTM D-2167) or the nuclear density method (ASTM D-2922). The nuclear density method shall have calibration curves periodically checked and adjusted to correlate to tests performed using ASTM D-1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D-3017. The calibration checks for both density and moisture gages shall be made at the beginning of work, on each different type of material encountered, and at appropriate intervals or as directed by the Authority.

PART 2 - PRODUCTS

2.01 BEDDING

A. Bedding for DIP shall be PennDOT 2A Coarse Aggregate or AASHTO No. 57 Coarse Aggregate, as indicated on the Drawings, meeting the requirements of PennDOT 408, Section 703.2, Type C or better. The use of slag is prohibited.

2.02 SELECT AGGREGATE MATERIAL

A. Select backfill shall be PennDOT 2A Coarse Aggregate, meeting the requirements of PennDOT 408, Section 703.2, Type C or better. The use of slag is prohibited.

2.03 SUITABLE SITE BACKFILL MATERIAL

A. Suitable site backfill material shall include excavated on-site subsoil or off-site borrow material that has been approved by the Authority's Representative as acceptable material. Material shall be free of stones greater than 2-inches in diameter, frozen material, topsoil, organic material and debris.

PART 3 - EXECUTION

3.01 BEDDING AND BACKFILL

- A. <u>Bedding</u>. The Contractor shall furnish and place bedding as shown on the Drawings such that all pipe is fully supported on the specified thickness of bedding material.
 - 1. Place bedding material around the pipe in 6-inch lifts to a height of at least 12-inches as specified on the Drawings above the top of the pipe. As fast as the material is placed, it shall be thoroughly cut under the haunches of the pipe with a shovel. Backfill material shall be carried up evenly on both sides of the trench.
- B. <u>Backfill</u>. Backfill material shall be defined as the material placed between the top of the bedding material and the bottom of the topsoil layer for finished grade for areas located outside of paved areas, or between the top of the bedding material and the bottom of the subgrade for areas located beneath paved areas (excluding concrete driveways and sidewalks). Two (2) types of backfilling shall be installed as follows:
 - 1. Areas located outside of paved areas.
 - a. Suitable site backfill material, approved by the Authority's Representative, may be used as backfill material. This material shall be free of stones greater than 2-inches in diameter, frozen material, topsoil, organic material, trash or any other unsuitable material. This material shall be placed in loose lifts not exceeding twelve (12) inches, then compacted to 90 percent of maximum density at optimum moisture content as determined by standard proctor tests performed in accordance with ASTM D-698.
 - 2. Areas located under paved areas.
 - a. Select aggregate material shall be installed full depth in loose lifts not exceeding eight (8) inches to the point of subgrade material as shown on the Drawings. Each lift shall be compacted to not less than 95

percent of maximum density at optimum moisture content as determined by standard proctor tests performed in accordance with ASTM D-698.

- C. At the discretion of the Authority's Representative, the Contractor may be required to utilize suitable native soil as backfill material in trenches under existing or proposed paved areas. Placement of this material shall conform to the requirements previously noted for the use of native soil as backfill material, except that each lift shall be properly compacted to no less than 95 percent of maximum density at optimum moisture content as determined by standard proctor tests performed in accordance with ASTM D-698. Neither the use or non-use of native soil material under paved areas shall in any way allow the Contractor to request additional payment or an extension in the project completion date.
- D. Detectable Utility Marking Tape. The Contractor shall furnish and install a continuous length of electronically detectable marker tape at an approximate depth of 12-inches below finished grade. Tape shall be as specified in Section 02660 as appropriate.

3.02 BACKFILL FOR STRUCTURES

- A. Backfilling shall not be completed until the permanent structure is in proper condition to receive the load. The Contractor shall be responsible for ensuring the structure has attained adequate curing strength to withstand backfilling loads. Backfill around structures shall be placed uniformly in successive layers around the entire structure to preclude the possibility of non-uniform loading of the exterior of same. In this regard, the maximum permissible differential elevation of backfill at any one time shall be four (4) feet.
- B. Backfill material and compaction of the backfill around structures shall be in accordance with Paragraph 3.01 of this Section.

3.03 BEDDING AND BACKFILL COMPACTION TESTING

- A. In-place compaction testing shall be performed by a Certified Soils Testing Laboratory, subject to the approval of the Authority's Representative, engaged and paid for by the Contractor.
- B. Conduct one (1) passing compaction test for each 200 linear foot length of utility inplace at locations as directed by the Authority's Representative during backfilling operations.

C. Areas for which tests indicate insufficient compaction shall be recompacted and retested until the areas conform to the requirements of the Technical Specifications. Cost of re-compacting and re-testing shall be borne by the Contractor.

END OF SECTION 02155



SECTION 02300

JACKED AND BORED CASING PIPE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Center Township Water Authority Developers Packet.
- B. Center Township Water Authority Rules, Regulations, Rates for the Water Supply.
- C. Center Township Water Authority Capital Fees Policy for Water System.

1.02 DESCRIPTION OF WORK

- A. The work of this Section shall consist of furnishing and installing jacked and bored casing pipe as indicated, as hereinafter specified, and/or as otherwise required for the proper and timely completion of this work.
- B. Excavation and backfill of bore and receiving pits will be considered as incidental to the completion of this item.

1.03 RELATED SECTIONS

- A. Section 02150 Excavation.
- B. Section 02660 Water Distribution.

1.04 <u>REFERENCE STANDARDS</u>

- A. AREA Specification "Jacking Culvert Pipe Through Fills", AREA Manual, Chapter 1, Section 4.9, and "Specification for Pipelines Conveying Non-Flammable Substances", AREA Manual, Chapter 1, Section 5.2.
- B. PennDOT Publication 408, Section 601.3(g) "Jacked Pipe".

C. AASHTO Guide Specifications for Highway Construction, Section 603 "Boring or Jacking Installations".

1.05 QUALITY ASSURANCE

- A. Jacking and boring operations shall be undertaken only by a firm well experienced in operations of similar magnitude, complexity, and conditions. The Authority reserves the right to approve or disapprove the jacking and boring contractor (or subcontractor) based upon prior experience and performance.
- B. Jacking and boring machine operator shall have a minimum of twelve months experience in the operation of the equipment being used.
- C. Field supervisor with a minimum of twelve months experience in the operation of the type of equipment being used for this work shall be at the site at all times when jacking and boring work is in progress.

1.06 SITE CONDITIONS

A. The Contractor shall be responsible for researching existing structure and utility information and confirming the pipeline grade as shown on the Drawings. The top crown of the casing pipe shall be located a minimum of 30 inches below the bottom of any existing utility or structure.

1.07 TEMPORARY SUPPORT SYSTEMS

- A. The Contractor shall provide all labor, material, and tools to furnish sheeting, shoring, and bracing for boring and receiving pits as required by the Department of Labor and Industry Regulations and the Federal Occupational Safety and Health Act of 1970. Trench shoring and bracing shall also be provided to protect other adjacent utilities.
- B. Shoring shall not be removed until the permanent work is in proper condition to receive the load. The cost of shoring will be incidental to boring and jacking operations.

1.08 SUBMITTALS

- A. Submit material certification for all products specified in Part 2 of this Section.
- B. Submit written request for approval of jacking and boring subcontractor, if used, at least fourteen (14) calendar days prior to scheduled commencement of any work under this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Casing Pipe:

- General Casing pipe shall be Standard Schedule, steel casing pipe designed to withstand the earth pressures, live loads, impacts and construction loads to which it is subjected. The diameter shall be as indicated on the Drawings.
- 2. Steel casing pipe shall meet the minimum requirement of ASTM A53 Grade B (minimum yield strength of 35,000 psi), Type S.
- 3. Coating The exterior of the casing pipe shall be coated with one mil (minimum) thickness of bituminous coating. The surface of the steel receiving the bituminous coating shall first receive a commercial blast cleaning (SSPC-SP-6).
- 4. The pipe shall be of seamless construction with full circumference welded joints (coated as required after welding).
- B. <u>Carrier Pipe:</u> Shall be as specified in Section 02660, "WATER DISTRIBUTION".
- C. <u>Casing End Seals</u>: Casing pipe end seals shall be a one piece pre-molded rubber boot complete with stainless steel securing bands. These boots shall be constructed and intended for the specific use of sealing underground casing pipe. The end seal shall be of a design to prevent the entrance of foreign material and water into the casing pipe. The seal shall allow movement of the carrier pipe without detrimentally affecting the seal or its ability to prevent entrance of foreign material and water.

D. <u>Pipe Spacers:</u> Pipe spacers shall be made of stainless steel with non-metallic liner and plastic runners and be of a type and design to facilitate easy installation and removal of the carrier pipe. Runners shall be of a size to center the longitudinal axis of the carrier pipe within the casing pipe. Pipe spacers shall be Model SS1, Stainless Steel Casing Spacers as manufactured by Advance Products and Systems of Lafayette, Louisiana, or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Jacking and boring shall consist of pushing the casing pipe through the subsurface material while rotating boring auger removes the spoil. The Contractor shall utilize a self-leveling laser in order to maintain line and grade elevation during jacking and boring operations. At every 20 feet of casing pipe advancement, and at the beginning of each work shift, the Contractor shall remove the auger, "defog" the casing pipe and check the line and grade elevation. Maximum misalignment tolerance shall be 2.0 inches for each 20 foot casing pipe segment. Maximum accumulative misalignment in an upward direction shall not exceed 10 inches as measured at the heading, or any upward amount which would interfere with existing utilities or structures.
- B. If an obstruction is encountered during installation to stop the forward action of the pipe, and it becomes evident that it is impossible to advance the pipe, or if any misalignment exceeds the specified tolerance, operations will cease and the pipe shall be abandoned in place and filled completely with grout (meeting the requirements of PennDOT Publication 408, Section 601.2(c), at no additional cost to the Authority). The Contractor shall relocate his boring operations to a new location as specified by the Authority's Representative.
- C. Jacked and bored installations shall have a bored hole essentially the same as the outside diameter of the pipe plus the thickness of the protective coating. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (plus coating) by more than 1 inch, grouting or other methods approved by the Authority's Representative shall be employed to fill such voids at no additional cost to the Authority.

- D. When water is known or expected to be encountered, pumps of sufficient capacity to handle the flow shall be maintained at the site. When dewatering, close observation shall be maintained to detect any settlement or displacement of the roadway and other facilities.
- E. The use of water or other liquid to facilitate casing placement spoil removal shall be prohibited.
- F. Removal of shoring and backfilling of pits shall not be initiated until the carrier pipe has been installed and accepted. Upon pipe acceptance, backfilling will be performed in accordance with Section 02155, "Backfill and Compaction".
- G. When boring under state highways and private railroads, comply with applicable occupancy permits

3.02 BRACING AND BACKSTOPS

A. Bracing and backstops shall be designed, and jacks of sufficient rating shall be used in order that the jacking process can be progressed without stoppage until the entire length of casing pipe specified has been placed.

3.03 AUGERS AND CUTTING HEAD

- A. Cutting head shall not lead the casing pipe by more than six (6) inches. Equipment operator shall maintain a log of the total length of auger and the total length of casing pipe in place at any given time.
- B. If unstable soil is encountered during boring, retract the cutting head into the casing to permit a balance between the pushing pressure and the ratio of pipe advancement to quantity of soil.

3.04 <u>CASING PIPE</u>

- A. The casing pipe shall be so constructed as to prevent leakage throughout its length and at the ends.
- B. The Contractor shall provide a full circumferential weld between casing pipe segments. Welds shall be of a strength and nature to withstand the forces imposed by

jacking operations. All welding shall be performed by certified licensed welders.

3.05 CARRIER PIPE

A. After acceptance of the casing pipe installation as described in this Section, the Contractor shall clean the casing pipe of all foreign material and install the carrier pipe inside the casing pipe utilizing pre-molded plastic runners, as indicated on the Drawings. After acceptance of the carrier pipe installation, casing pipe end seals shall be installed.

3.06 INSPECTION AND QUALITY CONTROL

- A. At the completion of jacking operations, the casing pipe installation (and welds) shall be completely water tight. Should water be observed infiltrating the casing, the Contractor shall repair the leak at no additional cost to the Authority with suitable measures as approved by the Authority's Representative.
- B. Prior to final acceptance of the utility casing pipe, the Authority's Representative, accompanied by the Contractor, shall make a thorough visual inspection of the entire installation. Any indication of defects in material or workmanship in the casing pipe installation shall be further investigated and corrected. Defects shall be corrected by the Contractor without additional compensation.

END OF SECTION 02300

SECTION 02660

WATER DISTRIBUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Center Township Water Authority Developers Packet.
- B. Center Township Water Authority Rules, Regulations, Rates for the Water Supply.
- C. Center Township Water Authority Capital Fees Policy for Water System.

1.02 <u>DESCRIPTION OF WORK</u>

- A. Unclassified excavation, trenching, dewatering, the installation of water distribution pipes, as specified and indicated, including fittings, service connections, valves, connection to existing waterline, concrete thrust blocking, encasements, cradles, and anchors.
- B. System complete, tested and approved.
- C. Perform backfilling, grading and compaction of soil, including required hand excavation and backfill, where required.

1.03 RELATED SECTIONS

- A. Section 01100 Special Requirements
- B. Section 02150 Excavation.
- C. Section 02155 Backfill and Compaction.
- D. Section 02300 Jacked and Bored Casing Pipe
- E. Section 02665 Fire Hydrants
- F. Section 02675 Testing and Disinfecting Water Mains.

1.04 REFERENCES

- A. AWWA C104 Cement-Mortar Linings for Ductile Iron Pipe and Fittings for Water.
- B. AWWA C900 Polyvinyl Chloride Pipe (PVC)
- C. AWWA C110 Ductile Iron and Gray Iron Fittings, 3 in. through 48 in. for Water and Other Liquids.
- D. AWWA C111 Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- E. AWWA C151 Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water or Other Liquids.
- F. AWWA C153 Ductile Iron Compact Fittings, 3 in. through 24 in. and 54 in. through 64 in. for Water Service.
- G. AWWA C509 Resilient-Seated Gate Valves, for Water Supply Service.
- H. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances.
- I. AWWA C651 Disinfecting Water Mains.
- J. The Commonwealth of Pennsylvania, Department of Transportation (PennDOT) Publication 408, Specifications, 1994 Edition and all subsequent supplements.

1.05 SUBMITTALS

A. Submit shop drawings or material certifications, as applicable, for all products specified in Part 2 of this Section.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

- B. Pipe and accessories shall be handled so as to insure delivery to the installed location in sound undamaged condition. Particular care shall be taken not to injure the pipe coating or lining. Repairs to the cement lining of Ductile Iron Pipe and fittings shall not be permitted. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned and foreign matter before lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.
- C. Store valves and appurtenances in accordance with manufacturer's recommendations.
- D. Do not stack pipe higher than the limits shown in ANSI/AWWA C600. Stacking of ductile iron, copper, PVC and steel pipe shall meet the requirements of the pipe manufacturer. Do not stack fittings, valves, valve boxes, or valve stands.
- E. The Contractor shall be responsible for the delivery, storage, and handling of products.
- F. All pipe, valves, hydrants, rubber gaskets, gasket lubricants, and other appurtenances shall be handled and stored in accordance with manufacturer's recommendations and AWWA C600.

PART 2 - PRODUCTS

2.01 GENERAL

A. All pipe, fittings, valves, and appurtenances shall be as shown on the Drawings and as specified in this Section. All pipe, fittings, valves, and appurtenances shall be new and unused. Piping shall be ductile iron for all services, private lines, and for fire protection lines. The Authority shall permit use of PVC Piping in applications where normal operating pressure is below 125PSI, pipe slope does not exceed 15% and the lines are not considered major transmission mains. Connection points, borings, and inside piping such (as meter vaults, pressure reducing stations, and items of the like) shall use ductile iron pipe.

2.02 MATERIALS

A. Pipe

- Ductile Iron Pipe (DIP) to be placed shall meet the requirements of ANSI/AWWA C151/A21.51 and shall be Thickness Class 52. All pipe supplied shall have standard outside coating of coal-tar or asphalt base in accordance with ANSI/AWWA C151/A21.51, and inside, double cementmortar lining complete with seal coat in accordance with ANSI/AWWA C104/A21.4.
- 2. Polyvinyl Chloride Pipe (PVC) designed, manufactured, and tested in strict accordance with AWWA C900 (DR-14). Pressure rated at 200 psi minimum (AWWA C900-97 and FM 1612) and also 305 psi in accordance with AWWA C900-07. Minimum standard dimension ratio (DR) of 14 for both barrel and bell dimensions. Pipe greater than 20 feet in length will not be accepted. Provide National Sanitation Foundation seal of approval. Comply with the requirements for Type 1, Grade 1 (PVC 1120), of ASTM D-1784. Provide push-on type joints with a rubber O-ring gasket conforming to ASTM D-1869.
- 3. Supply all pipe from one manufacturer.

B. Joints

- 1. DIP joints for underground waterline installation shall be standard or restrained push-on joint type as noted on the Drawings, required by the Authority or as noted herein. All joints shall meet the requirements of ANSI/AWWA C111/A21.11. Restrained push-on joints shall be made using self gripping style restrained push-on gaskets such as Field Lok or approved equal. Piping installed in fills or on slopes in excess of 20% shall have fully restrained joints.
- DIP joints within vaults and manholes shall be flanged joint as indicated on the Drawings or as specified herein. Flanged joints, nuts, bolts, full face rubber gaskets, and appurtenances shall meet the requirements of ANSI/AWWA C115/21.15 and Appendix A of ANSI/AWWA C115/A21.15. All bolts shall be stainless steel.

- 3. DIP rubber gaskets, nuts, bolts, retainer glands, and appurtenances shall meet the requirements of ANSI/AWWA C111/A21.11.
- 4. As required due to alignment of waterline (in areas less than 10 feet horizontally and 18 inches vertically from sanitary sewers storm sewers, inlets, or manholes) DIP joints shall be restrained joint.

C. Fittings

- 1. All underground fittings shall be ductile iron compact fittings, unless otherwise noted on the Drawings. Compact fittings shall meet the requirements of ANSI/AWWA C153/A21.53. All fittings shall have standard outside coating of coal-tar or asphalt base and double inside cement mortar lining complete with seal coat all in accordance with ANSI/AWWA C151/A21.51 and ANSI/AWWA C104/A21.4, respectively.
- 2. Underground fitting joints shall be mechanical joint with restraint follower glands (Mega-A-Lug). Joints shall meet the requirements of ANSI/AWWA C111/A21.11. The restraint follower gland shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80. Twist off nuts shall be used to insure proper actuating of the restraining devices. The restraining glands shall have a pressure rating equal to that of the pipe on which it is used. Glands shall be EBAA Iron Inc. Megalug or equal.
- 3. DIP fittings within vaults and manholes shall be ductile iron flanged joint meeting the requirements of ANSI/AWWA C110/A21.10, unless otherwise noted on the Drawings. All fittings shall have standard outside coating of coal-tar or asphalt base and double inside cement mortar lining complete with seal coat all in accordance with ANSI/AWWA C104/A21.4. All fasteners to be stainless steel.
- 4. Rubber gaskets, nuts, bolts, retainer glands and appurtenances shall meet the requirements of ANSI/AWWA C111/A21.11.
- Couplings under 2-inch nominal diameter other than copper shall be compression type Smith-Blair, flexible service couplings Series 522, or equal.
 For 2-inch nominal diameter and over, couplings shall be full bodied ductile

iron, rated for proposed test pressure, and shall meet the requirements of ANSI/AWWA C219.

D. Polyethylene Encasement

1. Polyethylene tubes or sheets meeting the minimum requirements of ANSI/AWWA C105/A21.5 shall be used on all underground ductile iron pipe, fittings, valves, and hydrants.

E. Gate Valves

- 1. General. All gate valves shall be of the resilient wedge non-rising stem type. Valves shall have a minimum rated working pressure of 250 p.s.i.g. and 500 p.s.i.g. minimum test pressure rating. Unless otherwise specified, the valves shall meet the latest revision of AWWA Standard C-509 Specification.
- 2. All valves shall open left (counter clockwise).
- 3. Valves installed within standard push-on joint pipe shall be equipped with mechanical joint ends with restraint follower glands (as specified herein for fittings) complying with ANSI/AWWA C111/A21.11. Valves within the vaults and manholes shall be flanged joint complying with the requirements of ANSI/AWWA C115/A21.15, as indicated on the Drawings. Valves installed within restraint joint pipe shall be equipped with either mechanical joint ends and Megalug restraints as manufactured by EBBA Iron Sales, Inc., or equivalent restraint joint system as approved by the Owner.
- 4. All valves shall have 2" square operating nuts except for valves within vaults and manholes which shall be provided with handwheel (max. 15-inch diameter) for operation.
- 5. All bolts, studs and nuts shall be stainless steel.
- 6. Provide interior and exterior epoxy coating.
- 7. All valves shall be manufactured by Mueller Co.- Catalogue No. A-2360.
- 8. Brass gate valve in air release manhole shall be as specified on the Drawings.

F. Air Release Valve

- 1. Valve shall be a combination air valve with orifice, sized for the proposed conditions, consisting of a kinetic air and vacuum valve and an air release valve contained in a single body housing as detailed on the Drawings and as specified herein.
- 2. The valve shall be designed to exhaust large amounts of air during filling, to release small amounts of accumulated air during operation and to admit large amounts of air upon impending vacuum during draining.
- 3. The inlet shall be the nominal size of the valve and the outlet the same size as the inlet.
- 4. The valve body and cover shall be constructed of cast iron conforming to ASTM A126, Class B.
- 5. The air and vacuum portion of the valve shall be designed to exhaust air at up to sonic velocity without blowing shut (i.e., kinetic operation). There shall be no baffles, deflectors, or stems. The air vacuum float shall be spherical and shall be capable of withstanding test pressure of 1000 psi.
- 6. The air release portion shall have a stainless steel leverage mechanism and spherical float capable of withstanding a test pressure of 750 psi. The small orifice shall be stainless steel and have a rubber seat.
- 7. The valve shall be manufactured by GA Industries of Mars, Pennsylvania.

G. Valve Boxes

- 1. Each buried valve shall have a valve box (minimum weight 88 lbs).
- 2. Cast iron, 2-piece construction, screw type, with 18-inches lengths, not less than 5" in diameter shaft.
- 3. Depth of setting shall be adjustable over a range to accommodate a cover over the pipe of 4' 0" (minimum) and the box length shall be variable to suit the installation.
- 4. Furnish a deep socket type cast iron cover with each valve box with the word "WATER" cast on the cover.

- 5. Coat valve boxes with two (2) coats of coal tar epoxy.
- 6. Valve boxes shall be Bingham and Taylor, Figure No. 22.
- 7. Furnish one valve wrench with a stem of sufficient length to suit all installations. Wrench shall fit a 2-inch square nut and have a tee handle welded on the other end.

H. Marker Posts (as directed by Authority)

1. A flexible marker post with notation "Warning Buried Water Valve" shall be provided marking the location of the gate valve and box in unopened streets/wooded areas. Posts shall be Carsonite Water Line Marker as manufactured by Carsonite International, or approved equal.

I. Detectable Utility Marking Tape (as directed by Authority)

1. An electronically detectable tape with a minimum width of 2 inches and a minimum thickness of 5 mils with the message "CAUTION - BURIED WATERLINE BELOW" every 24 inches, and color per the AWWA requirements shall be provided.

J. Concrete Thrust Blocks / Encasement/Pipe Cradles

1. Concrete thrust blocks, encasement, and pipe cradles are sized per the details on the Drawings. Concrete shall be PennDOT Class A and meet the requirements of PennDOT 408, Section 704. Miscellaneous metals for concrete thrust blocks shall be as specified on the Drawings and shall be protected against corrosion by galvanizing, by coating with bituminous paint or by encasing the entire assembly with polyethylene (as per AWWA C105).

K. Service Line Connections

- 1. Water service connections shall be the size indicated on the Drawings. Water service lines shall be copper, Type K, seamless tubing, conforming to ASTM B-88, and carrying the National Sanitation Foundation (NSF) seal of approval for potable water. Ductile iron service lines shall comply with Section 202.A.
- 2. Fittings for copper pipe shall be water works brass compression type for copper tube meeting the requirements of AWWA C800. All unions or

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couplings shall be manufactured by Ford Meter Box Co. and have a Ford Pack Joint joining system.

- 3. Water service line connections to the mainline shall be by the connection taps complying with applicable portions of AWWA C800.
 - a. Corporation stops ball type with standard corporation stop thread as manufactured by the Ford Meter Company, Inc. Catalog No. FB1000.
 Joining system shall be Ford Pack Joint.
 - b. Water service saddles shall be bronze two strap type Style 202B as manufactured by the Ford Meter Box Company, Inc.
- 4. Curb stops shall be ball type and comply with AWWA C800, Section 4.2 as manufactured by the Ford Meter Box Company, Inc., Catalog No. B44. Joining system shall be Ford Pack Joint.
- 5. Curb boxes shall be extension type with arch pattern base of the length required, complete with 1-inch upper section, 2 hole Erie pattern lid, and inside rod and pin as manufactured by the Ford Meter Box Company, Inc. (Style EA1-40-40-30R, HS Lid 2 Hole). The rod shall be stainless steel.

L. Manholes and Appurtenances

1. Precast Manhole - Precast concrete manhole shall be 5'-0" in diameter (I.D.) at the barrel and reinforced throughout with reinforcing mesh. Top section shall be as required by the Drawings and as specified herein. Top sections shall have a 27-inch minimum diameter clear opening. All precast manhole sections shall conform to ASTM Specification C-478. Bottom barrel sections shall have precast pipe openings ("doghouse" section). Connections between concrete manholes and pipe shall be made with a resilient connector conforming to the requirements of ASTM C-923. Precast sections shall have bell and spigot ends. Joints between manhole sections shall be equipped with O-ring gaskets conforming to ASTM C-361 or AASHTO M-198B. Manholes steps shall be grouted or poured in place during fabrication. Concrete strength shall be not less than 3,750 psi. Top sections shall accommodate the cast iron frame and cover as specified, and shall be provided with four (4) anchor bolts.

Concrete base sections shall be pre-cast. The pre-cast manhole manufacturer will be responsible for the adequate design of the pre-cast section (based



upon the actual depth of installation for the manhole). The pre-cast manhole bottom thickness is indicated on Drawings.

- 2. **Waterproof Materials** Bituminous waterproof material shall meet the requirements of PennDOT Publication 408, Section 680.2(a).
- 3. **Manhole Castings** The manhole frame and cover shall be gray iron conforming to the minimum requirements of ASTM A48, Class 35B. Frame and cover shall have continuously matching machined surfaces to prevent rocking. The lid shall be solid with "WATER" stamped thereupon and have integral lifting hasp. The frame shall have a minimum clear opening of 27-inch. The frame and lid shall be Neenah Foundry No. 1766-B1. The frame shall be provided with a minimum of four (4) 3/4-inch diameter holes in the base flange for anchoring to precast vault section. Four (4) 5/8-inch diameter steel anchor bolts of length required to anchor frame to precast vault section shall be provided.
- 4. **Manhole Steps** Manhole steps shall be polypropylene coated steel reinforcing bars. Steel shall be a deformed reinforcing bar No. 6, Grade 60, meeting the minimum requirements of ASTM-A615. Coating shall be copolymer polypropylene plastic that meets the requirements of ASTM-D2146, Type II, Grade 43758. Steps shall have a flat serrated tread with end lugs to prevent feet from slipping off and be of size and shape as detailed on the Contract Drawings. Grout utilized to anchor the steps into the manhole barrel shall be of the non-shrink type meeting the minimum requirements of ASTM C 827, C 191 and C 109.

M. Hidden Flushing (Blow-off) Hydrant Assembly

- 1. Hydrant shall be Mueller hidden type flushing hydrant (CAT. No. A-410) or Eclipse No. 78 blow off hydrant as manufactured by Kupferle Foundry Co. with two (2) 1/2-inch hose nozzle. Hydrant shall be free draining to prevent freezing. Bury depth shall be a minimum of 48-inches. A Mueller/McCullough meter thermal shell (15-inch diameter and 12-inch depth) with frame and lockable lid shall house the top of the hydrant and shut off.
- 2. A flexible marker post marking the hydrant location shall be as specified herein.

N. Tapping Sleeve

- 1. Sleeves shall be suitable for connection to pipe of nominal diameter and material required.
- 2. Sleeve and outlet flange shall be stainless steel and suitable for 250 psi maximum working pressure.
- 3. Sleeve outlet flange shall be compatible with the material its connected to and shall have outlet dimensions and be drilled to comply with ANSI B16.1, class 125 and recessed in accordance with MSS SP-60.
- 4. Body shall contain 3/4" NPT test plug
- 5. Tapping sleeve shall be as manufactured by Mueller Company, Model H-304.

O. Tapping Valve

- 1. Tapping valve shall meet the requirements "Gate Valves" specified in this section.
- 2. In addition, the tapping valve shall have inlet flange complying with ANSI B16.1, class 125 drilling and with MSS SP-60.

P. Meter Pits

- 1. Residential meter pits shall be Mueller/HUNT Thermal-Coil Meter Box.
- 2. Provide box having an 18-inch diameter and 48-inch depth.

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- 3. Provide insulation pad.
- Inlet valve to be locking.
- 5. Provide heavy duty locking cast iron lid

PART 3 - EXECUTION

3.01 INSPECTION

A. General

- 1. The quality of all materials, the process of manufacturer, and the finished products shall be subject to inspection and approval by the Authority's Representative. Such inspection may be made at the place manufacturer or on the work after delivery, or at both places; and the products shall be subject to rejection at any time on account of failure to meet any of the specifications' requirements even though sample products may have been accepted as satisfactory at the place of manufacture.
- 2. Prior to being installed, each pipe, fitting, and valve shall be carefully inspected, and those not meeting the specifications shall be rejected and at once removed from the work.
- 3. Any pipe showing a distinct crack and which it is believed there is not incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is installed so the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack(s).

3.02 CUTTING OF PIPE

A. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe or its lining. Unless otherwise recommended by the manufacturer, cutting shall be done with an approved type mechanical cutter. A wheel cutter shall be used when practicable. Squeeze type mechanical cutters shall not be used for ductile iron. Grind cut ends and rough edges smooth. Bevel end for push-on joints.

3.03 ADJACENT FACILITIES SEPARATION

A. Paralleling Installation

- 1. All potable water mains shall be separated from all other pressure and gravity sewer pipe systems by at least ten (10) feet horizontally measured edge to edge.
- 2. In cases where it is not possible to maintain 10 feet horizontal separation, the water line must be installed in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18-inches above the top of the sewer.

B. Crossing Installation

- 1. Should the water main be installed less than 18-inches above the top of the sewer, the water main shall be concrete encased a minimum of 10 feet (from outside edge of sewer) on either side of the crossing.
- 2. Should the water main be installed beneath a sewer, a concrete pipe cradle shall be installed along the water main a distance of 2 feet (from outside edge of sewer) on either side of the crossing.
- 3. When crossing sewer pipes, one full length section of water pipe shall be centered over the adjacent utility such that both joints will be as far from the crossing as possible.

3.04 **JOINT DEFLECTION**

A. The allowable deflection will be 80% of the maximum as permitted in AWWA C600 and by the pipe manufacturer (most stringent criteria applies). If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

3.05 EXCAVATION

A. Excavate trenches as specified in Section 02150 and to the dimensions shown on the Drawings. Provide at least 4 feet of cover from the top of the pipe to the finished grade elevation, unless noted otherwise.

3.06 PIPE BEDDING AND HAUNCHING

- A. Each pipe section shall be laid in a firm bedding and haunched and backfilled with care.
- B. Bedding shall be as described in the Drawings and Section 02155 of these Specifications. AWWA C600 shall be referenced as necessary.

3.07 PLACING AND LAYING

- A. Pipe and accessories shall be placed and laid according to AWWA C600 and these Specifications.
- B. Clean and inspect each length of pipe or fitting before lowering into the trench. Do not lower pipe into the trench except that which is to be immediately installed.
- C. Lay pipe to a uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recess in bedding material to accommodate joints, fitting, and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- D. Pipe shall be laid with bell ends facing the direction of laying, unless otherwise specified by the Authority. Where pipe is laid on a grade of ten percent or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe upgrade.
- E. Lay each section of pipe in such a manner as to form a close concentric joint with adjoining section and to avoid offsets.
- F. Lubricate pipe and gaskets as recommended by the manufacturer. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement.
- G. Check each pipe installed as to line and grade in place. Correct deviations immediately. Deflection of pipe joints in excess of 80 percent of the maximum deflection of those specified in AWWA C600 and by the manufacturer (most stringent applies) will be cause for rejection.
- H. Install fittings and valves as pipe laying progresses. Do not support weight of fittings and valves from pipe.

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- I. When work is not in progress, and at the end of each working day, securely plug the ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- J. Backfill in accordance with Section 02155 and the Drawings, concurrently with pipe laying to hold the installed pipe in place. When pipe laying is terminated for any reason, plug the end of the pipe with a ductile iron cap and provide at least 2 feet of backfill over all pipe.

3.08 **JOINT ASSEMBLY**

A. All pipe joint assembly shall comply with AWWA C600.

1. Push-on Joints

- a. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
- b. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.
- c. Insert the spigot end of the pipe into the socket using care to keep the joint form contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot is fully inserted.

2. Mechanical Joints

- a. Wash the socket and plain end. Apply a thin film of lubricant. Slip the gland and gasket over the plain end of the pipe. Apply lubricant to the gasket.
- b. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
- c. Slide the gland into position, insert bolts, and finger-tighten nuts.
- d. Bring bolts to uniform tightness. Tighten bolts 180-degrees apart alternately.

3. Restraint Joints

a. As recommended by the pipe manufacturer.

3.09 THRUST BLOCKING

- A. Plugs, caps, tees, and bends deflecting 11-1/4 degrees or more, either vertically or horizontally, on underground waterlines 4 inches in diameter or larger shall be provided with thrust blockings as detailed on the Drawings. Blocking shall be placed between undisturbed earth and fitting to be anchored. The sides of thrust blocks not subject to thrust may be poured against forms. Blocking shall be placed so that the fitting joints will be accessible for repair. Miscellaneous iron and steel thrust block connections shall be protected against corrosion by galvanizing, by coating with bituminous paint or by encasing the entire assembly with polyethylene (as per AWWA C105). In addition, the fitting shall be wrapped with tar paper.
- B. Anchor dimensions recommended for 2000 psf soil bearing strength shall be used when soil is encountered along the sides and bottom of trench.
- C. If adequate bearing surface for blocking cannot be obtained, a joint restraint system (i.e., multiple pipe joints restrained) as approved by the Authority's Representative shall be provided in addition to blocking. All piping that is rodded together shall be assembled by replacing the affected bolts of the mechanical joint fittings with Meg-A-Lug Glands, or approved equal.
- D. Where any section of a water line is provided with concrete thrust blocking for fittings, the hydrostatic tests shall not be made until at least seven (7) days after installation of the concrete thrust blocking unless otherwise approved.

3.10 CONCRETE PIPE CRADLE, ANCHOR, AND ENCASEMENT

- A. Install where and as shown on the Drawings.
- B. The pipe to be encased or supported shall be adequately braced in both horizontal and vertical directions.
- C. Concrete shall be placed under, around and over pipe in a manner which will maintain the existing sewer pipe at line and grade.
- D. Pipe anchor shall be installed just down slope of nearest pipe joint at the approximate spacing indicated on the Drawings.

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3.11 POLYETHYLENE ENCASEMENT INSTALLATION

- A. The Contractor shall install polyethylene wrap on all underground ductile iron pipe and fittings, hydrants, and valves.
- B. The polyethylene encasement shall be installed in accordance with AWWA C105/A21.5 and the following:
 - 1. Pick up the pipe by a crane at the side of the trench using either a sling or pipe tongs, and raise the pipe about 3 feet off the ground. Slip a section of the polyethylene tube over the spigot end of the pipe and bunch up, accordion fashion, between the end of the pipe and the sling. The tube should be cut to a length approximately 2 feet longer than the length of the pipe.
 - 2. Lower the pipe into the trench, seat the spigot end in the bell of the adjacent installed pipe and then lower the pipe to the trench bottom. A shallow bell hole shall be provided in the trench bottom to facilitate the wrapping of the joint.
 - 3. Make up the pipe joint in the normal fashion.
 - 4. Remove the sling from the center of the pipe and hook into the bell cavity and raise the bell end 3 or 4-inches to permit the tube of polyethylene film to be slipped along the full length of the barrel. Enough of the film should be left bunched up, accordion fashion, at each end of the pipe to overlap the adjoining pipe about 1 foot.
 - 5. To make the overlap joint, pull the film over the bell of the pipe, fold around the adjacent spigot and wrap with about three circumferential turns of the 2-inch wide plastic adhesive tape to seal the tube of film to the pipe.
 - 6. The tube on the adjacent pipe shall then be pulled over the first wrap on the pipe bell and sealed in place behind the bell using about three circumferential turns of the 2-inch plastic adhesive tape.
 - 7. The resulting wrap on the barrel of the pipe will be loose, and it should be pulled snugly around the barrel of the pipe and the excess material folded over at the top and the fold held in place by means of 6-inch strips of the 2-inch wide plastic adhesive tape at intervals of about 3-feet along the pipe barrel.

- 8. Fittings, valve, hydrants, etc., shall be hand wrapped, using polyethylene film that is held in place with plastic adhesive tape. Bends, reducers and offsets can be wrapped with the polyethylene tube in the same manner as pipe.
- 9. Valves shall be wrapped by bringing the tube wrap on the adjacent pipe over the bells or flanges of the valve and sealing them with the adhesive tape. The valve bodies are then wrapped with a flat sheet of the film passed under the valve bottom and brought up around the body to the stem and fastened in place with the adhesive tape.
- 10. Hydrants shall be wrapped with polyethylene tube slipped over the hydrant to encase the hydrant from the lead-in valve to the ground level of the hydrant. To provide drainage of the hydrant, it is necessary to cut a small hole in the film and insert a short pipe nipple to drain the water to the soil outside the film wrap.
- 11. All fittings that require concrete blocking should be completely wrapped prior to pouring the concrete block.

3.12 SETTING OF VALVES AND VALVE BOXES

- A. Install gate valves conforming to AWWA C509 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C509. Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.
- B. Valve boxes shall be installed where shown and as shown on the Drawings. Valve boxes shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each gate valve unless otherwise noted. Contractor shall verify the location at each valve box before setting.
- C. Valves after delivery shall be drained to prevent freezing and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the hydrant or valve shall be fully opened and fully closed to insure that all parts are in working condition.

3.13 CONNECTIONS TO EXISTING LINES

- A. The Contractor shall locate existing pipe horizontally and vertically and verify the exact size of existing pipe. Locate existing pipe sufficiently in advance of making connections to allow ample time for making changes in the connection location and size. Backfill excavation immediately after buried pipe is located and measured.
- B. Make each connection with fittings and valves indicated on the Drawings. All required pipe, fittings, valves, tools, and equipment shall be at the connection site prior to start of connection. The Owner is the only party which shall operate existing valves. Install sufficient pipe and restraint joints so existing pipe can be put in service immediately after connection is completed. Inspect joints and eliminate leaks immediately after connection is completed and existing pipe is put in service.
- C. Make connections to existing waterlines with a minimum interruption of service on the existing line. Make connections to existing lines as directed by the Authority.
- D. Connections between different types of pipe and accessories shall be made with transition couplings as specified herein and as approved by the Authority's Representative and as recommended by the pipe manufacturer.
- E. The Contractor shall notify the Authority three (3) days prior to connecting to the existing system. The Authority will be responsible for notifying affected customers that their water will be shut-off during connection to the existing system.

3.14 MANHOLE INSTALLATION

- A. Manholes shall be constructed on six (6) inches of bedding material. The subgrade shall be prepared in accordance with Section 02155. Manholes shall be set to the depth as shown on the Contract Drawings. All precast section joints and manhole-pipe connections shall be constructed tight and leak-proof with o-ring gaskets and resilient manhole-pipe connectors, respectively.
- B. For base flange/built-up frames the Contractor shall set four (4) 5/8" anchor bolts in the top section and securely fasten the frame to the top section with the associated bolts. The frame and cover shall be set on gasket material (Kent Seal) set between frame and top section. The Contractor is fully responsible for field adjustments required to set the casting to finished grade, as noted on the Contract Drawings. For manholes in nonpaved areas with top elevation noted as flush with finished grade, set rim one (1) inch above finished grade, unless directed otherwise.

- C. Manhole steps shall be spaced vertically at twelve (12) inch centers. Steps shall align vertically to within a one inch tolerance. The first step shall be installed no more than approximately fifteen (15) inches below the bottom of the frame and above the manhole invert.
- D. Waterproofing material shall be applied in accordance with PennDOT Publication 408, Section 680.3 (a) and (b) to the level of bury on the exterior of all manholes and concrete structures.
- E. Once the manhole is constructed and waterproofing material applied, the manhole shall be backfilled. Within paved areas, as defined in Section 02155, backfill shall be select aggregate material placed a minimum of two (2) feet outside the manhole in loose layers not exceeding six (6) inches and compacted to 95% of maximum density at optimum moisture content as determined by Standard Proctor tests performed in accordance with ASTM D-698. Outside paved areas, as defined in Section 02155, backfill shall be native material placed and compacted in accordance with Section 02155.

3.15 DETECTABLE UTILITY MARKING TAPE

A. A continuous length of electronically detectable marker tape shall be installed at an approximate depth of 12 inches below finished grade in accordance with manufacturer's recommendations. Tape shall be installed for all underground waterlines without exception.

3.16 SERVICE LINE CONNECTIONS

- A. Service line connections shall be made into the water main with a tapping saddle only. The drilling machine shall be in first class condition with a sharp drill used at all times. Tapping depth shall allow two to three threads exposed when the tap is in place.
- B. Service line connections, curb stops, and curb boxes shall be installed in accordance with good water works practice with a minimum of forty-eight (48) inches of cover. Service line connections extend service from the corporation stop to the curb stop.
- C. Service line excavation shall be in accordance with Section 02150, "EXCAVATION". Bedding around the service line shall be free of stones and shall consist of select or fine aggregate materials in accordance with Section 02155, "BACKFILL AND COMPACTION."

SECTION 02665

FIRE HYDRANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. As provided by the Developer.
- B. Center Township Water Authority Rules, Regulations and Rates for Water Supply.
- C. Center Township Water Authority Capital Fees Policy for Water System.

1.02 DESCRIPTION OF WORK

A. The work shall include furnishing and installing fire hydrant assemblies including hydrant, 6" gate valve and box, 6" lead piping, tee fitting or hydrant tee fitting, blocking, excavation, bedding, backfill and compaction, testing and any other items required to complete this item as specified at locations shown on the Drawings, and as specified herein. It is noted that all of the above described components of the fire hydrant assembly may not be specifically detailed at each location on the Drawings; however, all components described above shall be included as an integral component of the fire hydrant assembly to be provided and installed by the Contractor.

1.03 RELATED SECTIONS

- A. Section 02150 Excavation.
- B. Section 02155 Backfill and Compaction.
- C. Section 02660 Water Distribution.
- D. Section 02675 Testing and Disinfecting Water Mains.

1.04 REFERENCES

A. American Water Works Association (AWWA).

1.05 SUBMITTALS

A. Submit shop drawings or material certifications, as applicable, for all products specified in Part 2 of this Section.

PART 2 - PRODUCTS

2.01 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Prepare hydrants and accessories for shipment according to AWWA Standards and:
 - 1. Seal hydrant ends to prevent entry of foreign matter into product body.
 - 2. Box, crate, completely enclose, and protect products from accumulations of foreign matter.
- B. Store products in areas protected from weather, moisture, or possible damage.
- C. Do not store products directly on ground.
- D. Handle products to prevent damage to interior or exterior surfaces.

2.02 FIRE HYDRANTS

- A. Fire hydrants shall be Super Centurion 250 (Catalog No. A423) as manufactured by Mueller Company. All fire hydrants shall comply with AWWA Specifications C-502 and the following specifications.
 - 1. Fire hydrants shall be of the compression type, closing with the line pressure having a 5 1/4-inch valve opening.
 - 2. All hydrant bonnets shall be furnished with a weather seal to protect the operating nut from dirt and water.
 - 3. The shoe shall have a mechanical joint with restraint follower gland (as specified in Section 02660).
 - 4. Hydrants shall be furnished with breakable feature that will break cleanly upon impact. This safety flange shall also permit full 360 degree rotation of facing of the upper barrel to position nozzles in desired position.

- 5. Drain valves shall be provided for draining the hydrant barrel with the main valve in the closed position. The drain valves shall work automatically with the main valve and shall be an integral part of the main valve.
- 6. The lower barrel shall be removable from the shoe while the hydrant is under pressure. A ductile iron lower barrel that is grooved or utilizing screwed flanged will not be acceptable.
- 7. All hydrants shall have bronze seat ring threaded into a bronze drain way to give a bronze to bronze connection.
- 8. Nozzle Arrangement: Two 2½ inch hose nozzles and one 5 inch pumper nozzle. The threads for the 2½ inch hose nozzles shall meet Center Township Fire Department Specifications. Attach 2½ inch hose nozzles with a separate chain. The 5-inch nozzle shall be a Harington Integral Hydrant Storz connection. Storz nozzle shall exceed the requirements of AWWA C502 and comply with the following:
 - a. Provide Storz nozzle with brass metal face and hard anodized aluminum ramps and lugs. The aluminum finish shall be hardcoat anodized to Mil-A-8625, type 3, dark gray. The Storz shall be made of forged or extruded 6061-T6 aluminum.
 - b. Provide blind cap with hard anodized aluminum Stroz ramps and lugs made of forged or extruded aluminum 6061-T6. Equip the cap with a suction seal. Connect the cap to the hydrant with 0.125" vinyl coated aircraft cable. The cap shall require a Storz spanner wrench for removal. The integral hydrant Storz with cap shall extend less than 2-inch from the hydrant face.
- 9. Operating nut: National Standard 1½-inch pentagon.
- 10. Direction of Opening Counterclockwise, to the left.
- 11. Maximum working pressure rating of 250 psig.
- 12. Color: Hydrant shall have a factory applied chromate primer and two field coats of yellow engine enamel.
- B. Fire hydrant assembly installation shall include:
 - 1. Fire hydrant.

- 2. One (1) mechanical joint tee with a 6-inch diameter branch. A mechanical joint elbow may be added where space is limited or as indicated on the Drawings. For hydrants along restraint joint pipe sections, a mechanical joint tee with "Meg-A-Lug" retainers as manufactured by EBBA Iron Sales, Inc. may be used in place of a restraint joint tee. Fittings shall comply with Section 02660.
- 3. One (1) gate valve and valve box. Valve and valve box shall comply with Section 02660.
- 4. Six inch diameter pipe of suitable length per the Drawings. Pipe shall comply with Section 02660.
- 5. Coarse aggregate bedding and backfill material as specified in Section 02155.
- 6. Thrust blocking for hydrant tee and fire hydrant.

PART 3 - EXECUTION

3.01 FIRE HYDRANTS - GENERAL

- A. Determine the exact location and size of pipe, valves, and hydrant from the Drawings or other applicable portions of these Technical Specifications. Review proposed field location with Authority's Representative prior to the execution of work.
- B. Perform trench excavation, and backfill and compaction in accordance with Sections 02150 and 02155, respectively.
- C. Install pipe valve and fittings in accordance with other applicable paragraphs within Section 02660.
- D. Restore area as noted of the Drawings.

3.02 FIRE HYDRANTS

- A. Install fire hydrant as shown on the Drawings. Provide thrust blocking and drainage gravel as shown.
 - 1. A 4 foot minimum bury depth is required.
 - 2. Set hydrants plumb with pumper nozzle facing the edge of pavement.

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- 3. Set hydrants with nozzles at least 18- inches above the ground and the safety flange not more than 4-inches nor less than 2-inches above grade.
- 4. Ensure proper hydrant drainage (i.e., do not block drain hole).
- B. Hydrants shall be wrapped with polyethylene tube slipped over the hydrant to encase the hydrant from the lead-in valve to the ground level of the hydrant. To provide drainage of the hydrant, it is necessary to cut a small hole in the film and insert a short pipe nipple to drain the water to the soil outside the film wrap.
- C. Each fire hydrant shall be fully opened and closed under system water pressure to ensure proper operation. Dry barrel hydrants shall be checked for proper drainage.

END OF SECTION 02665

SECTION 02675

TESTING AND DISINFECTING WATER MAINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. As provided by the Developer.
- B. Center Township Water Authority Rules, Regulations and Rates for Water Supply.
- C. Center Township Water Authority Capital Fees Policy for Water System.

1.02 DESCRIPTION OF WORK

- A. The work of this Section includes, but is not limited to:
 - 1. Hydrostatic Pressure Testing.
 - 2. Leakage Testing.
 - 3. Disinfecting.

1.03 RELATED SECTIONS

- A. Section 02660 Water Distribution.
- B. Section 02665 Fire Hydrants.

1.04 REFERENCES

- A. American Water Works Association (AWWA).
- B. Pennsylvania Department of Environmental Protection (PaDEP) Water Supply Manual.

1.05 ACCEPTANCE

A. No test will be accepted until the results are below the specified maximum limits established herein or by the Pennsylvania Department of Environmental Protection.

B. The Contractor shall determine and correct all sources of leakage at his own expense.

1.06 SUBMITTALS

- A. Submit shop drawings or material certifications, as applicable, for all products specified in Part 2 of this Section.
- B. Disinfection test results shall be provided to the Authority's Representative and shall include:
 - 1. Location of test.
 - 2. Coliform densities.
 - 3. Date and hour samples collected.
 - 4. Date and hour samples tested.
 - 5. Analytical Method Employed.
- C. Hydrostatic Testing Submittal: The Contractor shall submit to the Authority's Representative a general testing sequence schedule and shall include listing or testing equipment to be used. A minimum of three (3) working days prior to the start of testing, the Contractor shall submit to the Authority's Representative notarized certificates attesting that all pressure gauges being used have been calibrated and are accurate to 0.1 lbs./sq. in. The Contractor shall submit to the Authority's Representative the results of all testing as specified herein.
- D. Bacteriological Test Lab: Contractor shall submit to the Authority's Representative, for approval (at least fourteen (14) calendar days prior to sampling/testing) the proposed name and certified (PaDEP) license number of the testing laboratory to perform all required bacteriological testing.

PART 2 - PRODUCTS

2.01 PRODUCTS

- A. Hydrostatic testing equipment shall consist of, but not be limited to:
 - 1. Hydro pump.
 - Pressure hose.

- 3. Test connections.
- 4. Pressure gauge, calibrated to 0.1 psi.
- Pressure relief valve.

2.02 CHEMICALS

- A. Liquid chlorine shall meet the requirements of AWWA B301.
- B. Calcium hypochlorite and sodium hypochlorite shall meet the requirements of AWWA B300.

PART 3 - EXECUTION

3.01 HYDROSTATIC TESTING

A. <u>Description</u>: The Contractor shall hydrostatically test the new water system waterline installation in accordance with AWWA C600 Standards. A pressure test and leakage test may be conducted concurrently. Regardless of the sequence of tests employed, the results of pressure test, leakage tests and disinfection shall be satisfactory as specified. All testing shall be witnessed by the Authority's Representative. The Contractor shall coordinate the test with the Authority's Representative. The Contractor shall provide temporary thrust restraint at the ends of the potable water line in order to prevent pipe or joint damage, separation, or movement resulting from the integral pipe pressure developed during hydrostatic testing. Where any section of a water line is provided with concrete thrust blocking for fittings, the hydrostatic tests shall not be made until at least seven (7) days after installation of the concrete thrust blocking unless otherwise approved.

Hydrostatic tests and disinfection may be conducted concurrently using the water treated for disinfection to accomplish the hydrostatic tests. If the water is lost when treating for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be re-accomplished by the Contractor at no additional cost.

B. <u>Flushing</u>: Prior to hydrostatic testing, all underground mains shall be flushed thoroughly to remove foreign materials which may have entered the pipe during the course of installation or which may have been present in existing piping. The minimum rate of flow shall not be less than the water demand rate of the system, which is determined by the system design or not less than that necessary to provide a velocity of 2.5 fps, whichever is greater. Flushing operations shall continue for a

- sufficient time to ensure thorough cleaning. Contractor shall provide all necessary flushing equipment and appurtenances required to complete the flushing. Contractor shall suitably dispose of the water issuing from the flushing outlets.
- Pressure Testing: After the water main is installed, trench partially backfilled leaving C. the joints exposed for examination, the water main shall be completely filled with water and all air expelled, the Contractor shall slowly increase the pressure in the line to 225 psig. Pressure reading shall be measured at the low point of the test section and corrected to the elevation of the test gauge. The test section of pipe shall be slowly filled with water. All air shall be removed through the permanent air vents installed in the line or through taps at all high points where permanent air vents are not installed. Taps shall be furnished by the Contractor and plugged with suitable brass plugs after testing and sterilizing. When the pressure in the line has stabilized, the Contractor shall begin the two (2) hour test period in which the pressure may not vary by more than 5 psi. If the pressure drops 5 psi below the test pressure, the Contractor shall again increase the pressure to the test pressure by pumping as required and restart the two (2) hour test period. This procedure shall be repeated as necessary to maintain the test pressure for a minimum period of two (2) hours. If the Contractor is unable to maintain the required test pressure for a minimum of two (2) hours after six (6) repeated attempts to maintain the test pressure, the section of the line under test shall be considered to have failed the pressure test. Upon test failure, the Contractor shall determine and correct the cause of excessive leakage, at no additional cost to the Authority, and repeat the hydrostatic test as required until the above test conditions have been meet.
 - 1. Each valve, if existing between testing points (valves), shall be opened and closed several times during the test. Exposed pipe, joints, fittings, valves, and hydrants shall be carefully examined during the test. Joints showing visible leakage shall be replaced or remade. Cracked or defective pipe, joints, fittings, valves or hydrants discovered in consequence of this pressure test shall be repeated until the test results are satisfactory.
 - 2. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Authority's Representative when one or more of the following conditions is encountered:
 - Wet or unstable soil conditions in the trench.
 - Compliance would require maintaining barricades and walkway around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.
 - The Authority's Representative directs the Contractor to backfill the

trench prior to testing.

The Contractor shall request this waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02155.

D. Leakage Test: Leakage test shall be conducted concurrently with the pressure test in accordance with AWWA C600. The leakage test shall be conducted for a minimum of two (2) hours by pumping water into the test section as required to maintain the test pressure. Leakage shall be measured by such means as approved by the Authority's Representative and shall not exceed the maximum allowable leakage as shown in Table 6A, Section 4.1 of AWWA C600, or 0.06 gallons per hour per inch diameter per 1000 feet, whichever is more stringent (i.e., less leakage).

If leakage exceeds the specified amount, the section of line under test shall be considered to have failed the leakage test. The Contractor shall determine and correct the causes for excess leakage, at no additional cost to the Authority, and repeat the leakage test as required until the above test conditions have been satisfied.

3.02 DISINFECTION

- A. Disinfect the entire potable water system as generally described in AWWA C651 unless modified herein.
- B. Hydrostatic tests and disinfection may be conducted concurrently using the water treated for disinfection to accomplish the hydrostatic tests. If the water is lost when treating for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be re-accomplished by the Contractor at no additional cost.
- C. Section 7.1, Standard Conditions of AWWA C651 is modified as follows: After final flushing and before the new water main is connected to the active distribution system, the Contractor shall collect one (1) water sample for every 1200 L.F. or less of water line being tested. The Contractor shall be required to obtain water samples at equidistant points along the length of the waterline being tested. Samples shall be transported to a PaDEP approved laboratory where they shall be analyzed for coliform bacteria. A complete written report shall be provided to the Authority indicating: Coliform Densities; Date and Hour Samples Collected; Date and Hour Samples Tested; and Analytical Method Employed. All samples must meet PaDEP water quality standards prior to permanent connection to the active distribution system.

- D. Include Section 9, "Final Connections to Existing Mains" of AWWA C651 as a requirement of this Section.
- E. Should the initial treatment fail to result in the conditions specified in the above paragraphs, the disinfection procedures shall be repeated until such results are obtained and are satisfactory in the opinion of the Authority's Representative, at no additional cost to the Authority.
- F. All expenses and costs incurred in carrying out the specified disinfection work including bacteriological sampling/laboratory testing shall be included in the cost of installing the pipeline.
- G. The Authority reserves the right to direct the Contractor to provide material and labor as is necessary to channel the discharge of flushing water, disinfection solution and testing water to a drainage structure if, in the opinion of the Authority or jurisdictional authority, the unrestricted discharge of said liquids causes an undesirable or hazardous condition. De-chlorinate all super chlorinated water prior to discharge.

END OF SECTION 02675