

# TECHNICAL SPECIFICATIONS

## CONSTRUCTION OF WATER MAINS AND APPURTENANCES CONNECTED TO THE PUBLIC WATER SYSTEM

QUARRYVILLE BOROUGH AUTHORITY

QUARRYVILLE, PENNSYLVANIA

RETTEW Project No. 0147102953

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**TECHNICAL SPECIFICATIONS FOR  
CONSTRUCTION OF WATER MAINS  
AND APPURTENANCES TO BE CONNECTED  
TO THE QUARRYVILLE BOROUGH AUTHORITY  
PUBLIC WATER SYSTEM**

**SECTION 1. GENERAL CONDITIONS**

**1.1 GENERAL**

These specifications cover the requirements for the cross-connection control program and additions and extensions to the Quarryville Borough Authority (Authority) Water System. All additions and extensions shall be completed in accordance with these Technical Specifications. The work shall include furnishing of all plans, labor, new materials, equipment, supplies, transportation, fuel, and power and performing all work as required by the Rules and Regulations and Technical Specifications, including such detail drawings as may be required to prosecute the work. All furnished drawings shall contain design plans and profiles at a scale of 1" = 20' horizontal and 1" = 5' vertical unless otherwise approved by the Authority. Work shall be executed in a workmanlike manner by qualified, careful and experienced workers.

The Quarryville Borough Authority reserves the right to establish special supplemental requirements for any given addition or extension based upon unique features of the specific project, recent changes in standard water works operating and construction practices which may not be reflected within the specifications as herein contained, or for any other legal or administrative reasons which the Authority may identify.

The following items are required as part of the design, construction, and dedication process for all extensions of and/or connections to the Authority's Public Water System:

1. All design/construction plans and specifications shall be sealed by a professional engineer who is registered in the Commonwealth of Pennsylvania prior to approval of the documents by the Authority.
2. All design/construction plans shall include a note indicating that all construction shall conform to the latest revision of the Authority specifications at the time of Final Plan approval by the Authority, and that all deviations from Authority specifications shall require approval by the Authority prior to construction.
3. All design/construction plans shall be based on a U.S.G.S. datum. The U.S.G.S. tie-in benchmark location must be either shown or referenced on the plans.
4. As required by the Authority, shop drawings of all materials and equipment to be installed as part of the construction project shall be submitted to the Authority for review and approval prior to construction.

5. As required by the Authority, a complete construction schedule and construction contact list shall be submitted to the Authority prior to construction.
6. Construction shall not begin until a Final Plan has been approved by the Authority.
7. The Authority shall be notified one week prior to the beginning of construction.
8. A pre-construction conference shall be conducted prior to construction. Attendees shall include the Authority, Authority's Engineer, Owner, Owner's engineer, and Owner's contractor, unless otherwise approved by the Authority.
9. As required by the Authority, complete record documents and operation and maintenance manuals shall be submitted to the Authority for review and approval. The Authority shall not accept dedication of any facilities until approval has been obtained.
10. If a project involves several types of utility installations, the Authority will only offer final approval of the design plans when design of all other utility installations is complete and only after final approval of the plans has been obtained by those agencies that regulate the other utility installations (e.g., storm sewer). At that point, the Authority will require written confirmation that all other reviewing agencies have approved the plans. The Authority shall then have the opportunity to re-review the plans for conformance with Authority specifications. Should the plans no longer be in conformance with Authority specifications, the Authority will forward its concerns in the form of a review letter to the entity responsible for the design. Only after all potential utility conflicts have been addressed to the Authority's approval will the design plans be finally approved by the Authority. At no point during this process will the Authority permit the construction of any utilities until all comments have been addressed to the satisfaction of the Authority and until a final set of revised plans incorporating all comments have been received and acknowledged by the Authority. During construction, the Authority reserves the right to inspect any utility installation that it deems in conflict or detrimental to those utilities owned or slated to be owned by the Authority. Any costs borne by the Authority for such inspection shall be the responsibility of the Developer installing said utilities.

## 1.2 DEFINITIONS

Terms used in the Technical Specifications, which are the same as terms, used in the Authority's Rules and Regulations shall have the same meaning as established in the Rules and Regulations.

The following additional definitions shall apply to the Technical Specifications and shall have the meaning established below unless indicated otherwise in the text.

Air Gap (AG) Separation - The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying potable water to tank, plumbing fixture, or other device, and the flood level rim of the receptacle. The differential distance shall be at least double the diameter (2 x D) of the supply pipe measured vertically, above the top of the rim of the vessel. In no case shall the Air Gap be less than one inch.

Approved - Backflow prevention device or method accepted by the Authority as suitable for the proposed use.

Atmospheric Vacuum Breaker (also known as the non-pressure type vacuum breaker) - Device containing a shut-off valve followed by a valve body containing a float-check, a check seat and an air inlet port. When the shut-off valve is open, the flow of water causes the float to close the air inlet port. When the shut-off valve is closed, the float falls and forms a check valve against back siphonage and at the same time opens the air inlet port.

Auxiliary Water System - Any water source or system on the Improved Property of or available to the Customer except Connections to the Public Water System.

Backflow - A flow condition, induced by a differential in pressure, which causes the flow of water or mixtures of water and other liquids, gases or other substances into the Public Water System from a source other than its intended source.

Backflow Preventer - A device or other means, which will prevent the Backflow of water or liquids of questionable quality into the Public Water System.

Backsiphonage - The Backflow of water or mixture of water and other liquids, gases, or other substances from a plumbing fixture or other customer source, into the Public Water System main due to a temporary negative or sub-atmospheric pressure within the Public Water System.

Building - A structure built, erected and framed of component structural parts designed for the housing, shelter, enclosure or support of persons, animals or property of any kind.

Building Service - The portion of the Service Line from the Street right-of-way line to the Building.

Containment - Cross-connection control which isolates the Customer's Water System from the Public Water System so as to provide the protection necessary to prevent contamination of the Public Water System in the event of Backflow from the Customer's Water System.

Contamination - The degradation of the quality of the drinking water by wastewaters, processed fluids, or any water of a quality less than accepted drinking water quality to a degree which would create an actual hazard to the public health through poisoning or through the spread of disease.

Cross-connection - An arrangement allowing either a direct or indirect connection through which Backflow, including backsiphonage, can occur between the drinking water in the Public Water System and a system containing a source or potential source of contamination.

Customer's Water System – A system to convey water that is owned and maintained by a private company or a private individual(s).

Degree of Hazard - An evaluation of the potential risk to health and the adverse effect upon the Public Water System.

Double Check Valve Assembly (DCVA) - An assembly composed of two single, independently acting, check valves including tightly closing shut-off valves located at each end of the assembly and suitable connections for testing the water tightness of each check valve.

Health Hazard - Any condition, device, or practice in a Public Water System or its operation that creates, or may create, a danger to the health and wellbeing of its users. The word "severe" as used to qualify "Health Hazard" means a hazard to the health of the user that could reasonably be expected to result in the significant morbidity or death.

Non-potable Water - Water not safe for drinking, personal, or culinary use.

Pollution - The presence in water of any foreign substance that tends to degrade its quality so as to constitute a hazard or impair the usefulness or quality of the water to a degree which does not create an actual hazard to the public health, but which does adversely and unreasonably affect such waters for domestic use.

Potable Water - Water that is satisfactory for drinking, culinary, and domestic purposes and meets the requirements of the Department of Environmental Protection.

Pressure Vacuum Breaker - An assembly containing an independently operating-internally loaded check valve and an independently-operating loaded air inlet valve located on the discharge side of the check valve. The assembly is to be equipped with properly located test cocks and tightly closing shut-off valves attached at each end of the assembly. This assembly is designed to protect against a Health Hazard under a backsiphonage condition only.

Process Fluids - Any fluid or solution which may be chemically, biologically, or otherwise contaminated or polluted in a form or concentration such as would constitute a health, pollutional, or system hazard if introduced into the public or a Customer's Water System. This includes, but is not limited to:

- A. polluted or contaminated waters;
- B. process waters;
- C. used waters originating from the Public Water System that may have deteriorated in sanitary quality;
- D. cooling waters;
- E. contaminated natural waters taken from wells, lakes, streams, or irrigation systems;
- F. chemicals in solution or suspension;
- G. oils, gas, acids, alkalis, and other liquid and gaseous fluids used in industrial or other processes, or for firefighting purposes;
- H. heating system waters from boilers or heat pumps.

Professional Engineer - An individual licensed and registered under the laws of the Commonwealth of Pennsylvania to engage in the practice of engineering.

Professional Land Surveyor - An individual licensed and registered under the laws of the Commonwealth of Pennsylvania to engage in the practice of surveying.

Public Water System - A system that is owned and operated by a Public or Private entity governed by State and Federal regulations for the provision to the public of water for human consumption, firefighting, manufacturing, irrigation, culinary, and animal consumption through pipes and other constructed conveyances.

Reduced Pressure Zone Device (RPZ) - Minimum of two independently acting check valves together with an automatically operated pressure differential relief valve located between the two check valves. During normal flow and at the cessation of normal flow, the pressure between these two checks shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve, by discharging to the atmosphere, shall operate to maintain the pressure between the checks at less than the supply pressure. The unit must include tightly closing shut-off valves located at each end of the device, and each device shall be fitted with properly located test clocks.

Service Line - The pipe that connects a Public Water system to a Customer's Water System.

System Hazard - A condition posing an actual or potential threat of damage to the physical properties of the Public Water System or the Customer's Water System.

### 1.3 USE OF EXPLOSIVES

Blasting and Explosives: Any extensions or modifications to the Authority's water system, which contemplates blasting or use of explosives, shall be submitted to the Authority for review at least three days prior to the commencement of such work. The Authority, in its discretion, may prohibit the use of explosives on any such work or may limit the range or scope of blasting work if, in the opinion of the Authority's Manager or Public Works Superintendent or the Authority's Engineer, the use of explosives could cause damage or harm to the Authority's Public Water System.

When blasting is permitted by the Authority for any specific project, the use of explosives shall be governed by the "Regulations for the Storage, Handling and Use of Explosives" of the Pennsylvania Department of Labor & Industry as well as any other applicable Federal, State or local regulations governing the use of explosives. In addition, the party seeking to use explosives shall obtain from the local municipality any blasting permits required in order to use explosives for any part of the construction of any work. Receipt of the Authority's permission to use explosives on any particular work does not constitute a release of liability of any Owner or other party undertaking such project. Any harm caused to the Authority's facilities as a result of such blasting shall be repaired or replaced by the party causing such harm. Where the Authority's approval to use explosives in any particular project is given, the Owner to whom such permission is given shall: (a) comply with any additional requirements or safeguards imposed by the Authority in addition to all other Federal, State and local bodies regulating the use of explosives and blasting; and (b) defend, indemnify and hold harmless the Authority from and against all damages, injuries, and death caused by use of such explosives.

#### 1.4 LEAD BAN

Pursuant to the Pennsylvania Plumbing System Lead Ban and Notification Act (the “Lead Ban Act”), no connection shall be made to the Authority’s Public Water System until the Authority receives a certification from the Owner that only lead-free materials have been used in the construction of a new Building and in the mains, Service Lines, and Service Connections. The Lead Ban Act applies to all work completed after January 6, 1991. If the Owner requesting connection to the Public Water System is unable to provide proper certification, the Authority, under the Lead Ban Act, must refuse to allow the connection.

## **SECTION 2. CROSS CONNECTION CONTROL PROGRAM**

### **2.1 PURPOSE**

The purpose of this program is:

- A. To protect the Public Water System from Contamination or Pollution by isolating, within the Customer's Water System, contaminants or pollutants which could Backflow through the Service Line into the Public Water System.
- B. To promote the elimination or control of existing Cross-connections, actual or potential, between the Water System and non-potable water sources, plumbing fixtures, and sources or systems containing Process Fluids.
- C. To provide for the maintenance of a continuing program of Cross-connection control which will systematically and effectively prevent the Contamination or Pollution of the Water System.

### **2.2 APPLICATION**

This program shall apply to all Improved Property served by the Public Water System of the Authority, Quarryville, Pennsylvania.

### **2.3 POLICY**

The Authority and the Customer have the joint responsibility for protection of the Public Water System from Contamination due to Backflow of contaminants through the Service Connection. All Improved Property served by the Authority shall be required to have a backflow prevention device installed. An approved backflow prevention device shall be installed prior to the first branch line leading off each service line to a customer's water system. The backflow preventor shall be installed in residences and in businesses in a location accessible to Authority personnel. Backflow prevention devices shall not be bypassed, made inoperative, removed, or otherwise made ineffective without specific authorization by the Authority.

### **2.4 CROSS-CONNECTIONS PROHIBITED**

- A. No Service Line shall be installed or maintained to any Improved Property where actual or potential Cross-connections to the Public Water System or Customer's Water System may exist unless such actual or potential Cross-connections are abated or controlled to the satisfaction of the Authority.
- B. No Service Line shall be installed or maintained whereby water from an Auxiliary Water System may enter the Public Water System unless such Auxiliary Water System and the method of Connection and use of such supply shall have been approved.

## SECTION 3. BACKFLOW PREVENTION DEVICES

### 3.1 GENERAL

- A. General. The requirement to install backflow prevention devices on all new service lines was adopted by the Authority through Ordinance 314 dated July 6, 1998. In selecting for use the devices outlined in this Section, it is vital that the degree of protection provided be commensurate with the Degree of Hazard present. Backflow prevention devices shall be as recommended by the Pennsylvania Department of Environmental Protection in its "Water Supply Manual, Part VII, Cross-connection Control/Backflow Prevention." It is also important that the limitations of each device be understood since the degree of protection provided will depend on the type of Backflow prevention device and the maintenance program employed.

Acceptable Backflow prevention devices used for Cross-connection control are as follows:

1. Air Gap (AG)
  2. Reduced Pressure Zone Devices (RPZD)
  3. Double Check Valve Assembly (DCVA)
  4. Other Approved Device by the Authority
- B. Air Gap (AG). An Air Gap separation provides a complete physical separation between the free flowing discharge end of a Potable Water supply line, faucet, plumbing fixture, or other device and the flood level rim of an open or non-pressure receiving vessel. An acceptable Air Gap separation shall be at least double the diameter of the supply line. In no case shall the Air Gap be less than one inch.

Advantages: Properly designed and installed Air Gap installations provide the maximum degree of protection against Backflow.

Limitations: Air Gap separations can be defeated by the thoughtless addition of a hose that in effect extends the discharge end of the pipe to a point below the highest possible water level of the fixture. Under some conditions the cost of an Air Gap separation may be high when compared to a mechanical Backflow prevention device. Air Gap separation usually deprives the water Customer of the use of the water pressure in the main.

- C. Reduced Pressure Zone Device (RPZD). This device consists of two spring loaded check valves operating in series, and a spring-loaded diaphragm activated differential pressure relief valve, located in the zone between the check valves. Two tightly closing shutoff valves and four test cocks complete the assembly. These devices will indicate leakage through one or both check valves or the relief valve by the discharge of water from the relief valve port. This factor is an important advantage over the double check valve assembly.

Advantages: The RPZDs, when periodically tested and properly maintained, may be used for Backflow protection situations where it would be extremely difficult to provide an Air Gap separation between two systems. Malfunctioning of RPZDs is indicated by the discharge of water from the relief port. RPZDs provide protection from Backflow due to both backpressure and or Backsiphonage.

Limitations: RPZDs are mechanical devices that require periodic testing and maintenance. Pressure loss through RPZDs may be expected to average between ten to 30 psi, depending on *the* size and the flow rate of the device. RPZDs should not be installed below ground level, must be protected from freezing and provided with adequate space to facilitate maintenance and testing.

- D. Double Check Valve Assembly (DCVA). The DCVA consists of two independently acting check valves mounted in series with two tightly closing shutoff valves and four test cocks.

Advantages: The primary advantage of a DCVA is that when its two check valves are in the wide-open position there is a relatively little resistance to flow. The head loss through the device ranges between 3 and 11 psi, depending on the rate of flow and the diameter of pipe. DCVAs provide protection against Backflow due to Backsiphonage or backpressure. The DCVA may be less expensive to install than an Air Gap or a RPZD.

Limitations: DCVAs have an inherent weakness of possible failure without giving an exterior indication that a failure has occurred. DCVAs are mechanical devices that require periodic inspection and maintenance.

- E. Approved Devices. All Backflow prevention devices, both reduced pressure principle and double check valve types, shall meet the requirements of American Water Works Association Standards latest revisions. The devices shall either appear on an approved list or be tagged by the manufacturer as meeting the referenced standard.

## 3.2 SURVEYS

- A. It shall be the responsibility of the Customer to conduct periodic surveys of water use practices on its Improved Property to determine whether there are actual or potential Cross-connections to the Customer's Water System through which contaminants or pollutants could Backflow into the Public Water System.

## 3.3 FIRE PROTECTION SYSTEMS

- A. An approved Backflow prevention device shall be installed on each Service Line to a fire protection system where the following conditions exist. The type of protection required for fire protection systems shall depend on the Degree of Hazard and shall be as follows:
1. Reduced Pressure Zone Device (RPZD)
    - a. Any system where anti-freeze or inhibitors are used.

- b. Any system where an Auxiliary Water System is available and connected to the fire system.
2. Double Check Valve Assembly (DCVA)
  - a. Any system (wet or dry) with a pumper connection.
  - b. Wet system only with booster pump on a Building over three stories high.
  - c. Any system with private hydrants.

### 3.4 TYPE OF PROTECTION REQUIRED

- A. The type of protection required shall depend on the Degree of Hazard that exists as follows:
  1. An approved Air Gap separation shall be installed where the Public Water System may be contaminated with substances that are dangerous to the public health and could cause a severe Health Hazard.
  2. An approved Air Gap separation or an Approved Reduced Pressure Zone Backflow assembly shall be installed where the Public Water System may be contaminated with a substance that could cause a system or Health Hazard.
  3. An approved Air Gap separation or an approved Reduced Pressure Zone Assembly or an approved Double Check Valve Assembly or other approved device by the Authority shall be installed where the Public Water System may be polluted with substances that would be objectionable, but not dangerous to health.

### 3.5 BACKFLOW PREVENTION DEVICES

- A. Any Backflow prevention device required by these Technical Specifications shall be of a model or construction approved by the Authority and shall comply with the following.
  1. Air Gap (AG) separation to be approved shall be at least twice the diameter of the supply pipe measured vertically above the top rim of the vessel, but in no case less than one inch.
  2. A Double Check Valve Assembly (DCVA) or a Reduced Pressure Zone Assembly (RPZA) shall be approved by the Authority and shall mean a device that has been manufactured in full conformance with standards established by the American Water Works Association entitled, "AWWA C510-89 Standards for Double Check Valve Backflow Prevention Devices and AWWA C511-89 Standards for Reduced Pressure Zone Devices."

The Authority herein adopts said AWWA Standards. Final approval, however, of the Reduced Pressure Zone Assembly and the Double Check Valve Assembly shall be evidenced by a "Certificate of Full Approval" issued by an approved testing laboratory certifying full compliance with the said AWWA standards.

- B. Existing Backflow prevention devices approved by the Authority at the time of installation and properly maintained shall, except for inspection and maintenance requirements, be excluded from the requirement of Section 2.9 of this program providing the Authority is assured that they will satisfactorily protect the Public Water System. Whenever the existing device is moved from the present location or requires more than minimum maintenance or when the Authority finds that the maintenance of the device constitutes a Health Hazard, the device shall be replaced by a Backflow prevention device meeting the requirements of this program.

### 3.6 CUSTOMER RESPONSIBILITIES - COMMERCIAL AND INDUSTRIAL

- A. The Customer has the responsibility, upon application for service or when the condition of the Customer's Water System changes, to inform the Authority:
  - 1. Of any Auxiliary Water System that may be used by the Customer;
  - 2. Of the type of fire protection system to be utilized;
  - 3. Of any facility or process that may endanger the Public Water System.
- B. The Customer shall have a competent plumber/tester provide, install, and test Backflow prevention devices.
- C. The Customer shall have an inspection and an operational test made on Backflow prevention devices bi-annually by a competent plumber/tester in accordance with the manufacturer's procedures and shall have all necessary and proper maintenance done promptly. The Customer shall inform the Authority of the results of all tests and of all maintenance performed using forms approved by the Authority.
- D. The biannual report and test forms shall include the plumber's certification that the Backflow prevention device is operating properly.
- E. If the Backflow prevention device fails to meet the test requirements, this failure shall be indicated on the biannual report and test forms. The device shall be repaired or replaced promptly and the Authority shall be notified when this repair or replacement has been completed. Failure to do so shall result in the Authority making such repair or replacement at the expense of the Customer.
- F. Failure to comply with the requirements of this Section may result in discontinuance of water service by the Authority.
- G. In the event of accidental Pollution or Contamination of the Customer's Water System due to Backflow from the Customer's Improved Property, the Owner shall promptly take steps to confine further spread of the Contamination within the Customer's Water System and should notify the Authority of the condition.

### 3.7 BACKFLOW DEVICE TESTER/PLUMBER

- A. The tester/plumber shall make competent inspections, repair Backflow devices and prepare reports to the Authority using forms approved by the Authority.
- B. The tester/plumber shall use original manufactured parts for repair or replacement of Backflow devices and shall provide the Authority with a list of materials or replacement parts used.
- C. The tester/plumber shall not change the design, material or operational characteristics of a Backflow prevention device without the prior written approval of the Authority.

## SECTION 4. MATERIALS AND INSTALLATION OF WATER MAIN CONSTRUCTION

### 4.1 TRENCH PREPARATION AND EXCAVATION

- A. Perform sheeting and shoring as required by Federal, State, and local laws and regulations and as otherwise required to protect workers, the public, and adjacent structures, utilities, and other aboveground and below-ground facilities.
- B. General: Excavation of every description and of whatever substances encountered shall be performed in accordance with all applicable Federal, State, and Local requirements.
  - 1. Excavation shall be made by open cut, unless tunneling or boring is required.
  - 2. Trenches may be excavated and backfilled either by machinery or by hand as the Owner may elect, provided, however, the Owner shall use hand excavation where necessary to protect existing structures, utilities, or private or public properties and provided, further, that backfilling shall be done by hand to the extent hereinafter specified.
- C. Stripping, Storing and Restoring Surface Items: The Owner shall remove all paving, sub-paving, curbing, gutters, brick, paving block, granite curbing, flagging or other similar materials, and grub and clear the surface over the area to be excavated and shall properly store and preserve such materials that may be required for future use in restoring the surface. The Owner shall be responsible for any loss or damage to said materials because of careless removal or neglectful or wasteful storage, disposal, or use of the materials.
  - 1. The Owner shall restore all shrubbery, fences, poles or other property and surface structures, removed or disturbed as a part of the work, to a condition equal to that before the work began, furnishing all labor and materials incidental thereto.
- D. Width of Trench: Pipe trenches shall be sufficiently true in alignment to permit the pipe to be laid in the approximate center of the trench. The trench shall be wide enough to provide a free working space on each side of the pipe.
- E. Length of Trench:
  - 1. No trench shall be opened more than 100 feet in advance of the pipelines laid.
  - 2. The Owner shall limit all trench openings to a distance commensurate with all rules of safety.
  - 3. If the work is stopped either totally or partially, the Owner shall refill the trench and temporarily repave over the same and the trench shall not be opened until he is ready to proceed with the construction of the pipeline.
  - 4. The length of open trench shall not exceed what the Owner can complete within that working day.

- F. Pumping and Draining: The Owner shall remove by pumping, draining, or otherwise, any water which may accumulate in the trenches and other excavations and shall build all dams and do all other work necessary to keep the trenches or other excavation as free from water as possible. Disposal of all water removed from the trenches or other excavations shall be in accordance with good erosion and sedimentation pollution control practices.
- G. Accommodations of Drainage: The Owner shall keep gutters, sewers, drains and ditches open at all times so that the flow of storm or other waters shall not be obstructed. If the material excavated from the trenches must temporarily extend over gutters or other waterways, it shall be the duty of the Owner to plank or bridge over the gutters, without extra compensation, so that the flow of water is not impeded.
- H. Maintenance of Traffic: Work shall be conducted so as to cause a minimum of inconvenience to pedestrian and vehicular traffic and to private and public properties along the line of work. It shall be the duty of the Owner, at all times, to maintain crossing, walks, sidewalks, and other Streets open to traffic and in a satisfactory condition, and to keep all fire hydrants, water valves, fire alarm boxes, and letter boxes accessible for use. Whenever it is necessary to maintain pedestrian traffic over open trenches, a timber bridge at least three feet in width and equipped with side railings shall be provided. When the excavated material will encroach upon sidewalks or private property, sheeting shall be placed in order to keep the sidewalk or private property clear of excavated material.
1. Maintenance and protection of traffic on Borough Streets and State Highways shall be in strict accordance with Pennsylvania Department of Transportation (PennDOT) Form 408, Section 900; and Title 67, Chapter 203. The Owner shall modify the sign locations daily in order to protect that section of Street to be disturbed during that same day. No use of explosives shall occur without prior approval by the Authority.
- I. Protection of Utilities, Property and Structures: The existence and location of underground utilities as indicated on any plans of the Authority is presented merely to serve as a notification that such utilities do exist in the general proximity of the work. Any utilities not shown, or not located as shown, shall not be cause of the Owner to deny responsibility for their protection and/or repair during construction.
1. The Owner shall notify all utility companies in advance of construction to include requesting the utilities to be located in accordance with Pennsylvania One Call Act No. 187 **Pennsylvania811** (1-800-242-1776) and cooperate with agents of these companies during the progress of the work. Procedures for emergency action and repairs to utilities shall be established with the utility company prior to commencement of the work. During the course of his work, if the Owner damages any of the aforementioned utilities, he shall immediately follow the procedure of emergency action and repair as established at his own expense.
  2. Whenever the Owner, during the progress of the excavation, shall uncover service pipes or lines, which because of injury or age are in poor condition, he shall immediately notify the proper authority in order that steps may be taken for replacement or repair. Locations of repairs, and the procedures of repairs that have been made shall be recorded by the Owner.

3. The Owner shall sustain in their places, and protect from direct or indirect injury, all pipes, conduits, tracks, walls, buildings, and other structures or property in the vicinity of his work, whether above or below the ground, or that may appear in the trench.

J. Stream Crossings:

1. Construct stream crossing in accordance with an approved Stream Crossing Plan and an approved Sedimentation and Erosion Control Plan. Obtain all Federal, State, and Local permits.
2. Make all necessary provisions for cofferdamming, dewatering, and removal of excess excavated material. Disposal of water removed from excavations shall be in accordance with the Sedimentation and Erosion Control Plan and good erosion and sedimentation control practices.
3. Maintain the flow in the stream at all times.
4. Where rock is encountered in the stream crossings, do not use forms to construct the concrete encasement; place concrete on firm rock below the pipe and against firm rock on both sides of the pipe to provide a firm bond between the encasement and the rock.

K. Sinkholes:

1. Where a sinkhole is found or formed during construction or warranty period, the Authority shall be notified immediately. An evaluation of the sinkhole shall be conducted by the Authority's Engineer or licensed professional company for sinkhole remediation approved by the Authority. A method of sinkhole remediation shall be chosen by the Authority's Engineer or licensed professional company for sinkhole remediation approved by the Authority. Remediation of the sinkhole shall be completed in the presence of the Authority's Engineer and at minimum as specified hereinafter.
2. Sinkhole Prevention and Remediation: Soil located above a zone of solution activity is usually soft and wet. Owner shall maintain the depth of excavation to the absolute minimum required to accommodate the Work and shall take measures to prevent the development of localized low spots. If weak, yielding or saturated conditions are encountered, Owner shall perform excavation as described below:
  - a. Perform excavation and backfill of unstable subgrade as follows:
    - 1) If, during preparation of subgrade, soft or unstable subgrade areas are detected, excavate the unsuitable subgrade to the limits directed by the Authority's Engineer.
  - b. Backfill the excavated areas with on-site soil backfill material.
    - 1) Compact in layers not exceeding six inches loose depth. Compact to 95% of the soil's maximum standard dry density, to pipe trench bottom or structure aggregate base bottom.
  - c. If during subgrade excavation operations a sinkhole develops, the Owner shall remove all soft or unstable soils located in the base of the sinkhole and shall continue excavation until stable soils are encountered, the "throat" of the sinkhole is exposed

and/or the presence of rock outcrops or the depth of excavation preclude further excavation.

- 1) Due to the instability of the sides of an existing sinkhole, extreme caution must be exercised during sinkhole remediation to prevent collapse of the soils due to pressure from equipment.
- d. Following removal of all unstable soils from the base of the sinkhole, an evaluation of the stability of the base and sidewalls shall be conducted by Owner's geotechnical engineer. This evaluation will be used to make specific recommendations regarding remediation of the cavity. As a guide, the sinkhole should be backfilled as described below.
- 1) If the base of the excavation exposes a "throat" or opening into bedrock, grouting and/or concrete may be required to fill or block the throat in order to prevent additional soil from collapsing or being washed into the opening.
  - 2) Having established or modified the integrity of the base of the sinkhole, Owner or may proceed with backfilling of the excavation. Sinkhole shall be backfilled approximately 1-1/2 feet with crushed aggregate having a maximum particle size of approximately 3/4 inches.
  - 3) Backfill the final 1/2 to 2/3 of the excavation using site soils compacted to at least 95% of soil's maximum dry density.

## 4.2 PIPE BEDDING AND TRENCH BACKFILL

- A. Bedding: The trench shall be excavated to a depth of six (6) inches below the outside diameter of the pipe barrel, or deeper if so specified. The resultant subgrade shall be undisturbed or compacted as approved. The bedding shall then be prepared by placing a thoroughly compacted aggregate pipe bedding and initial backfill material, as specified hereinafter, in 6-inch (uncompacted thickness) layers to 12-inches above top of pipe. Bedding shall provide uniform and continuous bearing and support for the pipe at every point between bell ends.
- B. Special Bedding:
1. Concrete Encasement: If concrete encasement is required, the trench shall be excavated to a depth of six (6) inches below the outside of the barrel of pipes 24-inches in diameter or less and nine (9) inches below the outside of the barrel of pipes larger than 24-inches in diameter.
  2. Flowable Fill Encasement: If flowable encasement is approved or required, the trench shall be excavated to a depth of six (6) inches below the outside barrel of the pipe and no less than twelve (12) inches on each side pipe barrel. The trench shall be filled to "pavement restoration depth" with flowable fill.
  3. Unstable Subgrade: Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, any type of refuse, vegetable, or other organic material, or large pieces or fragments of inorganic material, the Owner shall excavate and remove such unsuitable material to a width and depth approved by the Authority's Engineer.

4. Excavation in Fill: When the pipe is laid in fill, the compacted embankment shall be brought to a height of at least nine inches above the proposed top of the pipe before the trench is excavated. At no time may the pipe be laid on grade and the embankment brought up around it.
- C. Backfilling Methods:
1. General: Backfilling shall not be done in freezing weather except by permission of the Authority, and it shall not be done with frozen material. Do not backfill when the material already in the trench is frozen.
  2. Compact trench backfill as follows:
    - a. Within State Highway Right-Of-Way: All trench excavation and backfill within State Highway right-of-way will be subject to inspection by representatives of the Commonwealth of Pennsylvania, Department of Transportation, and the work must be performed in accordance with the requirements of PennDOT. The Owner shall have no claim to the Authority even though such requirements may entail more labor or services than the methods herein described. Use mechanical tampers or trench rollers to compact final backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of not less than 95 percent of maximum lab density as determined by ASTM D698 or as determined by PennDOT requirements. The Owner shall perform field determinations of density, when requested, in accordance with ASTM D1556 or in accordance with PennDOT requirements.
    - b. Areas Other Than State Highway Right-Of-Way: Use mechanical tampers to compact backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of not less than 95 percent of maximum density obtained at optimum moisture content as determined by ASTM D698. The Owner shall perform field determinations of density, when requested, in accordance with ASTM D1556.
- D. Pipe Bedding Beneath and to Springline of Pipe: All trenches shall be backfilled, from the bottom of the trench to the centerline of the pipe with PennDOT No. 1B bedding material placed in layers of 6 inches (uncompacted thickness) and compacted by tamping or other approved mechanical methods. Bedding material shall be deposited in the trench for its full width on each side of the pipe and fittings simultaneously.
- E. Initial Backfill Over Pipe: From the springline of the pipe and fittings to a depth of one 1) foot above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods with PennDOT No. 1B. The Owner shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe. The backfill shall be placed in 6-inch layers (uncompacted thickness) and compacted by tamping or other approved mechanical methods.
- F. Aggregate Backfill to Restoration Depth (State and existing Borough Streets including Driveways): From one 1) foot above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be PennDOT No. 2A or PennDOT 2RC aggregate material subject to limitations specified and consolidated by tamping in 6-inch layers or other approved mechanical methods unless otherwise specified. Any

consolidation method utilizing water such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.

- G. Backfill Material to Restoration Depth (proposed Borough Streets including Driveways, Lawns, Meadows and Cultivated Fields): From one foot above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be excavated material approved by the Authority and containing no stones larger than eight (8) inches in maximum dimension. A maximum of 20% of the backfill volume may be stones so long as the stones are evenly distributed within the material. Excavated material shall be free of organic material, refuse, and frozen materials, subject to limitations specified, and consolidated by tamping in eight-inch layers or other approved mechanical methods unless otherwise specified. Any consolidation method utilizing water, such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.

#### 4.3 WATER MAIN

- A. Minimum Diameter Pipe: eight inches.
- B. Water main shall be cement lined ductile iron pipe per the latest ANSI/AWWA C 151/A 21.51 and ANSI/AWWA C 150/A 21.50.
- C. Wall thickness shall be a minimum of Class 52. The minimum wall thickness shall be based on internal pressure, earth, and live loads, with the addition of corrosion and casting tolerances and shall be determined in accordance with ANSI Standard A21.50, American Standard for the Thickness Design of Ductile-Iron Pipe.
- D. Cement mortar linings shall conform to ANSI/AWWA C 103/A 21.4 double thickness.
- E. Joints shall be push-on type or mechanical joint type in accordance with ANSI/AWWA C 111/A 21.11 for all pipes except as approved by the Authority.
1. All joints between full sections of pipe shall be restrained push-on type in accordance with ANSI/AWWA C110/A21.11. Mechanical restrained joints shall be used for joints that include less than a full section of pipe to be fitted into the bell end of a new section of pipe, a change in alignment, appurtenances, or any other condition that requires pipe restraint.
    - a. Restrained joints for pipe anchorage shall be TR Flex, as manufactured by U.S. Pipe; Super-Lock or Field Lok as manufactured by Clow; Lok-Fast, as manufactured by American Pipe; Locked Mechanical Joint, as manufactured by Atlantic States; Snap-Lok as manufactured by Griffin or equal.
    - b. Mechanical restrained joints shall include restrained push-on type pipe with a follower gland equipped with twist-off nuts to ensure proper restraint against the pipe. When the twist-off nuts are sheared off, standard hex-heads shall remain. The follower gland shall employ a restraining system which, when activated, employs a multiple wedging action against the pipe. Follower glands shall possess a minimum working pressure of

250 psi. Follower glands shall be as manufactured by EBBA Iron, Inc: Mega-lug, or equal.

- F. Fittings shall be ductile iron AWWA/ANSI C110/A21.10 or ductile iron compact fittings AWWA/ANSI C153/A21.53. All fittings shall have a minimum pressure rating of 250 psi and shall have cement lining and joints as required for pipe restraint.
- G. At the option of the Authority, the Owner shall submit to the Authority, in duplicate, a certification from the manufacturer that all fittings comply with all applicable requirements and standards noted above.

All pipe installed at special crossings under highways and streams shall have mechanical joint ends, conforming to the requirements of ANSI Standard A21.51.

#### 4.4 VALVES

A. Gate Valves (3"-12" in diameter):

- 1. Stem type when installed underground and rising stem type otherwise.
- 2. Valve stem seal of such design that allows replacement of O-rings with valve under pressure in the fully open position.
- 3. Iron body, outside screw and yoke, bronze mounted with resilient-seated wedge conforming to AWWA C 509.
- 4. Resilient seat of Styrene Butadiene SBR or Urethane Rubber bonded to cast iron wedge.
- 5. Stem seals of "O"-ring type.
- 6. Valves equipped with 2-inch square operating nut and open counter-clockwise.
- 7. Exterior to be asphalt varnish or epoxy coated; interior ferrous metal parts to be epoxy coated, AWWA C 550.
- 8. Acceptable Manufacturers:
  - a. American Flow Control.
  - b. or Equal.

B. Air Valves:

- 1. The air valves shall be of the float operated, compound leverage type, stainless steel construction conforming to ASTM A 240 and A 276, and capable of automatically releasing air from a fluid system while that system is in operation and under pressure. The body and trim shall be cast iron construction conforming to ASTM A 48, Class 35 or ASTM A 126, Class B.
- 2. To assure drop tight shut off, a viton orifice button having an adjustable feature shall be used to seal the valve discharge orifice. The orifice diameter must be sized for use within a given operating pressure range to ensure maximum discharge capacity.
- 3. The float shall be of all stainless steel construction and capable of withstanding a pressure of 1,000 psi, conforming to ASTM A 240.

4. Acceptable Manufacturers:
  - a. Crispin
  - b. APCO.
  - c. ValMatic.
  - d. GA Industries.
  
- C. Pressure Reducing Valve:
  1. Valve shall be designed for at least a 200-psi maximum inlet pressure and an adjustable outlet pressure. Valve shall be complete with pilot valve(s) and factory piping and ready to install when received from the factory.
  2. The pressure-reducing valve shall automatically maintain a uniform downstream pressure and also function as a check valve in the event that upstream pressure drops below downstream pressure.
  3. Valve body shall be cast stainless steel and liner shall be 65 Durometer natural rubber blend.
  4. Acceptable Manufacturers:
    - a. The Roll Seal Valve Company.
    - b. Golden Anderson.
    - c. Watts.
    - d. Or Approved Equal.
  
- D. Tapping Sleeve and Valve:
  1. Design Working Pressure: Minimum 200 psi.
  2. Tapping Sleeve: AWWA approved construction split sleeve, mechanical joint. Material shall be cast iron, ductile iron, or stainless steel.
  3. Tapping Valve: Oversize seat rings, standard flange for bolting to sleeve, mechanical or push-on joint with slotted holes for bolting to tapping machine. Tapping valves shall be iron body; bronze mounted with resilient-seated wedge conforming to AWWA C 509, and double-disc, and shall be vertical, non-rising, stem-nut operated. Valves shall be equipped with a 2-inch square operating nut and open counter-clockwise.
  4. Acceptable Manufacturers:
    - a. Mueller.
    - b. American Flow Control.
  
- E. Valve Boxes:
  1. For valves 2-inches and larger, provide an adjustable roadway type box constructed of cast iron, with a shaft provided with screw extension pieces, and either round or oval detachable base.
  2. Valve boxes shall have a 5 1/4-inch shaft unless otherwise specified by the Authority.

3. Box shall have a plug lid fitting into a recessed seat. The lid shall have the word "WATER" cast on the top surface. All parts of the box shall be of gray iron, free from cold shuts and blowholes and shall be painted with black bituminous paint. All valve boxes shall be equipped with a "mud plug" prior to placing the valve in service.
4. Valve boxes shall be set at or above the surface of the adjoining ground or roadway and shall be provided for all buried valves. Valve box shall have an adjustable range up to 6-inches above grade.

#### 4.5 FIRE HYDRANTS

- A. All fire hydrants and main sizes shall meet the specifications of the Middle Department Association of Fire Underwriters.
- B. Hydrants shall be cast iron body, fully bronze mounted, suitable for a working pressure of 150 psi, and shall conform to AWWA Standard C 502, latest revision. Hydrants shall be constructed in a manner permitting withdrawal of internal working parts without disturbing the barrel or casing. Valve, when shut, shall be reasonably tight when upper portion of barrel is broken off. Each hydrant shall be shop tested to hydrostatic pressure of 300 lbs. per sq. in. with valve in both open and closed positions.
- C. All public fire hydrants served by the Public Water System shall conform to the following minimum standards:

Number of Connections:

- One -- 4-1/2-inch connection
- Two -- 2-1/2-inch connections

National Standard Threads (NST)

<u>Connection</u>	<u>Outside Diameter (Male)</u>	<u>Threads Per Inch</u>
2-1/2-inch	3.0686 inches	7-1/2
4-1/2-inch	5.7609 inches	4

- D. The hydrant standpipe shall be connected to the ground line either by a frangible coupling or by flanges with frangible cast iron bolts. The main valve rod at the ground line shall be connected employing a frangible coupling. Hydrants shall be provided with an "O" ring type seal plate. The seal plate shall be fitted with at least two "O" rings. The lower "O" ring shall serve as the pressure seal and the upper "O" ring as a combined dirt and moisture seal.
- E. The main valve shall open left with the direction of opening cast on head of hydrant. Hose nipples shall be bronze or non-corrosive metal. Nipple caps shall be securely chained to the barrel. The hydrant shall be currently dated.
- F. Hydrant tees shall be used to tee hydrant lateral from water main to hydrant.
  1. Acceptable Manufacturers:

- a. Union Foundry Company
  - b. Griffin
  - c. Or Approved Equal
- G. Hydrants shall be painted with an approved paint of color as directed by the Authority, after their installation.
- H. Acceptable Manufacturer: American Darling B-62-B-5.

#### 4.6 BLOW-OFF HYDRANTS

- A. General: Cast iron, self-draining, non-freeze box hydrant with brass operating parts.
- B. Box: Cast iron with provisions for padlock.
- C. Barrel: 2-inch Class 50 ductile iron pipe.
- D. Inlet Connection: 2-inch MJ.
- E. Outlet: 2-inch brass National Straight Hose Thread.
- F. Drainage Aggregate at Base of Hydrant: AASHTO No. 57 crushed stone.
- G. Acceptable Manufacturer: Kupferle Foundry Company Model TF500 – 2”, or approved equivalent.

#### 4.7 SERVICE CONNECTIONS - CORPORATIONS

- A. Refer to Section 4 of the Technical Specifications for requirements related to Service Lines.

#### 4.8 PIPE, VALVES, AND FIRE HYDRANT INSTALLATION AND TESTING

- A. General: All pipe shall be laid and maintained to the required lines and grades with fittings and valves at the required locations, spigots centered in bells, and all valves plumb.
- 1. The pipe shall be laid in materials as specified in Section 3.2.
  - 2. Construction of the pipelines shall begin with connections to existing, active water lines and shall proceed with adjoining main line sections.
  - 3. If services are connected to the main prior to testing, testing shall be done against the curb stops.
- B. Construction Control: During the installation of a water main, the pipe shall be laid at a constantly increasing grade to each high point, air valve, or point of discharge. The Owner shall provide sufficient construction control to assure that there are no sags or loss in grade in the pipeline that could tend to accumulate air. Failure to comply with this requirement shall necessitate the Owner take remedial steps to correct this situation to the Authority’s satisfaction.

- C. Water Mains on Steep Slopes: Water mains on slopes of 15 percent or greater shall be anchored securely with concrete anchors. Spacing of anchors is subject to approval of the Authority on a case-by-case basis.
- D. Restraint: All plugs, caps, tees, and bends (both horizontal and vertical) shall be provided with mechanically restrained joints. The Owner shall submit a drawing and obtain the Authority's approval for the pipe restraint and fittings at each connection, or at any locations designated by the Authority.

When the water mains must be tested before connections to existing mains can be completed, temporary reaction backings or restrained type plugs shall be installed.

- E. Depth of Pipe: All pipes shall be laid to a minimum of 4-feet, 0-inches from grade to the crown of pipe, unless otherwise approved by the Authority.
- F. Separation of Water Mains, Sanitary Sewers and Storm Sewers:
  - 1. Parallel Installation: Water mains shall be laid at least ten feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, deviations may be allowed, subject to the approval of the Authority.
  - 2. Crossings: Whenever water mains must cross building drains, storm drains, or sanitary sewers, the water main shall be laid at such an elevation that the bottom of the water main is 18 inches above the top of the drain or sewer. This vertical separation shall be maintained for the portion of the water main located within ten feet horizontally of any sewer or drain it crosses. The ten feet is to be measured as a perpendicular distance from the drain or sewer line to the water line.
    - a. Where water mains must cross under a sewer line, additional protection shall be provided by:
      - 1) A vertical separation of at least 18 inches between the bottom of the sewer line and the top of the water line.
      - 2) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line.
      - 3) That the length of the water line be centered at the point of the crossing so that the joints shall be equidistant and as far as possible from the sewer line.
    - b. If any of the above conditions cannot be met, concrete encasement shall be utilized, and installed per AWWA C 105 Specifications, Method A or B. The encasement shall extend ten feet in each direction from the crossing measured perpendicular to the sewer or storm drain.
    - c. The Owner is responsible for providing all fittings, anchorage, excavation, backfill, as required to cross any and all sanitary sewer lines and appurtenances and storm drain lines within the above requirements.

- d. All crossings must meet the requirements of the latest Pennsylvania Department of Environmental Protection Water Supply Manual.
  - e. The Authority reserves the right to review and govern water main crossings and separation of other utilities including but not limited to gas and oil pipe lines.
- G. Handling of Pipeline Materials Into Trench: Proper implements, tools and facilities satisfactory to the Authority's Engineer shall be provided and used by the Owner for the safe and convenient prosecution of the work.
- H. Cleaning Pipe and Fittings: All lumps, blisters, and excess coal tar coating shall be removed from the bell and spigot end of each pipe; and the outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean and dry and free from oil and grease before the pipe is laid.
- I. Laying Pipe: Every precaution shall be taken to prevent foreign material from entering the pipe while the pipe is being placed in the trench. After placing a length of pipe in the trench, the spigot end shall be centered in the bell or coupling and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved aggregate material tamped under it except at the joints. Pipe and fittings that do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space.
- J. Cutting Pipe: The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe, so as to leave a smooth end at right angles to the axis of the pipe.
  - 1. At times when pipe-laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other approved means. This provision shall apply during the lunch hour or any extended break period, as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
- K. Bell Ends to Face Direction of Laying: Bell and spigot pipe shall be laid with bell ends facing in the direction of laying.
- L. Underground Warning Tape: Printed polyethylene tape, three inches minimum width, blue for water lines, one inch minimum lettering, printed with name of utility buried below, and suitable for installation in all soil types shall be installed above all new water lines.
- M. Permissible Deflection of Joints: If deflection is required, make after joint is assembled. The amount of deflection shall not exceed the maximum limits as specified in the AWWA Standard C 600. Restrained joints must be capable of being deflected up to the maximum limits as specified in the AWWA Standard C 600 for push-on type joints.
- N. Unsuitable Conditions for Laying Pipe: No pipe shall be laid in water or when, in the opinion of the Authority, trench conditions are unsuitable.

O. Jointing Ductile Iron Pipe:

1. Mechanical Joints: The spigot end of the pipe shall be centrally located in the bell so that the rubber gasket is evenly seated.
  - a. All loose rust or foreign matter shall be removed from the inside surfaces of the bell and outside surface of the spigot prior to assembly. Bolts shall be tightened uniformly with a ratchet wrench so as to effect the joint seal. The normal range of bolt torques to be applied is:
 

Bolt Size (Inches)	Torque-Ft. Lbs.
5/8	45 - 60
3/4	75 - 90
1	100 - 120
1¼	120 - 150
  - b. If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning.
2. Push-On Type Joints: The joint shall be assembled as recommended by the manufacturer so as to effect the joint seal.
3. Restraints for Fittings: All tees, plugs, plugged crosses, and bends deflecting 11.25 degrees or more on mains 6" in diameter or larger shall be provided with restrained joints to prevent movement.
4. Metal Harness: Metal harness with tie rods of adequate strength to prevent movement shall be used when, in the judgment of the Authority, they are deemed necessary. Steel rods shall be Type 304 stainless steel. Metal harness shall be as approved by the Authority.
  - a. Acceptable Manufacturers:
    - 1) Astral Corporation
    - 2) or Approved Equal

P. Disinfection of Installed Pipe:

1. General: Before pressure and leakage testing, disinfect the water pipelines in accordance with the recommended practice established in AWWA Standard C 651. Conduct water line disinfection in the following steps:
  - a. Preliminary flushing
  - b. Chlorine application
  - c. Final flushing
  - d. Bacteriologic tests
2. Preliminary Flushing: Prior to disinfection, except when the tablet method is used, fill the line to eliminate air pockets and flush the line at a rate of flow which provides a velocity of 2.5 feet per second to remove particulates. Refer to AWWA C 651 for rate of flow to produce 2.5 fps in pipe of various sizes. The Authority shall be notified at least 24 hours in advance of any flushing operation. The Authority shall be present during the operating of valves required to

fill mains. The Authority shall monitor Flushing. The Owner shall dispose of flushing water in a manner approved by the Authority.

3. Chlorine Form: The chlorine form to be applied to the system shall be either chlorine gas solution, calcium hypochlorite or sodium hypochlorite. The Authority's written approval of the chlorine form to be used is required.
4. Chlorine Application:
  - a. Continuous Feed Method:
    - 1) Continuous feed method consists of placing calcium hypochlorite granules in the main with Potable Water during construction. Completely fill the main to remove air pockets, flush to remove particulates, and fill the main with Potable Water chlorinated so that after a 24-hour holding period in the main there will be a free chlorine residual of not less than ten mg/L.
    - 2) At a point not more than ten feet downstream from the beginning of the new main, feed water and chlorine to the line at a constant rate such that the water will have not less than 25 mg/L free chlorine. Chlorine application shall not cease until the entire line is filled with heavily chlorinated water.
    - 3) During chlorine application, take precautionary measures to prevent the concentrated treatment solution from flowing back into the existing distribution system and/or supply source.
  - b. Granular Method:
    - 1) The granular method consists of placing calcium hypochlorite granules in the water main as it is being installed and then filling the main with potable water when installation is completed.
    - 2) **NOTE:** Since the preliminary flushing step must be eliminated, this method may be used only when scrupulous cleanliness has been exercised and only with approval of the Authority's Engineer. It shall not be used if trench water or foreign material has entered the main, or if the water temperature is below 41°F.
    - 3) During construction, place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500 ft. intervals. Refer to AWWA C 601 for quantity of granule to be used.
    - 4) **WARNING:** This procedure must not be used on solvent welded plastic pipe or in screwed joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.
    - 5) During construction, place sufficient amount of granular calcium hypochlorite in each section of pipe, in hydrants, hydrant branches, and other appurtenances to obtain a minimum concentration of 25-mg/L available chlorine.
    - 6) When pipeline installation is completed, fill the main with water at a maximum velocity of one foot per second. This water shall remain in the pipe for at least 24-hours. Manipulate valves so that the chlorine solution does not flow back into the line supplying the water.

- c. During the 24-hour treatment, operate all valves, curb stops, and hydrants in the section treated.
  - d. At the completion of the 24-hour treatment, the treated water in all portions of the main shall have a residual of not less than ten mg/L free chlorine.
  - e. Repeat the disinfection process until the minimum available chlorine is present at the end of the treatment sequence. The granular method cannot be used in these subsequent disinfections. No additional compensation will be provided the Owner for repeat treatment or testing.
5. Final Flushing: Within 24-hours after chlorination, flush the heavily chlorinated water from the system under treatment until the chlorine concentration in the water leaving the system is no higher than that generally prevailing in the system or is acceptable for domestic use. Notify the Authority at least 24 hours prior to final flushing.
6. Disposing of Heavily Chlorinated Water: It shall be the Owner's sole responsibility to dispose of the chlorinated water in a manner acceptable to the Pennsylvania Department of Environmental Protection. The chlorinated discharge water will cause damage to the environment therefore neutralizing agent using one of the chemicals listed below shall be applied per Table 1 to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water.

TABLE 1

Pounds of Chemicals Required to Neutralize Various Residual Chlorine Concentrations in 100,000 gal. of Water

Residual Chlorine Concentration mg/L	Sulfur Dioxide SO <sub>2</sub>	Sodium Bisulfite NaHSO <sub>3</sub>	Sodium Sulfite	Sodium Thiosulfate Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ·5H <sub>2</sub> O
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

7. Bacteriological Testing:
- a. After final flushing is completed and before the water main is placed in service, test the line for bacteriologic quality.
  - b. Collect a minimum of one sample at the end of each line for each test, and one sample of the incoming water from the existing Public Water System for comparison.
  - c. Collect samples in sterile bottles treated with sodium thiosulfate.

- d. Sampling tap shall consist of corporation stop installed in the main with copper tube gooseneck assembly. No hose or fire hydrant shall be used to collect samples.
- e. Provide bacteriological test reports to the Authority. Failure to meet State health standard requirements will be cause for Owner to rechlorinate and retest the system, at no additional cost to the Authority.
- f. No section of water main shall be approved to be put into service until satisfactory bacteriological test reports for that section have been submitted to the Authority.
- g. The Authority reserves the right to test the water at any time prior to final acceptance of the work and, if found unsafe bacteriologically, to require the Owner to rechlorinate the system.

Q. Testing of Installed Pipe:

- 1. Hydrostatic Tests: No pipe shall be hydrostatically tested prior to a completed disinfection test.
  - a. Pressure Test: After the pipe has been laid, backfilled and disinfected as specified, all newly laid pipe, or any valved section thereof, shall be subjected to a hydrostatic pressure of 150 pounds per square inch, or 50% in excess of the normal working pressure, whichever is greater.
    - 1) Duration of Test shall be at least two hours.
    - 2) Procedure: Each section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Authority. The pump, pipe connections, and all necessary apparatus, including gauges, shall be furnished by the Owner and is subject to approval by the Authority. The Owner will make all taps into the pipe, and furnish all necessary assistance for conducting the tests. The Owner shall supply either a container calibrated in 0.1 gallon increments or a laboratory certified calibrated water meter accurate to 0.1 gallons.
    - 3) Expelling Air Before Test: Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Owner shall make the necessary taps at such points before the test is made. After the test has been completed the Owner shall remove and plug the taps or leave them in place at the direction of the Authority.
    - 4) Examination Under Pressure: Any cracks or defective pipes, fittings, or valves discovered in consequence of this pressure test shall be removed and replaced by the Owner with sound material, and the test shall be repeated until satisfactory to the Authority.
    - 5) Hydrostatic Test Pressure Variations: Hydrostatic test pressures shall not vary by more than five psi for the duration of the test.

- 6) Test Pressure Variations: Test pressures shall not vary by more than  $\pm 5$  psi for the duration of the test.
  - 7) Saturation of Cement Lining: It is good practice to fill the pipeline to be tested 24 hours in advance of the test to allow the cement lining of the pipe to become saturated.
2. Leakage Test: A leakage test shall be conducted concurrently with the pressure test. The Owner will furnish laboratory calibrated test gauge and measuring device, and all necessary assistance to conduct the test.
- a. Leakage Definition: Leakage is defined as the quantity of water that must be supplied into the newly laid pipe, or any section thereof, to maintain pressure within five psi of leakage test pressure after the pipe has been filled with water and the air expelled.
  - b. Permitted Leakage: No pipe installed will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

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

In which "L" equals the allowable leakage in gallons per hour; "S" is the length of pipeline tested in feet; "D" is the *nominal* diameter of the pipe, in inches, and "P" is the average test pressure during the leakage test, in pounds per square inch gauge. (The allowable leakage according to the formula is equivalent to 11.65 U.S. Gal. per 24 hours per mile of pipe per inch nominal diameter, for pipe in 18-foot lengths evaluated on a pressure basis of 150 psi). When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gallon per hour per inch of nominal valve size shall be allowed. There shall be no additional leakage allowed for service connections.

- 1) The Authority will record both the makeup water and pressure at one-half hour intervals during the test period.
  - 2) Should any test of pipe laid disclose leakage greater than that specified above, the Owner shall, at his own expense, locate, repair, and replace the defective joints, pipe, or fittings until the leakage is within the specified allowance.
3. Common Requirements:
- a. Authority Presence: The Authority or Authority's Engineer shall monitor the pressure and leakage tests. The Owner shall notify the Authority and/or Authority's Engineer of the test day at least five working days in advance.
  - b. The Authority shall be present during the operating of valves required to fill mains for pressure and leakage tests.
  - c. If test fails to meet test requirements, the Owner shall pay for all additional Authority and/or Authority's Engineer testing time.

- d. Weather: No testing will be authorized unless air temperature is 35 degrees F. or higher.
  - e. Hydrants: When hydrants are in the test section, the test shall be made against the closed hydrant. The valve prior to the hydrant must be open during the test.
  - f. Acceptance: Observation of successful testing of pipelines by the Authority does not constitute acceptance of the system or any portion thereof. Upon completion of any determined portion of a total system, and successful testing thereof, the Authority's Engineer may recommend final acceptance to the Authority. Only upon final inspection by Authority and upon written acceptance for same, will the system or portion thereof be considered substantially completed. Acceptance of dedication requires formal action by Council and posting security and as constructed plan. If, during this final inspection, any irregularities are observed, the condition must be corrected at the Owner's expense prior to acceptance.
  - g. If the test is applied against an existing valve and the Owner suspects that the valve is leaking, Owner shall excavate valve at his expense so the Authority can sound valve. In addition to the sound test, test section shall be valved off and pressure applied. The Authority will observe pressure for 24 hours. This section shall remain at test pressure if the Authority determines that valve is not leaking.
  - h. If any of the tests is applied against an existing valve, the previously required Bacteriological Testing must be completed prior to the Hydrostatic Testing or Leakage Test is performed.
- R. Installation of Valves:
- 1. General: Valves and fittings shall be set and jointed to pipe in the manner specified for cleaning, laying, and jointing pipe.
    - a. The weight of valves and fittings is not to be supported by pipe.
  - 2. Valve Boxes and Valve Pits: A cast iron valve box shall be provided for every valve as shown on the plans. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed.
- S. Fire Hydrant Installation:
- 1. Location: Hydrants shall be located as directed by the Authority.
  - 2. Position: All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb. Hydrants shall be set to the established grade; with the nozzles at least 12-inches above the ground, and the frangible ring of the hydrant shall be two inches above the ground.
  - 3. Hydrant Drainage in Pervious Soil: Wherever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing crushed stone as shown on the drawings, assuring that the hydrant drain hole is clear.

4. Hydrant Drainage in Impervious Soil: Wherever a hydrant is set in clay or other impervious soil, a drainage pit two feet in diameter and three feet deep shall be excavated below each hydrant and filled completely with AASHTO No. 57 aggregate, under and around the elbow of the hydrant and to a level of six inches above the waste opening, assuring that the hydrant drain hole is clear.

#### 4.9 CONCRETE ENCASEMENT INSTALLATION

- A. Preparation: Prior to the installation of the concrete encasement, temporary supports consisting of solid concrete bricks or cap blocks shall be used to support the pipe in place. Temporary supports shall have minimum dimensions and shall support the pipe at not more than two locations, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket, and the other near the spigot end.
- B. Placing: After jointing of the pipe has been completed, concrete shall be uniformly poured beneath and on both sides of the pipe.
  1. Placement shall be done by the use of suitable equipment.
  2. The concrete shall be wet enough during placement to permit its flow, without excessive prodding, to all required points around the pipe surface.
  3. The width of encasement shall be such as to fill completely the trench width. In case of extremely wide trenches, concrete encasement may be confined above the top of the pipe to a narrower width, but in no case shall it be less than the width of trench required for the size of pipe being used.
  4. Before depositing concrete, the space within the limits of the pour shall have been cleared of all debris and water.
  5. Water shall not be allowed to rise adjacent to, or flow over, concrete deposited for less than 24 hours.
  6. Concrete shall be protected from the direct rays of the sun and kept moist by an approved method for a period of seven days or until backfilling is begun.
  7. In no case shall backfilling begin within 36 hours of the time of placing.

#### 4.10 CASING PIPE MATERIALS

- A. Steel Casing Pipe: ASTM A 53 or other suitable steel as approved by the Authority's Engineer.
  1. 35,000 psi minimum yield strength.
  2. Full circumference welded joints.
  3. Asphalt coated.

4. Minimum Wall Thickness: 0.375 inch.
  5. Steel casing pipe diameter shall be at least six inches larger than the outside diameter of the pipe bell, or as required by the owner of the right-of-way, entity issuing the permit, or the Authority.
  6. Smooth wall steel pipes with a nominal diameter of over 54 inches will not be permitted.
- B. Casing Spacer: Owner shall provide the following types:
1. Constructed of two-piece solid fusion shell of epoxy coated carbon steel, 14 gauge thickness; runners made from ultra-high molecular weight (UHMW) polymer and attached to T-304 stainless steel risers; fasteners shall be T-304 stainless steel. A minimum of three (3) casing cradles per pipe stick is required. Provide casing spacers similar to Model CCS as manufactured by Advance Products & Systems, Inc.
- C. End Seals: Rubber with T-304 stainless steel bands.

## **SECTION 5. MATERIALS AND INSTALLATION FOR SERVICE LINES AND SERVICE CONNECTIONS**

### **5.1 GENERAL CONDITIONS**

- A. The Service Line from the main to the Improved Property and/or Building shall be installed and maintained by and at the expense of the Owner of Improved Property. The Service Line shall not be covered with backfill until the Authority has inspected the Service Line and Service Connection and until the tap on the main is made and the Service Line is tested.
- B. All Service Line and Service Connection materials and equipment shall be able to withstand a pressure of at least 150 psi.
- C. The maximum length of a Service Line shall be 300 ft.
- D. No Service Line shall be installed in the same trench with gas pipe, sewer pipe (except as permitted hereinafter), or any other facility of a public utility company, nor within three feet of any open excavation, conduit, or vault.

### **5.2 TRENCH PREPARATION AND EXCAVATION**

- A. Perform sheeting and shoring as required by Federal, State, and local laws and regulations and as otherwise required to protect workers, the public, and adjacent structures, utilities, and other aboveground and below-ground facilities.
- B. Submit a Sediment and Erosion Control Plan to the Authority for approval prior to any construction.
- C. General: Excavation of every description and of whatever substances encountered shall be performed in accordance with all applicable Federal, State, and Local requirements.
  - 1. Excavation shall be made by open cut, unless boring, jacking, or tunneling is required.
  - 2. Trenches may be excavated and backfilled either by machinery or by hand as the Owner may elect, provided, however, the Owner shall use hand excavation where necessary to protect existing structures, utilities, or private or public properties and provided, further, that backfilling shall be done by hand to the extent hereinafter specified.
- D. Maintenance of Traffic: Work shall be conducted so as to cause a minimum of inconvenience to pedestrian and vehicular traffic and to private and public properties along the line of work. It shall be the duty of the Owner, at all times, to maintain crossing, walks, sidewalks, and other roadways open to traffic and in a satisfactory condition, and to keep all fire hydrants, water valves, fire alarm boxes, and letter boxes accessible for use. Whenever it is necessary to maintain pedestrian traffic over open trenches, a timber bridge at least three feet in width and equipped with side railings shall

be provided. When the excavated material will encroach upon sidewalks or private property, planking shall be placed in order to keep the sidewalk or private property clear of excavated material.

1. Maintenance and protection of traffic on Borough Streets and State Highways shall be in strict accordance with PennDOT Form 408, Section 900; and Title 67, Chapter 203. The Owner shall modify the sign locations daily in order to protect that section of Street to be disturbed during that same day.

E. Protection of Utilities, Property and Structures: The existence and location of underground utilities as indicated on any plans of the Authority is presented merely to serve as a notification that such utilities do exist in the general proximity of the work. Any utilities not shown, or not located as shown, shall not be cause of the Owner to deny responsibility for their protection and/or repair during construction.

1. The Owner shall notify all utility companies in advance of construction to include requesting the utilities to be located in accordance with Pennsylvania One Call Act No. 187 **Pennsylvania811** (1-800-242-1776) and cooperate with agents of these companies during the progress of the work. Procedures for emergency action and repairs to utilities shall be established with the utility company prior to commencement of the work. During the course of his work, if the Owner damages any of the aforementioned utilities, he shall immediately follow the procedure of emergency action and repair as established at his own expense.
2. Whenever the Owner, during the progress of the excavation, shall uncover service pipes or lines, which because of injury or age are in poor condition, he shall immediately notify the proper authority in order that steps may be taken for replacement or repair. Locations of repairs, and the procedures of repairs that have been made shall be recorded by the Owner.
3. The Owner shall sustain in their places, and protect from direct or indirect injury, all pipes, conduits, tracks, walls, buildings, and other structures or property in the vicinity of his work, whether above or below the ground, or that may appear in the trench.

### 5.3 PIPE BEDDING AND TRENCH BACKFILL

A. Bedding: When bedding is required, the trench shall be excavated to a depth of six inches below the outside diameter of the pipe, or deeper if so specified. The resultant subgrade shall be undisturbed, or compacted as approved. The bedding shall then be prepared by placing a thoroughly compacted bedding material, as specified hereinafter, in four inch (uncompacted thickness) layers to the springline of the pipe. Bedding shall provide uniform and continuous bearing and support for the pipe.

B. Special Bedding:

1. Unstable Subgrade: Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, any type of refuse, vegetable, or other organic material, or large pieces or fragments of inorganic material, the Owner shall excavate and remove such unsuitable material to an approved width and depth.

2. Excavation in Fill: When the pipe is laid in fill, the compacted embankment shall be brought to a height of at least nine inches above the proposed top of the pipe before the trench is excavated. At no time may the pipe be laid on grade and the embankment brought up over it.
- C. Backfilling Methods:
1. General: Backfilling shall not be done in freezing weather except by permission of the Authority, and it shall not be done with frozen material. Do not backfill when the material already in the trench is frozen.
  2. Compact trench backfill as follows:
    - a. Within State Highway Right-of-Way: All trench excavation and backfill within State Highway right-of-way will be subject to inspection by representatives of PennDOT, and the work must be performed in accordance with the requirements of PennDOT. The Owner shall have no claim to the Authority even though such requirements may entail more labor or services than the methods herein described. Use mechanical tampers to compact final backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of not less than 100 percent of maximum lab density as determined by ASTM D698 or as determined by PennDOT requirements. The Owner shall perform field determinations of density, when requested, in accordance with ASTM D1557 or in accordance with PennDOT requirements.
    - b. Areas Other Than State Highway Right-of-Way: Use mechanical tampers to compact backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of not less than 95 percent of maximum lab density as determined by ASTM D698. The Owner shall perform field determinations of density, when requested, in accordance with ASTM D1556.
- D. Pipe Bedding Beneath and to Springline of Pipe: All trenches containing copper shall be backfilled, from the bottom of the trench to the springline of the pipe with type "A" silica sand or clean top soil as specified in PennDOT Publication 408, Section 703. Bedding material shall be deposited in the trench for its full width on each side of the pipe and fittings simultaneously.
- E. Initial Backfill Over Pipe: From the springline of the pipe and fittings to a depth of six inches above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods with type "A" silica sand or clean top soil as specified in PennDOT Publication 408, Section 703. The Owner shall use special care in placing this portion of the backfill so as to avoid damaging or moving the pipe. The backfill shall be placed in six inch layers (uncompacted thickness) and compacted by tamping or other approved mechanical methods must be used for Initial Backfill material on all trenches containing copper pipe. Initial backfill material shall be deposited in the trench for its full width on each side of the pipe and fittings simultaneously.
- F. Aggregate Backfill to Restoration Depth (State, Existing Borough Streets including Driveways): From six inches above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be PennDOT No. 2A or

PennDOT 2 RC aggregate material subject to limitations specified and consolidated by tamping in six inch layers or other approved mechanical methods unless otherwise specified. Any consolidation method utilizing water such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.

- G. Backfill Material to Restoration Depth (Proposed Borough Streets, Lawns, Meadows and Cultivated Fields): From six inches above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be excavated material approved by the Authority and containing no stones larger than four inches in maximum dimension. A maximum of 20% of the backfill volume may be stones so long as the stones are evenly distributed within the material. Excavated material shall be free of organic material, refuse, and frozen materials, subject to limitations specified, and consolidated by tamping in eight inch layers or other approved mechanical methods unless otherwise specified. Any consolidation method utilizing water, such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.

#### 5.4 SERVICE LINE INSTALLATION

- A. Connections to existing mains shall either be done by the Authority or, if done by anyone other than the Authority, shall be done under the inspection of the Authority or Authority's Engineer. All connections shall be coordinated with the Authority at least two weeks prior to the connection date.
- B. For all water Service Lines crossing less than half of the paved street, excavate trench to the line and grade required for the installation of the Service Lines.
- C. All services, which must cross more than half of the paved cartway, shall be bored with an auger or pushed through a drive pipe. (The drive pipe may be removed when the Service Line is installed.) Where rock or other obstructions are encountered, the location of the Service Line may be moved as much as is necessary with the Authority's approval; but the Service Lines must be extended along the Street so as to place the curb boxes at the proper locations. Should it be impossible to push or drive any Service Line under the roadway, the Owner shall make such excavations as necessary with approval of PennDOT in all State rights-of-way, and with the Authority's approval in all other rights-of-way.
- D. Screw corporation stops directly into a tapped and threaded ductile iron main as required. Where main construction is of AC or plastic, a corporation saddle must be used. Locate corporation stops at least 12-inches apart longitudinally.
- E. Use proper seals or other devices to ensure that no leaks are left in the water mains at the points of tapping. Do not backfill and cover the service connection until approved by the Authority.
- F. Use bends in the copper to connect the Service Line pipe or tubing to the tapping fitting or corporation stops to provide flexibility to counteract the effects of settlement or expansion/contraction in the line.

- G. Lay each section of the Service Line in a manner to form a tight joint with the adjoining section. Avoid offsets, kinks or awkward bends to ensure a smooth flow line.
- H. Unions shall be utilized at Service Line joints. The number of union joints shall be minimized and in no case shall joints be located less than 60-feet apart on Service Lines.
- I. When the work is not in progress and at the end of each workday, securely plug the ends of pipe and fittings to prevent any dirt or foreign substances from entering the Service Lines.
- J. The Owner shall install all services to the edge of the rights-of-way at predetermined locations. Where Building Services exist adjacent to and outside of the right-of-way, Owner shall connect the new Service Line to the existing Building Services, unless otherwise instructed by the Authority.
- K. New Service Lines which are not to be connected to existing Building Services shall be permanently capped at the right-of-way line and marked with a 2" x 4" wooden marker stake. The marker shall extend 24 inches below grade and 24 inches above grade.
- L. Service Lines shall not be less than four feet below the finished grade.
- M. Water Service Line may be installed in a combined trench with Sewer Service Line meeting separation requirements shown on the Standard Detail.
- N. Every service pipe must be provided with a ball valve, water meter, backflow preventer, and ball valve, respectively, these shall be installed on the inside of the basement or foundation wall, adjacent to the location where the pipe passes through it and shall be easily accessible and fully protected from freezing.
- O. When pressures exceed 80 psi, the Owner shall, at his own expense, install and maintain on the house side of the meters pressure regulating valves meeting Authority specifications.
- P. Curb boxes shall not be installed in curbing under any circumstance. Existing curb boxes may remain in curb if curb is being replaced, as long as a curb joint is placed one foot on either side of curb box to facilitate future replacement/maintenance of curb box.
- Q. All service lines must be inspected by the Authority prior to backfill of service line trench. Owner shall notify the Authority 24 hours in advance of planned backfilling.

## 5.5 SERVICE LINE AND SERVICE CONNECTION MATERIALS

- A. Corporation Stop: Brass, compression style, ball corporation.
  - 1. Acceptable Manufacturer:
    - a. Mueller Co.:
      - 3/4" B25008N Full Port Only
      - 1" B25008N Full Port Only
      - 1-1/2" B25008N Full Port Only
      - 2" B25008N Full Port Only

- b. Ford Meter Box Co.:
          - 3/4" FB1000-3Q-NL
          - 1" FB1000-4Q-NL
          - 1-1/2" FB1000-6Q-NL
          - 2" FB1000-7Q-NL
- B. Curb Stop: Brass, compression style, ball curb stop.
  - 1. Acceptable Manufacturer:
    - a. Mueller Co.:
      - 3/4" B25209N Full Port Only
      - 1" B25209N Full Port Only
      - 1-1/2" B25209N Full Port Only
      - 2" B25209N Full Port Only
    - b. Ford Meter Box Co.:
      - 3/4" B44-333Q-NL
      - 1" B44-444Q-NL
      - 1-1/2" B44-666Q-NL
      - 2" B44-777Q-NL
- C. Coupling:
  - 1. Acceptable Manufacturer:
    - a. Mueller Co.:
      - 3/4" H-15403N
      - 1" H-15403N
      - 1-1/2" H-15403N
      - 2" H-15403N
    - b. Ford Meter Box Co.:
      - 3/4" C44-33-Q-NL
      - 1" C44-44-Q-NL
- D. Curb Box: Curb Boxes shall be cast iron Arch Pattern style extension type. All lower section parts of the box shall be of gray iron, free from cold shuts and blow holes and shall be painted with black bituminous paint. The upper section shall be made of steel, screw threads shall be cut integral with the steel box wall. Welded screw threads shall not be utilized. The extension range to be determined for each application. Curb boxes are to be used on curb stops up to two inch. Curb boxes shall be EA1 Series as manufactured by Ford Meter Box Co. with Stainless Steel Stationary Rod and Stainless Steel Cotter Key. The Lid shall be Type HS, 2-Hole as manufactured by Ford Meter Box Co. Each Curb Box shall be installed with a "Curb Box Sleeve". Owner shall provide box heights as required for the services.
  - 1. Acceptable Manufacturer:
    - a. Ford Meter Box Co. (Series EA1).
    - b. Or Equal.
- E. Pressure Regulating Valve: Pressure regulating valves on Service Liens shall be Watts, USB, or equal.

## 5.6 SERVICE LINE (MAIN TO CURB STOP)

- A. Service Line shall conform to the requirements of ASTM Designation B88, Type K, soft-temper copper.
- B. Approved by Special Exemption Only, Cross-linked Polyethylene:
  - Pipe shall be Cross-linked Polyethylene blue in color, UV-resistant high-density polyethylene. Pipe shall be AWWA C904 and NSF 61 certified. Pipe shall be Copper Tubing Size (CTS) and approved for use with AWWA C800 fittings. Pipe shall be rated for 160 psi @ 73.4-degrees F and 100 psi @ 180-degrees F. Minimum diameter approved shall be 1".
  - A low lead brass corporation stop and curb stop along with the Authority's standard curb box shall be utilized. Tracer wire, insulated copper, ten gauge or thicker, blue in color shall be installed by attaching the wire to the Cross-linked Polyethylene pipe. The tracer wire shall be accessible in curb box.
  - Pipe bedding and initial backfill shall be Silica Sand or Clean Topsoil containing no slag and shall be six inches below and above the service line pipe.

## 5.7 SERVICE LINE (CURB STOP TO BUILDING)

- A. Service Line shall conform to the requirements of ASTM Designation B88, Type K, soft-temper copper.
- B. Approved by Special Exemption Only, Cross-linked Polyethylene:
  - Pipe shall be Cross-linked Polyethylene blue in color, UV-resistant high-density polyethylene. Pipe shall be AWWA C904 and NSF 61 certified. Pipe shall be Copper Tubing Size (CTS) and approved for use with AWWA C800 fittings. Pipe shall be rated for 160 psi @ 73.4-degrees F and 100 psi @ 180-degrees F. Minimum diameter approved shall be ¾".
  - A low lead brass corporation stop and curb stop along with the Authority's standard curb box shall be utilized. Tracer wire, insulated copper, ten gauge or thicker, blue in color shall be installed by attaching the wire to the Cross-linked Polyethylene pipe. The tracer wire shall be accessible in curb box.
  - Pipe bedding and initial backfill shall be Silica Sand or Clean Top Soil containing no slag and shall be 6" below and above the service line pipe.
- C. Fittings for Copper Tubing:
  - 1. Fittings for use with copper tubing installed underground shall be of the approved compression type.
    - a. Acceptable Manufacturer:
      - 1) Mueller Company.
      - 2) Ford Meter Box Co.

- D. Ball Valves: Bronze designed for minimum working pressure of 150 psi.
  - 1. Acceptable Manufacturer:
    - a. Apollo 70 Series.
    - b. Nibco.
    - c. Wolverine.
    - d. Or equal.

## 5.8 WATER METERS

- A. Size and Configuration of Meter: The Authority shall approve the size of meter to be installed and will furnish the meter at the expense of the Owner of Improved Property. In all cases, the meter size shall be compatible with the projected estimated water usage. Where one or two Dwelling Units receive their supply through a single meter, the minimum meter size shall be 3/4-inch. Where three or more Dwelling Units receive their supply through a single meter, the size shall be at least one-inch. The meter assembly shall be configured with a ball valve, water meter, backflow preventer, and ball valve as shown on either the Detector Check Meter Vault detail or the Water Use Meter Vault detail, as applicable.

When a meter greater than 3/4-inch is required, the Owner shall purchase and supply the meter. This meter shall conform to the Authority's standard meter reading system.

- B. Location/Installation of Meters: The Authority will determine the location of all meters. If the Authority decides that a meter shall be placed within the Building, the Owner shall provide, free of charge and expense to the Authority, an easily accessible place in the cellar near the entrance of the Service Line to the cellar. If the Authority decides that a meter shall be placed outside the Building, the meter assembly must be placed in a meter box at the expense of the Owner. The Authority must approve both the assembly and box. Every meter assembly must include installation of a remote reading device as approved by the Authority. It is the responsibility of the Owner to install all meter equipment including meter, wiring, and remote reading device.

- 1. Acceptable Manufacturers for Meter Boxes Installed Outside of Building:
  - a. Mueller.
  - b. Ford.
  - c. Or Approved Equal.

- C. Meter Tests: At the request of the Owner of Improved Property, the Authority will make a test of accuracy of the meter supplying his/her Improved Property. The Authority will, from time to time, establish rates for all service calls relating to meter tests, including service calls to remove meters from Improved Property and test with corresponding meter at Authority's test facility, and removal of meter and forwarding of meter to a certified technician for testing. The Authority in its Rate Schedule will publish the rates established by the Authority from time to time for these services. In the event a service call to test a meter on Improved Property results in determination by the Authority, or the certified technician testing the meter, that such meter has a malfunction, no fee will be imposed for the service call made by the Authority's employee or representative.

- D. Meter and Meter Box Inspection: All meters must be inspected by the Authority prior to placing into service. All meter boxes must be inspected by the Authority prior to backfill adjacent to meter vault. Owner shall notify Authority five days in advance of required inspection.

## 5.9 BOOSTER PUMPS

- A. It shall be the responsibility of the Customer to maintain the booster pump, low-pressure cutoff device and backflow prevention device in proper working order. All installations, modifications, and maintenance must be documented and submitted to the Authority.

## 5.10 BACKFLOW PREVENTER MATERIALS

- A. Any Backflow prevention device required shall be of a model or construction approved by the Authority and shall comply with the following:

- 1. Each device, including but not limited to a Double Check Valve Assembly, a Dual Check Valve Assembly, or a Reduced Pressure Zone Assembly, shall be subject to the approval of the Authority and shall be a device that has been manufactured in full conformance with standards established by the American Water Works Association entitled:

AWWA C510 Standards for Double Check Valve Backflow Prevention Devices and AWWA C511-89 Standards for Reduced Pressure Zone Devices.

- B. Acceptable Manufacturers:

- 1. Double Check Valve Assembly (DCVA):
  - a. Conbraco Industries, No. 40-3C5-4B.
  - b. Watts Regulator, Inc., Series 7.
  - c. Ames Fire & Waterworks, 3000 SS
- 2. Dual Check Valve Assembly:
  - a. Watts Regulator, Inc., Series 75
- 3. Reduced Pressure Zone Assembly (RPZA):
  - a. Watts Regulator, Inc., Series 909.
  - b. Conbraco Industries.
  - c. Mueller Company.
  - d. Hersey Products, Inc.
  - e. Ames Fire & Waterworks, 5000 SS
  - f. Or equal.

### 5.11 COMMERCIAL/INDUSTRIAL BACKFLOW PREVENTER INSTALLATION/INSPECTION AND MAINTENANCE

- A. Backflow prevention devices required by these Technical Specifications shall be installed at a location and in a manner approved by the Authority and shall be installed by a person properly qualified and at the expense of the Owner.
- B. Backflow prevention devices shall be installed at point of delivery ahead of any outlet and after the water meter.
- C. Backflow prevention devices installed on the Service Line to a Customer's Water System shall be located on the Customer's side of the water meter, as close to the meter as is reasonably practical, and prior to any other connection.
- D. Backflow prevention devices shall be installed according to the manufacturer's recommendations and in a readily accessible location for maintenance and testing.
- E. Backflow prevention devices shall not be located where any part of the device will be submerged at any time. Backflow prevention devices should not be installed in pits below ground but, if absolutely necessary, the pit should be well drained to prevent flooding. Pits or vaults shall be of watertight construction, so located and constructed as to prevent flooding and shall be maintained free from standing water by means of either a sump and pump or a suitable drain. Such sump pump or drain shall not connect to a sanitary sewer nor permit flooding of the pit or vault by reverse flow from its point of discharge. An access ladder and adequate natural or artificial lighting shall be provided to permit maintenance inspection and testing of the Backflow prevention device.
- F. The water Customer must maintain a complete record of each Backflow prevention device from purchase to retirement. This shall include a comprehensive listing that includes a record of all tests, inspections, and repairs. Records of inspections, tests, repairs, and overhaul shall be submitted to the Authority upon request.
- G. The Authority may deny or discontinue, after reasonable notice to the occupants thereof, the water service to any Improved Property wherein any Backflow prevention device required by this Resolution is not installed, tested, and maintained in a manner acceptable to the Authority, or if it is found that the Backflow prevention device has been removed or bypassed, or if an unprotected Cross-connection exists on the Improved Property, or if a low pressure cut-off device required by this Resolution is not installed and maintained in working order.
- H. Water service to such Improved Property shall not be restored until the Customer has corrected or eliminated such conditions or defects in conformance with this Program and to the satisfaction of the Authority.

### 5.12 REPLACEMENT OF SERVICE LINES CONNECTED TO AN EXISTING MAIN

- A. When existing Service Lines are to be modified (i.e., severed, repaired, terminated, removed, or otherwise altered in any way), the work shall be done in such a manner as to prevent damage to existing water system facilities and in an expedient manner to minimize the time that the Owner of the Improved Property will be disconnected from the Public Water System. Wherever existing water system facilities are damaged in making said modification, the Owner will be responsible for the replacement of the damaged facility. Existing piping, once removed, shall not be permitted to be reused. Where parts of existing systems are altered, the remaining system shall be properly reconnected as required for proper operation.
- B. When existing Service Lines are to be modified (i.e., severed, repaired, terminated, removed, or otherwise altered in any way), materials and labor required for such modification are the sole responsibility of the Owner. Labor shall include, but not be limited to, locating Connections to the existing main, making all necessary modifications, and completing any restorative work necessary to return the disturbed area back to original condition. Prior to commencement of work, the Owner shall submit to the Authority a description of the proposed modification and a list of proposed materials to be used for the modification. Approval for said modification shall be obtained from the Authority before work begins. All costs resulting from said modification are the sole responsibility of the Owner.
- C. Unless otherwise directed, materials resulting from removal operations of Service Lines and Connections shall become the property of the Owner and shall promptly be removed from the work site at his expense.
- D. Temporary Utilities: In the event it is necessary to interfere with any utilities, the Owner at his expense shall install temporary utilities. The utility company at the Owner's expense without written notice may remedy delays resulting in residences or businesses having to go overnight or for longer periods without utilities due to the neglect of the Owner.

### 5.13 CASING PIPE FOR SERVICES

- A. Casing for Service Lines through foundation wall shall be Schedule 40 PVC at least one inch larger in diameter than service being installed. Casing pipe filled with expanding foam and shall be flush with foundation walls.
- B. Casing for service through footer shall be plastic pipe at least one inch larger in diameter than service being installed.

## SECTION 6. RESTORATION AND CLEAN-UP OF SURFACE

### 6.1 REPLACEMENT OF PROPERTY:

The Owner shall restore (unless otherwise stipulated) all sidewalks, curbing, gutters, shrubbery, fences, poles, sod, markings, traffic lines, or other property and surface structures removed or disturbed as a part of the work to a condition equal to that before the work began, furnishing all labor and materials incidental thereto.

### 6.2. PAVEMENT RESTORATION:

Restoration of State Highways shall be in accordance with Pennsylvania rules and regulations, PennDOT requirements, and the provisions of the highway occupancy permit. Restoration of Borough streets and other paved surfaces shall be in accordance with the requirements of the authority having jurisdiction.

### 6.3 SEEDING RESTORATION

#### A. Lawn Restoration Materials:

1. Sod or Permanent Seed Mixture: PennDOT 408, Section 809 or Section 804, Formula B.
  - a. Kentucky Blue Grass; a combination of improved certified varieties with no one variety exceeding 25 percent of the total Blue Grass component: 50 percent by weight.
  - b. Creeping Red or Chewings Fescue: 30 percent by weight.
  - c. Perennial Ryegrass; a combination of improved certified varieties with no one variety exceeding 50 percent of the total Ryegrass component: 20 percent by weight.
2. Temporary Seed Mixture: PennDOT 408, Section 804, Formula E. Annual Ryegrass: 100 percent.
3. Provide seed that complies with the Pennsylvania Seed Act of 1965, Act No. 187, and regulations of the Pennsylvania Department of Agriculture, Bureau of Plant Industry.
4. Lime: Pulverized agricultural limestone; PennDOT 408, Section 804.
5. Mulching Material: Oat or wheat straw, dry, free from weeds and foreign matter detrimental to plant life. Hay or chopped cornstalks are not acceptable.
6. Mulching Material: Wood cellulose fiber, free of growth or germination inhibiting ingredients.
7. Planting Fertilizer: Dry formulation of 10-20-20 analysis; PennDOT 408, Section 804.
8. Slow-Release Nitrogen Fertilizer: Dry formulation of 38-0-0 urea-form.
9. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

B. Restoration of Lawns, Pastures, Meadows, and Cultivated Fields:

1. General:

- a. Topsoil shall be free from subsoil, brush, weeds, or other litter, clay lumps and stones, but may contain decaying vegetable matter.
- b. Comply with laws and regulations related to Sediment and Erosion Control.
- c. Seed shall be not more than two years old. Germination tests of seeds shall be made not more than six months prior to seeding. Do not use seed that has become wet, moldy, or otherwise damaged.
- d. Submit all seed mixture formulas to the Authority for approval prior to seeding.
- e. The Owner shall be responsible for seeding all areas of bare soil that result from his construction operations and for producing a stand of grass in all seeded areas. Erosion, drought, or any other condition will not relieve the Owner of this requirement.

2. Lawns:

- a. Prior to construction, strip and stockpile the full depth of existing topsoil, but no less than six inches, from all areas to be disturbed.
- b. Scarify top of trench backfill to minimum depth of two inches before placing topsoil.
- c. Use stockpiled topsoil to bring the trench area to final grade.
- d. If stockpiled topsoil is not sufficient to provide at least six inches of topsoil over area to be restored, import sufficient topsoil to provide such coverage.
- e. Use topsoil in relatively dry State. Place during dry weather.
- f. Fine grade topsoil eliminating rough or low areas.
- g. Remove stone, roots, grass, weeds, debris, and foreign material from topsoil while spreading.
- h. Manually spread topsoil around trees, plants, building, and paving to prevent damage.
- i. Lightly compact placed topsoil. Use roller weighing no more than 120 pounds per foot of roller width.
- j. Remove surplus subsoil and topsoil from site.
- k. Leave stockpile area and site clean and raked, ready to receive landscaping.
- l. Grading tolerance: Finished surface of topsoil shall not deviate by more than 1/2 inch up or down from a straight edge or stringline placed across the trench and held on existing grade on both sides of the trench.
- m. Apply lime at the rate of 800 pounds per 1,000 sq. yd.
- n. Do not apply fertilizer sooner than three days after lime application.
- o. Apply planting fertilizer at the rate recommended by manufacturer. Apply fertilizer after raking topsoil smooth and prior to roller compaction. Do not apply fertilizer at the same time or with the same machine as will be used to apply seed.
- p. After spreading of fertilizer is complete; apply peat moss to a depth of 1/4-inch over the area to be seeded.

- q. Mix lime, fertilizer, and peat moss thoroughly into the upper two inches of topsoil.
  - r. Lightly water to aid the dispersion of fertilizer.
  - s. Apply seed at a rate of 21 lbs. per 1,000 sq. yd evenly in two intersecting directions. Rake in lightly. Do not seed area in excess of that which can be mulched on same day.
  - t. Planting season: March 15 to June 1 and August 1 to October 15. Areas in which trench backfilling operations are completed in other time periods shall be seeded with annual Ryegrass (PennDOT 408, Section 804, Formula E) at the rate of ten pounds per 1,000 sq. yd to provide temporary protection. Permanent seeding shall then be applied later during the specified periods.
  - u. Do not sow seed immediately following rain, when ground is too dry, or during windy periods.
  - v. Roll seeded area with roller not exceeding 120 lbs. per foot of roller width.
  - w. Immediately following seeding and compacting, apply mulch at the rate of 1,200 pounds per 1,000 sq. yd for straw or 320 pounds per 1,000 sq. yd for wood cellulose fiber.
  - x. If straw is used for mulch, anchor straw with emulsified asphalt binder or other material approved by Authority's Engineer.
  - y. Apply water with a fine spray immediately after each area has been mulched.
  - z. At completion of Owner's work, apply slow-release nitrogen fertilizer to all seeded areas at the rate of 50 lbs. per 1,000 sq. yd.
  - aa. Re-seed areas that show bare spots prior to expiration of the Owner's warranty period.
3. Pasture and Meadows:
- a. Prior to construction, strip and stockpile the full depth of the existing topsoil, but no less than 12 inches, from all areas to be disturbed. Use stockpiled topsoil to bring the trench area to final grade.
  - b. Remove all crushed stone and construction debris from the disturbed area.
  - c. Planting season: Perform seeding no later than the start of the next planting season following completion of trench backfilling. The planting season shall be as established by the U. S. Agricultural Service for the area of construction.
  - d. Seed mixture:
    - 1) Timothy 18%
    - 2) Orchard Grass (Pennlate or Pennmeade) 46%
    - 3) Redtop 18%
    - 4) Kentucky Bluegrass 18%
  - e. Spread the seed using an approved seeding procedure at the rate of 22 to 25 pounds per acre.

4. Cultivated Fields:
  - a. Prior to construction, strip and stockpile the full depth of existing topsoil, but no less than 12 inches, from all areas to be disturbed.
  - b. Upon completion of construction, remove all crushed stone and other construction debris.
  - c. Use stockpiled topsoil to bring the trench area to final grade.
  - d. Scarify to minimum depth of ten inches all areas that have been compacted as a result of construction operations.

## **SECTION 7. CLEAN-UP AND MAINTENANCE DURING CONSTRUCTION WORK**

### **7.1 CLEAN-UP**

- A. During construction, surfaces of all areas including, but not limited to, Streets and driveways shall be maintained on a daily basis to produce a safe, desirable, and convenient condition.
1. Streets shall be swept and flushed after trench backfilling, and re-cleaned as dust, mud, stones, and debris caused by the work, or related to the work, again accumulates.
  2. Failure of the Owner to perform this work shall be cause for the Authority to order the work to be done by others and to charge all costs to the Owner.
  3. During construction, Owner is required to provide the necessary materials and equipment to maintain dust control.

### **7.2 REPAIR OR CORRECTION OF UNSATISFACTORY CONDITIONS:**

Any subnormal or dangerous condition caused by the work, on any surface, shall be repaired and/or corrected within two hours of observation or notification of its existence. If repairs are not made with this two-hour period, the Authority shall cause to have the work completed and the resulting cost will be charged to the Owner.

### **7.3 TEMPORARY PAVEMENT:**

The Authority and/or PennDOT may require that the Owner construct temporary pavement until conditions are suitable for placement of permanent pavement. The Owner shall continuously maintain temporary pavement until it is replaced with permanent pavement.

# APPENDICES

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# APPENDIX 1

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## *Water Main Leakage Test Report*

## QUARRYVILLE BOROUGH AUTHORITY WATER MAIN LEAKAGE TEST REPORT

Date: \_\_\_\_\_

Computed By: \_\_\_\_\_

Project Number: \_\_\_\_\_

Checked By: \_\_\_\_\_

Project Name: \_\_\_\_\_

Sheet: \_\_\_\_\_ of \_\_\_\_\_

Client: \_\_\_\_\_

Test Pressure: \_\_\_\_\_

Test Start: \_\_\_\_\_

Test Finish:: \_\_\_\_\_

### ALLOWABLE WATER LOSS

L = Leakage in Gallons (GPH) \_\_\_\_\_ **LOCATION:** \_\_\_\_\_

S = Length of Pipe Tested in Feet \_\_\_\_\_

**CALCULATIONS**

D = Diameter of Pipe in Inches \_\_\_\_\_

P = Test Pressure in PSIG \_\_\_\_\_

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

Note: 7.48 Gallons/FT<sup>3</sup> \_\_\_\_\_

Time	Pressure	Loss or Depth	
			<b>Start</b>
			<b>½ Hr. Reading</b>
			<b>Repressure</b>
			<b>1 Hr. Reading</b>
			<b>Repressure</b>
			<b>1 ½ Hr. Reading</b>
			<b>Repressure</b>
			<b>2 Hr. Reading</b>
			<b>Repressure</b>

Total Leakage for 2 Hour Period \_\_\_\_\_

Allowed Leakage for 2 Hour Period \_\_\_\_\_

Line Pass or Fail Test

# APPENDIX 2

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## *Cross-connection Control Sheet*

## QUARRYVILLE BOROUGH AUTHORITY CROSS-CONNECTION CONTROL SHEET

Name of Firm or Owner: \_\_\_\_\_

Address: \_\_\_\_\_

Name of Principle Contact: \_\_\_\_\_

	DATE	INITIAL
1. Initial Letter Mailed	_____	_____
2. Second Letter Mailed	_____	_____
3. Telephone Contact	_____	_____
4. Initial Inspection	_____	_____
5. Inspection Report Mailed	_____	_____
6. Number and Type of Devices Required:	_____	_____

7. Installation Data Received	_____	_____
8. Installation Data Approved	_____	_____
9. Follow-up Inspection	_____	_____

Devices Installed: \_\_\_\_\_  
\_\_\_\_\_

10. Additional Inspections	_____	_____
11. Installation Complete	_____	_____
12. Installation and Testing Accepted	_____	_____
13. Installation and Inspection Performed By:	_____	_____

14. REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# APPENDIX 3

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## *Cross-connection Survey Form*



# **APPENDIX 4**

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## ***Backflow Prevention Assembly Test and Maintenance Report***

**QUARRYVILLE BOROUGH AUTHORITY  
BACKFLOW PREVENTION ASSEMBLY TEST  
AND MAINTENANCE REPORT**

TO: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Attention: Cross-Connection Control Section

The cross-connection control assembly detailed hereon has been tested and maintained as required by the Rules and Regulations of the Authority and is certified to comply with these Rules and Regulations.

Manufacturer: \_\_\_\_\_ Size: \_\_\_\_\_  
 Model Number: \_\_\_\_\_ Located at: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_

	Reduced Pressure Zone Device (RPZD)			Double Check Valve Assembly (DCVA)		
	1 <sup>st</sup> Check	2 <sup>nd</sup> Check	Relief Valve	Air Inlet	Check Valve	
Initial Test	DC-Closed Tight <input type="checkbox"/>	Closed Tight <input type="checkbox"/>	Opened at _____ psig	Opened at _____ psig	_____ psig	_____ psig
Repairs And Materials Used	Leaked <input type="checkbox"/>	Leaked <input type="checkbox"/>		Did Not Open <input type="checkbox"/>	Leaked <input type="checkbox"/>	<input type="checkbox"/>
Test After Repair	DC-Closed Tight <input type="checkbox"/>	Closed Tight <input type="checkbox"/>				
	RP- _____ psig					

The above is certified to be true.

Firm Name: \_\_\_\_\_ Certified Tester: \_\_\_\_\_  
 Firm Address: \_\_\_\_\_ Cert. Tester No. \_\_\_\_\_ Date: \_\_\_\_\_  
 \_\_\_\_\_

# APPENDIX 5

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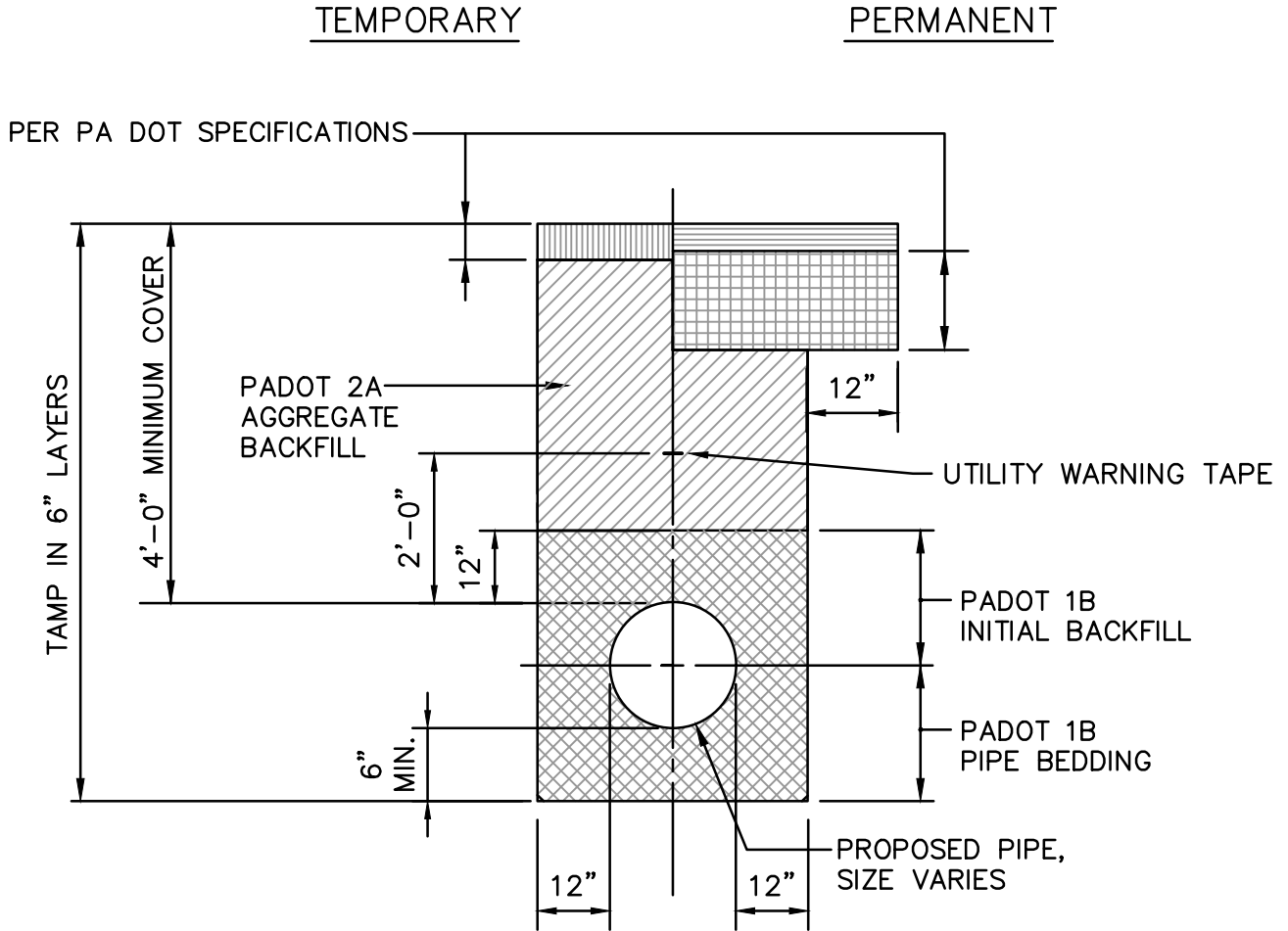
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## *Standard Details*

<u>Standard Details</u>	<u>Detail No.</u>
Backfill and Pavement Restoration Detail – State/Borough/Township Roads	1
Trench Restoration - Lawn/Agricultural Areas	2
Combined Trench Detail – Sewer Lateral/Water Service Line – State/Borough/Township Roads	3
Combined Trench Detail – Sewer Lateral/Water Service Line – Lawn/ Agricultural Areas	4
Standard Water Main Crossing Above Utilities	5
Standard Water Main Crossing Beneath Utilities	6
Standard Water Main Crossing Utilities Using Fittings	7
Standard Valve Installation Detail	8
Standard Fire Hydrant Setting Detail	9
Standard Casing Cradle Detail	10
Standard Concrete Encasement Detail	11
Typical Blow-off Hydrant Detail	12
Restrained Pipe Length Schedule	13
Fire Service Setting Detail – Vault Installation (Special Exception Only)	14
Fire Service Setting Detail – Building Installation	15
Domestic Meter Setting Detail – Vault Installation – Utilizing Meters 3” & Larger (Special Exception Only)	16
Domestic Meter Setting Detail – Building Installation – Utilizing Meters 3” & Larger	17
Combination Fire & Domestic Meter Setting Detail – Vault Installation (By Special Exception Only)	18
Standard Water Service Line Installation (Roadway with Curbing)	19
Standard Water Service Line Installation (Behind Curb & Sidewalk)	20
Standard Water Service Line Installation (Roadway w/o Curbing)	21
Standard Residential Domestic Water Meter Setting Detail	22
Sinkhole Remediation	23
Combination Fire and Domestic Meter Setting Detail – Residential Installation	24
Encapsulation Clamp	25
Polyethylene Service Line with Curbing	26
Polyethylene Service Line with Curb & Sidewalk	27
Polyethylene Service Line with No Curbing	28
Thermal Coil Meter Pit	29



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ALL WORK TO BE DONE IN ACCORDANCE WITH PADOT PUBLICATION 408 WHEN IN PADOT ROW .

**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 BACKFILL & PAVEMENT RESTORATION DETAIL  
 STATE/BORO/TWP ROADS

QUARRYVILLE BOROUGH                      LANCASTER COUNTY

**RETTEW**

RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO. 1

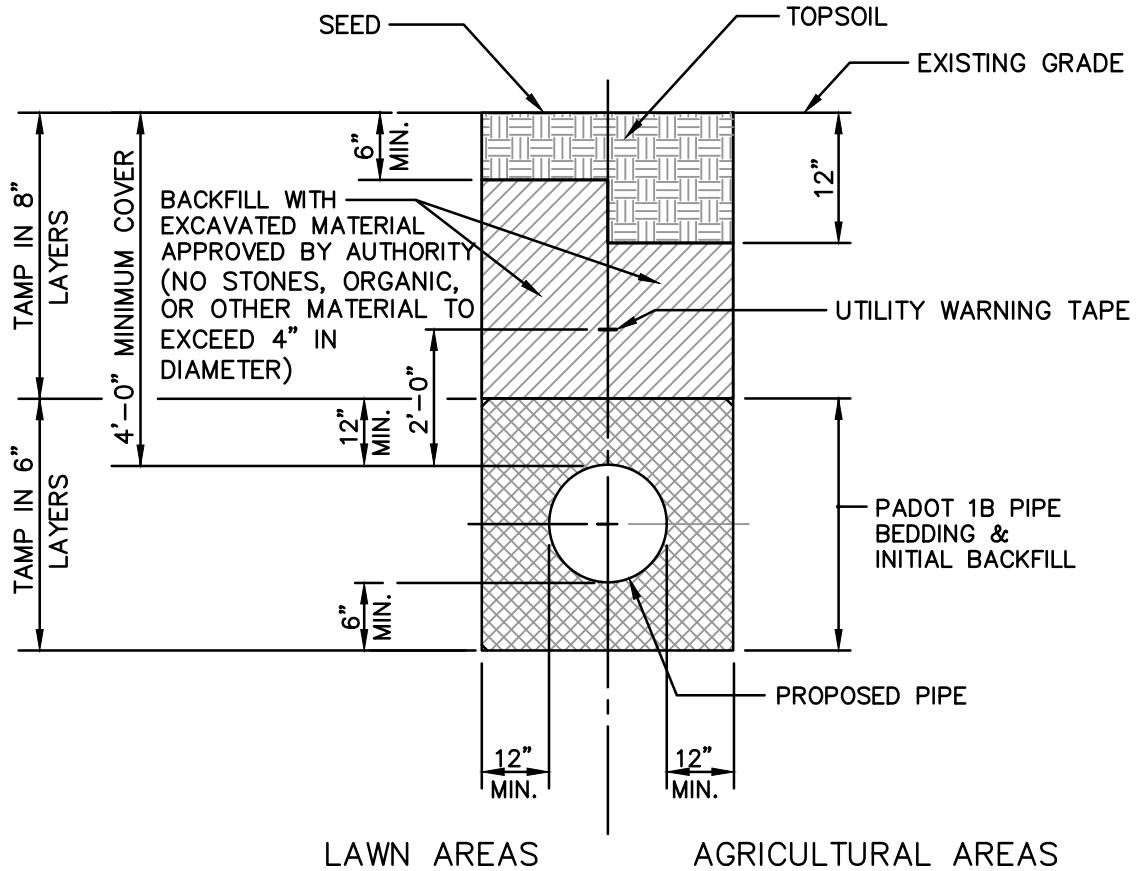
DRAWN BY: JNW

DATE: MAY 2025

SCALE: N/A

DWG. NO. 0147102953

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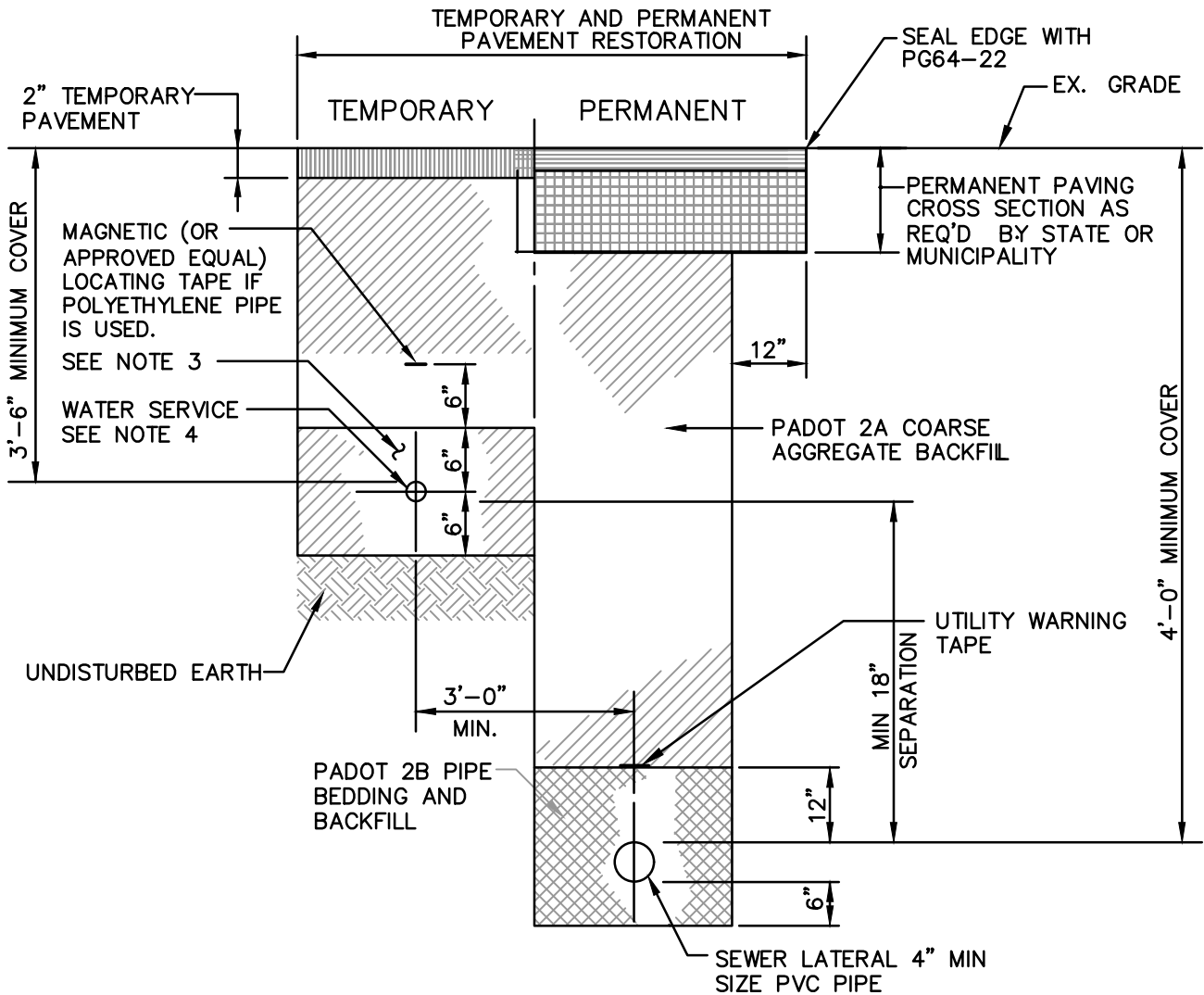
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 TRENCH RESTORATION LAWN &  
 AGRICULTURAL AREAS

**RETTEW**

RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO. 2  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

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**NOTES:**

1. SEWER LINE SHALL NOT BE ABOVE THE WATER LINE.
2. SEWER LINE SHALL NOT CROSS THE WATER LINE.
3. CLEAN TOP SOIL (WHEN COPPER SERVICE LINE IS USED).
4. WATER SERVICE LINE MIN 3/4" TYPE K COPPER (MAIN TO CURB STOP).
5. IF 18" VERTICAL SEPARATION CANNOT BE ACHIEVED THEN 10' HORIZONTAL SEPARATION MUST BE MAINTAINED.

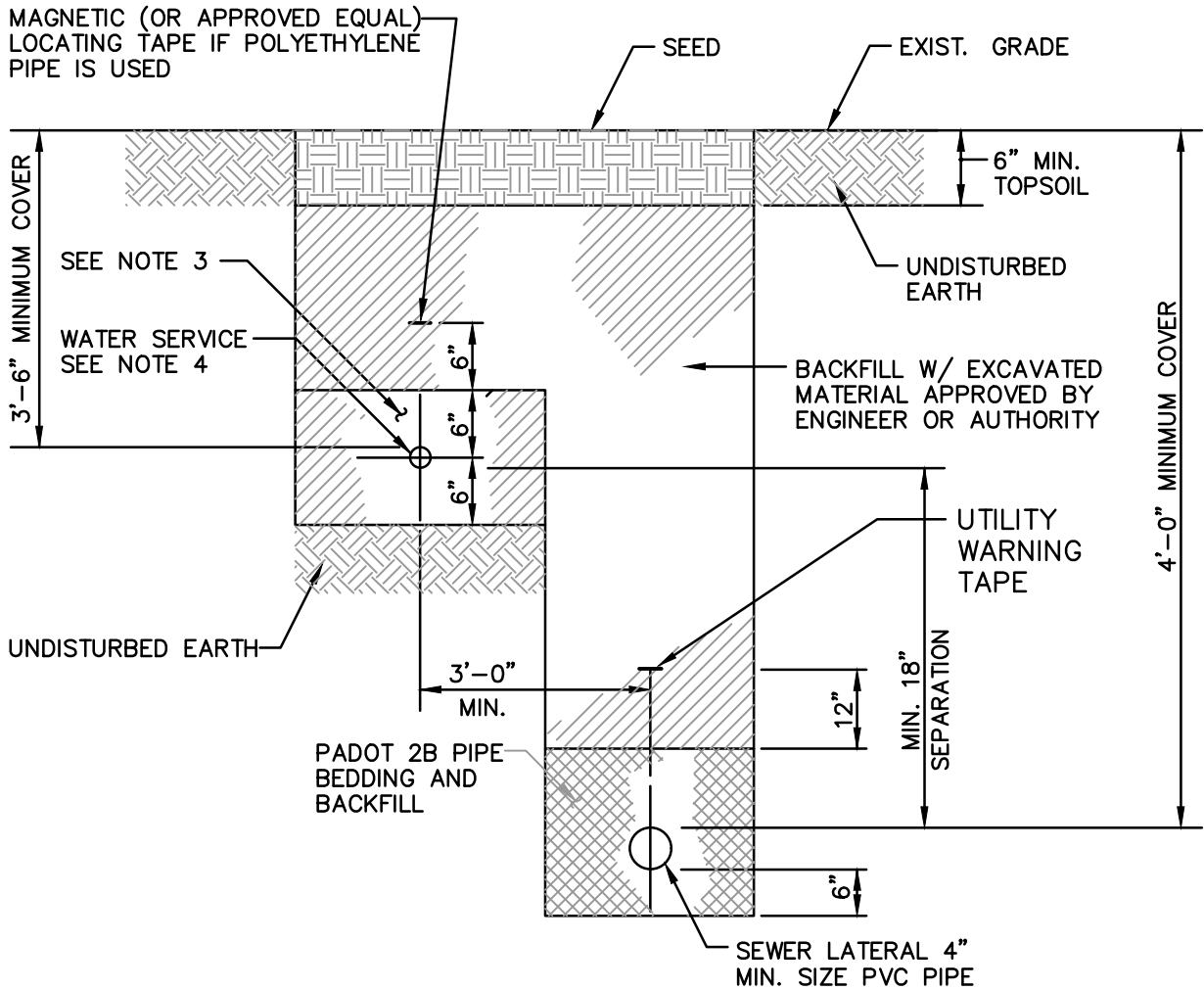
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 COMBINED TRENCH DETAIL SEWER LATERAL &  
 WATER SERVICE LINE - STATE/BORO/TWP ROADS



RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO. 3  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

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**NOTES:**

1. SEWER LINE SHALL NOT BE ABOVE THE WATER LINE.
2. SEWER LINE SHALL NOT CROSS THE WATER LINE.
3. CLEAN TOP SOIL (WHEN COPPER SERVICE LINE IS USED).
4. WATER SERVICE LINE MIN. 3/4" TYPE K COPPER (MAIN TO CURB STOP).
5. IF 18' OF VERTICAL SEPARATION CANNOT BE ACHIEVED THEN, 10' OF HORIZONTAL SEPARATION MUST BE MAINTAINED.

**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM

COMBINED TRENCH DETAIL SEWER LATERAL &  
WATER SERVICE LINE LAWN/AGRICULTURAL AREAS

QUARRYVILLE BOROUGH

LANCASTER COUNTY

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DETAIL NO. 4

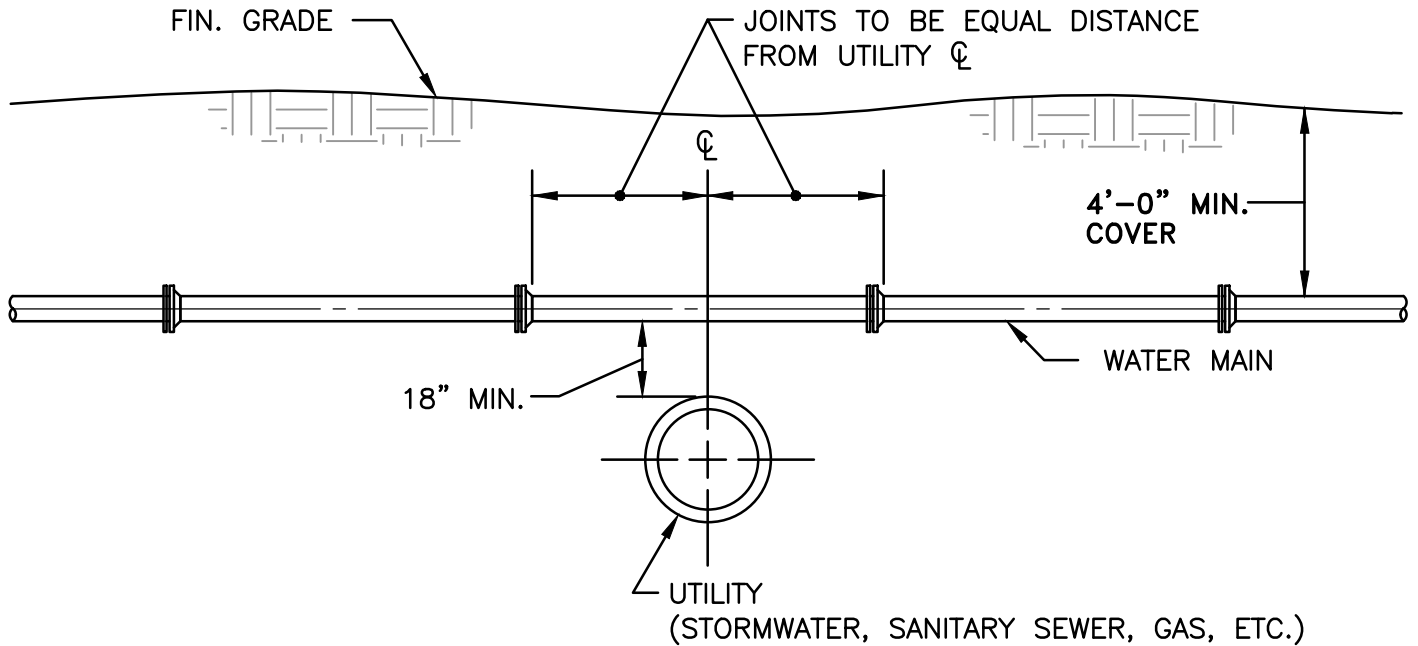
DRAWN BY: JNW

DATE: MAY 2025

SCALE: N/A

DWG. NO. 0147102953

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NOTE:

1. THE UTILITY OWNER MAY, AT THEIR DISCRETION AND IN CONSULTATION WITH THE AUTHORITY, REQUIRE CONCRETE ENCASEMENT OF EITHER THE UTILITY OR THE WATER LINE.
2. THE 18" VERTICAL SEPARATION CAN BE REDUCED TO A MINIMUM OF 6 INCHES, UTILIZING STEEL CASING PIPE WITH THE AUTHORITY'S APPROVAL.

**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM

STANDARD WATER MAIN  
CROSSING ABOVE UTILITIES

QUARRYVILLE BOROUGH

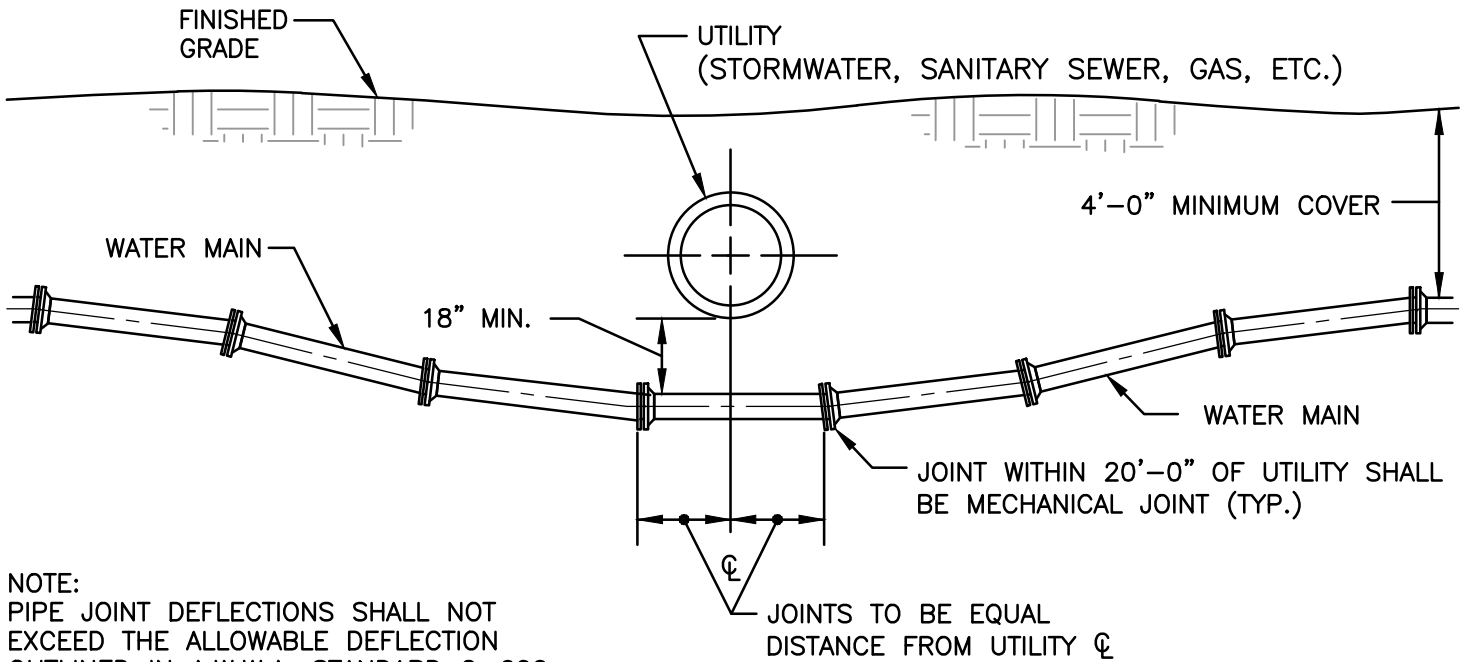
LANCASTER COUNTY

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330 Innovation Blvd., Suite 104, State College, PA 16803  
Phone (800) 738-8395  
Email: rette@rette.com  
Website: www.rette.com

DETAIL NO.	5
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\06 - Std Water Main Crossing Beneath Utilities.dwg



NOTE:  
 PIPE JOINT DEFLECTIONS SHALL NOT EXCEED THE ALLOWABLE DEFLECTION OUTLINED IN A.W.W.A. STANDARD C-600.

- NOTE:
1. THE UTILITY OWNER MAY, AT THEIR DISCRETION AND IN CONSULTATION WITH THE AUTHORITY, REQUIRE CONCRETE ENCASEMENT OF EITHER THE UTILITY OR THE WATER LINE.
  2. THE 18" VERTICAL SEPARATION CAN BE REDUCED TO A MINIMUM OF 6 INCHES, UTILIZING STEEL CASING PIPE WITH THE AUTHORITY'S APPROVAL.

**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM

STANDARD WATER MAIN  
 CROSSING BENEATH UTILITIES

QUARRYVILLE BOROUGH

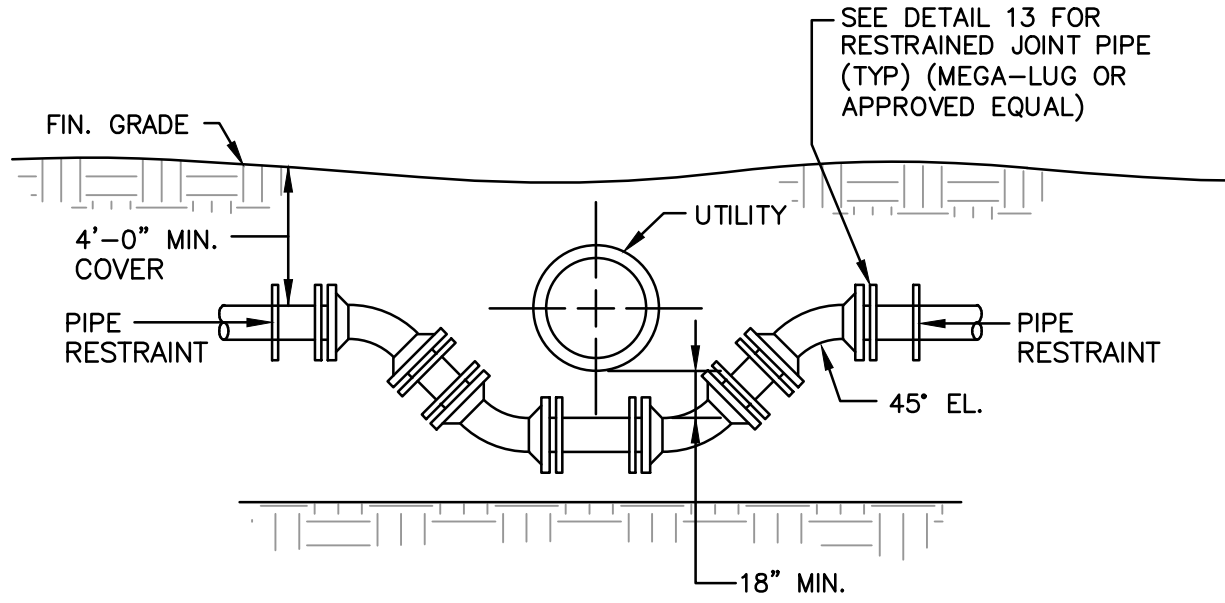
LANCASTER COUNTY



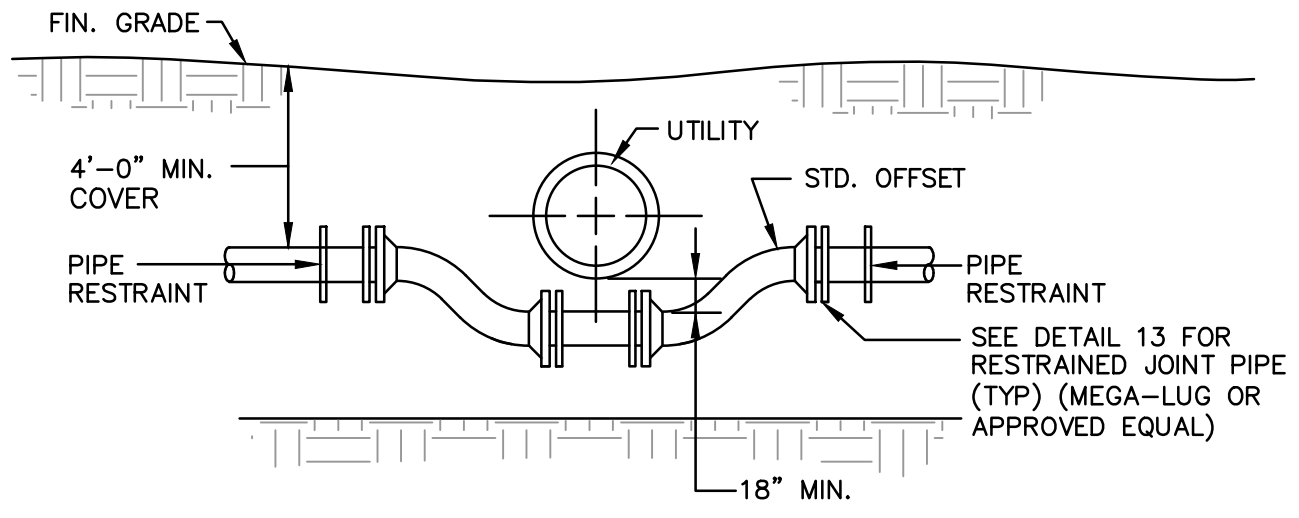
RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO.	6
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\07 - Std Water Main Crossing Using Fittings.dwg



USING ELBOWS



USING STD. OFFSETS

**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM

STANDARD WATER MAIN CROSSING  
USING FITTINGS

QUARRYVILLE BOROUGH

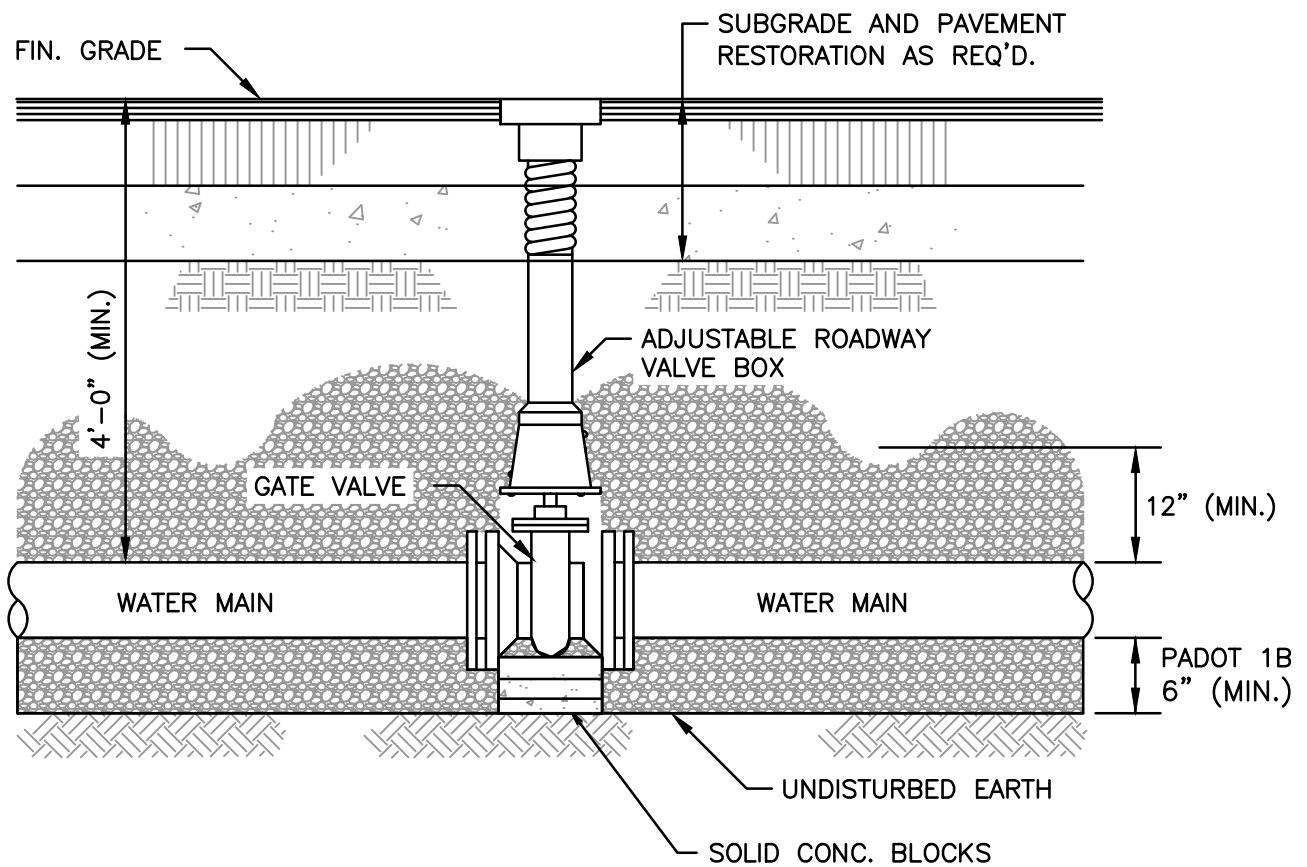
LANCASTER COUNTY

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DETAIL NO.	7
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\08 - Std Valve Installation.dwg



**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 STANDARD VALVE INSTALLATION DETAIL

QUARRYVILLE BOROUGH

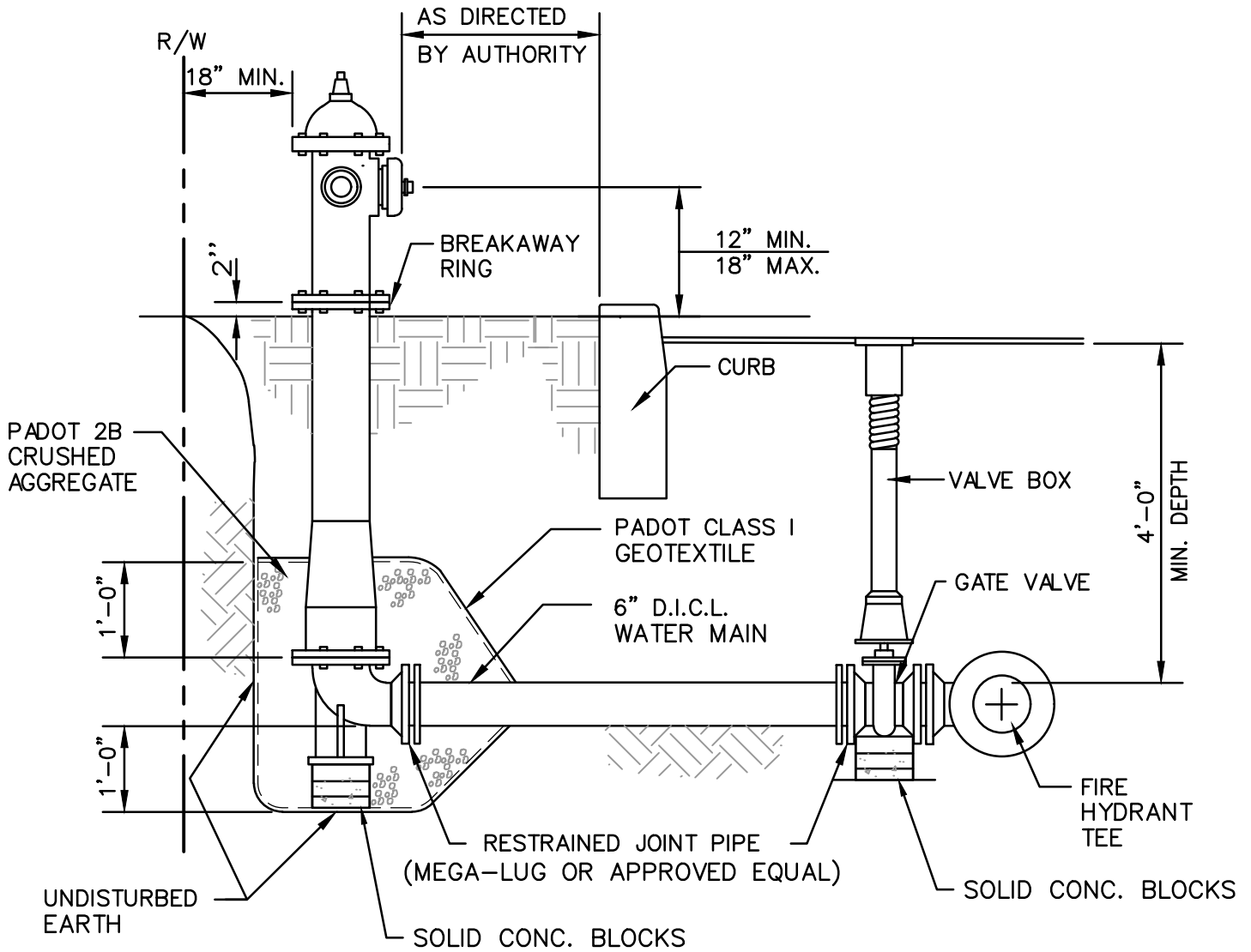
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DETAIL NO.	8
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\09 - Std Fire Hydrant Setting.dwg



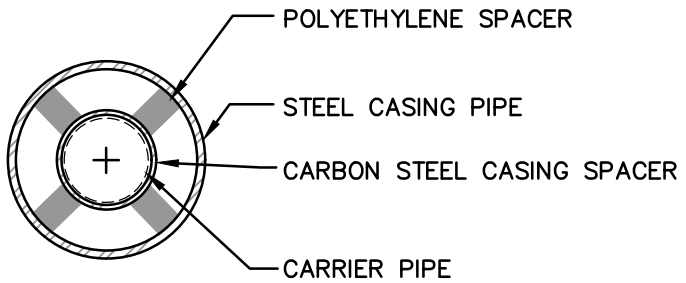
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 STANDARD FIRE HYDRANT  
 SETTING DETAIL

**RETTEW**

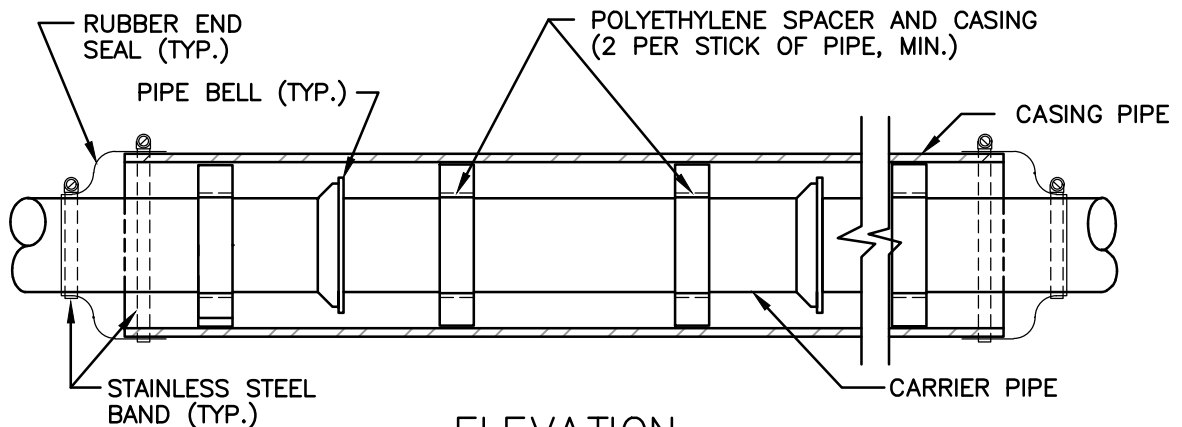
RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rette@rette.com  
 Website: www.rette.com

DETAIL NO. 9  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\10 - Std Casing Cradle.dwg



SECTION



ELEVATION

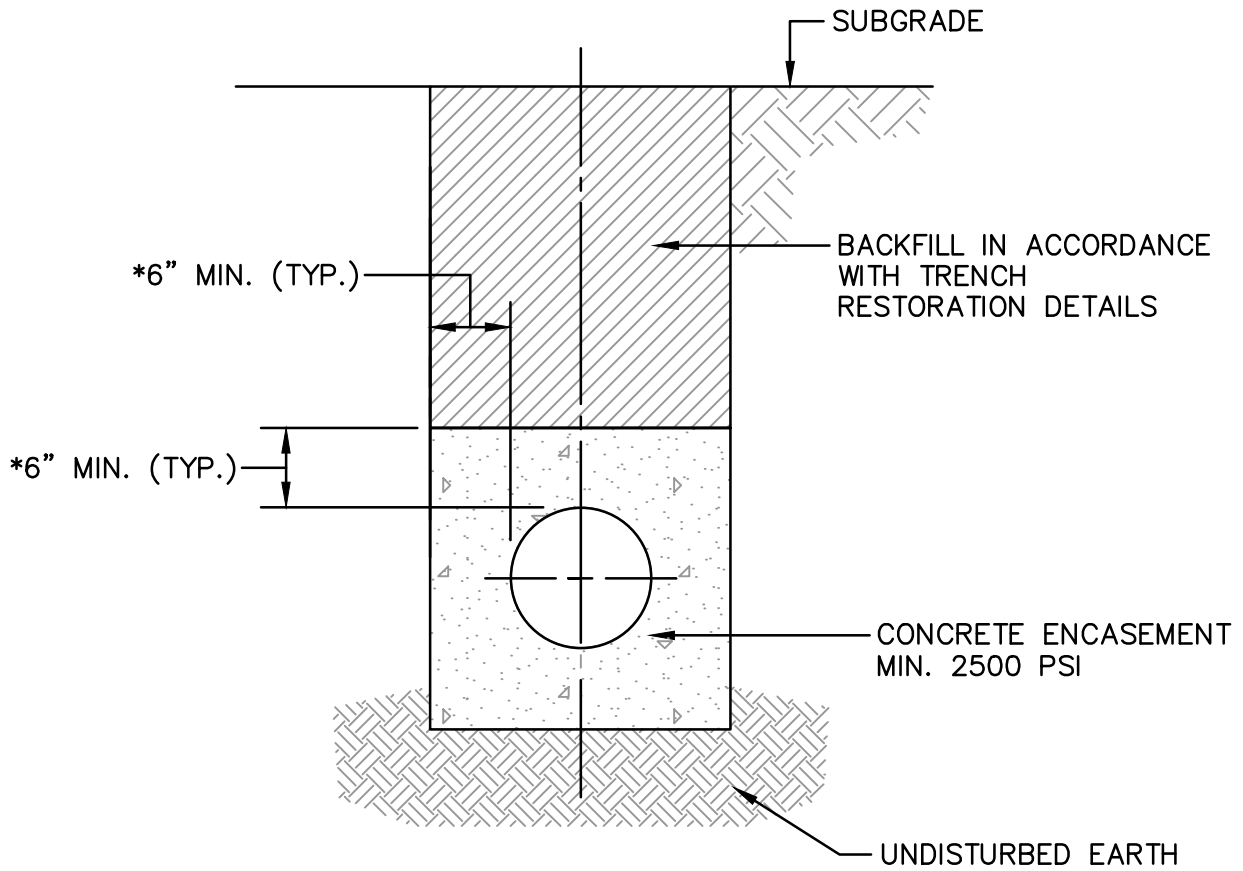
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 STANDARD CASING CRADLE DETAIL

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 Website: www.rettew.com

DETAIL NO. 10  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\11 - Std Concrete Encasement.dwg



- \* 6" MINIMUM THICKNESS FOR PIPES UP TO 24 INCHES DIAMETER.
- 9" MINIMUM THICKNESS FOR PIPES 24 INCHES DIAMETER AND GREATER.

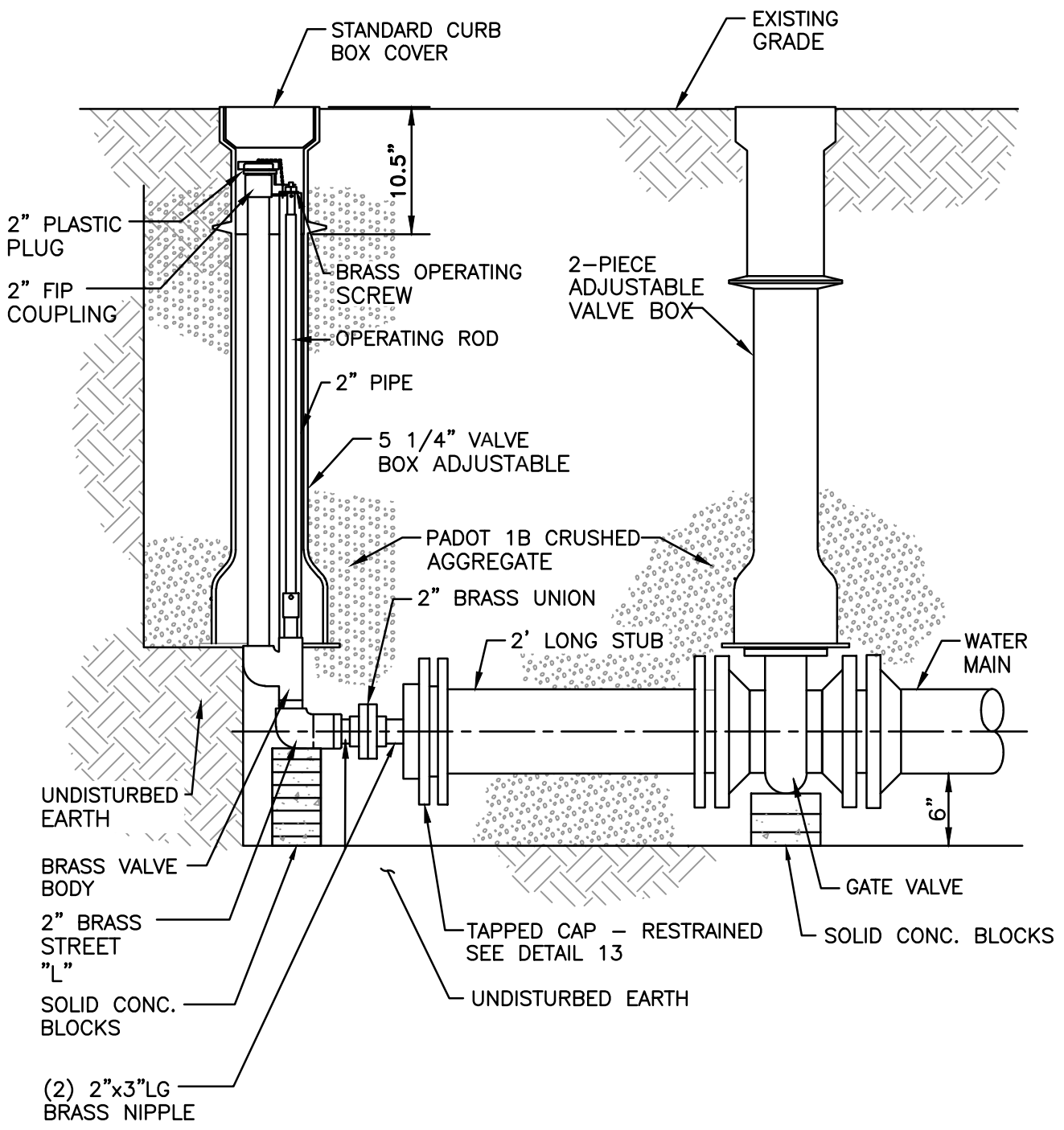
**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM  
STANDARD CONCRETE ENCASEMENT DETAIL

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Website: [www.rettew.com](http://www.rettew.com)

DETAIL NO. 11  
DRAWN BY: JNW  
DATE: MAY 2025  
SCALE: N/A  
DWG. NO. 0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\12 - Typ Blow-Off Hydrant.dwg

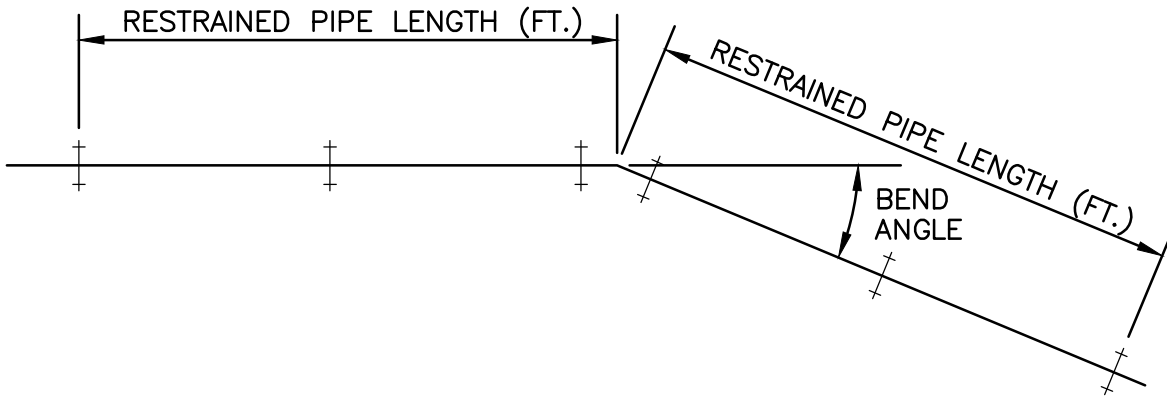


**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 TYPICAL BLOW-OFF HYDRANT DETAIL



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DETAIL NO.	12
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953



RESTRAINED PIPE LENGTH SCHEDULE					
PIPE DIAMETER	HORIZONTAL & VERTICAL UP BENDS				
	90°	45°	22 1/2°	11 1/4°	PLUGS & TEES
6"	18.3'	7.6'	3.6'	1.8'	50'
8"	24.0'	9.9'	4.8'	2.4'	65'
10"	28.6'	11.9'	5.7'	2.8'	75'
12"	33.4'	13.9'	6.7'	3.3'	90'
14"	38.1'	15.8'	7.6'	3.7'	100'
16"	42.4'	17.6'	8.4'	4.2'	115'

\* ADD 40% TO LENGTH IF PIPE IS POLYETHYLENE

RESTRAINED PIPE LENGTH SCHEDULE				
PIPE DIAMETER	VERTICAL DOWN BENDS			
			22 1/2°	11 1/4°
6"	23.3'		13.2'	7.0'
8"	29.8'		16.9'	9.0'
10"	35.7'		20.2'	10.7'
12"	41.4'		23.4'	12.4'
14"	46.8'		26.4'	14.0'
16"	52.1'		29.4'	15.6'

\* ADD 40% TO LENGTH IF PIPE IS POLYETHYLENE

NOTE: ALL LENGTHS BASED ON 150 PSI MAXIMUM PRESSURE. FOR HIGHER PRESSURES, INCREASE LENGTHS IN PROPORTION TO PRESSURE RATIO.

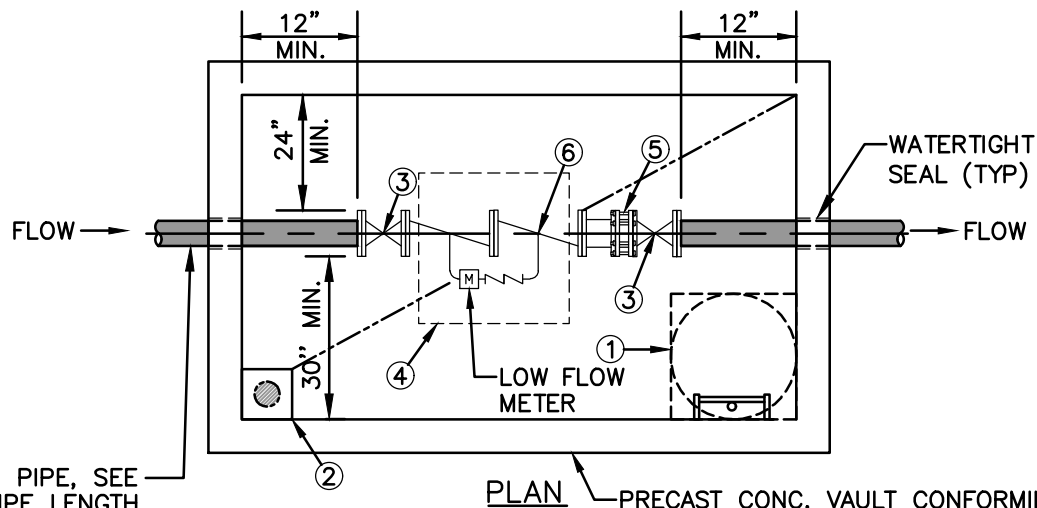
**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM  
RESTRAINED PIPE LENGTH SCHEDULE

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DETAIL NO. 13  
DRAWN BY: JNW  
DATE: MAY 2025  
SCALE: N/A  
DWG. NO. 0147102953

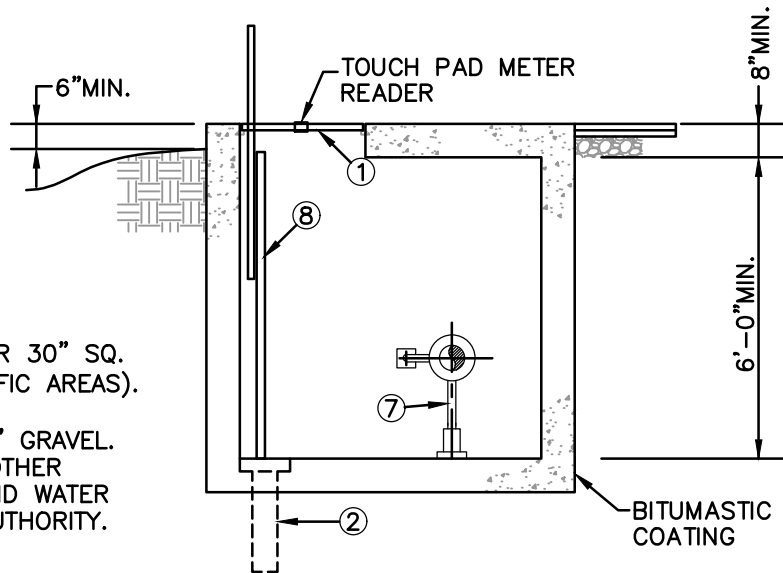
Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - Fire Service Setting - Vault Installation.dwg



RESTRAINED PIPE, SEE RESTRAINED PIPE LENGTH SCHEDULE DETAIL NO. 13

PLAN

PRECAST CONC. VAULT CONFORMING TO AASHTO H-25 LOADING, SLOPE FLOOR FOR POSITIVE DRAINAGE. LOCATE OUTSIDE OF TRAFFIC AREAS, UNLESS OTHERWISE APPROVED BY THE THE AUTHORITY



TYPICAL SECTION

**KEY NOTES:**

- ① 30  $\phi$  MANHOLE COVER (TRAFFIC AREAS) OR 30" SQ. WATERTIGHT AL. ACCESS HATCH (NON TRAFFIC AREAS).
- ② 2' LENGTH OF 6" DIP HALF FILLED WITH 1" GRAVEL. PIPE SHALL CONTAIN A CHECK VALVE OR OTHER MEANS OF PROTECTION TO PREVENT GROUND WATER FLOW INTO VAULT AS APPROVED BY THE AUTHORITY.
- ③ OS&Y GATE VALVE
- ④ 36" SQ. (MIN.) WATERTIGHT HATCH. SUITABLE FOR H-25 IMPACT LOADING IN TRAFFIC AREA. POSITION HATCH OVER DOUBLE CHECK VALVE ASSEMBLY FOR ABOVE GRADE READING.
- ⑤ FLANGED ADAPTER (RESTRAINED) AMES
- ⑥ 3001 DOUBLE CHECK DETECTOR ASSEMBLY W/LOW FLOW METER & DOUBLE CHECK VALVE.
- ⑦ STN. STL. ADJUSTABLE PIPE SADDLE SUPPORTS.
- ⑧ AL. LADDER W/ EXTENDIBLE STN STL CENTER SAFTEY POST

**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 FIRE SERVICE SETTING DETAIL – VAULT  
 INSTALLATION (SPECIAL EXCEPTION ONLY)

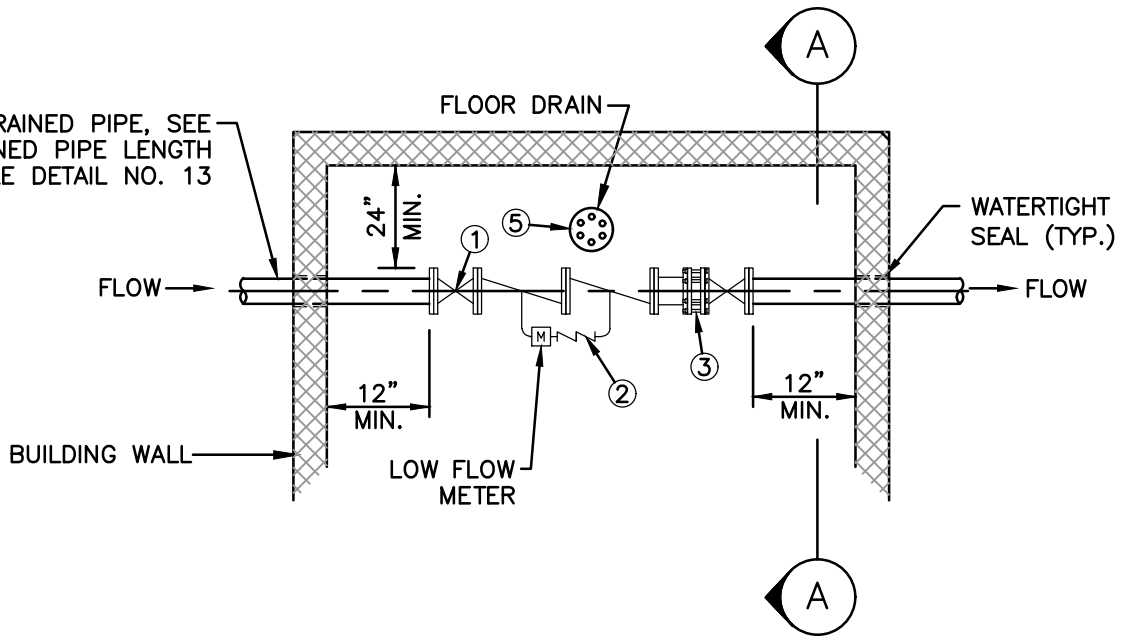
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 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO. 14  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\15 - Fire Service Setting - Bldg Installation.dwg

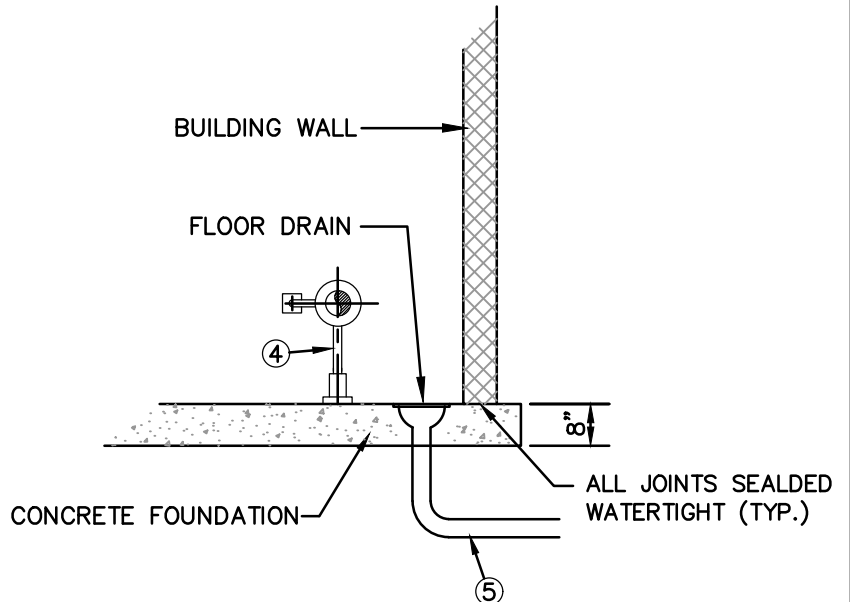
RESTRAINED PIPE, SEE RESTRAINED PIPE LENGTH SCHEDULE DETAIL NO. 13



PLAN

**KEY NOTES:**

- ① OS&Y GATE VALVE.
- ② AMES 3001 DOUBLE CHECK DETECTOR ASSEMBLY W/LOW FLOW METER & DOUBLE CHECK VALVE.
- ③ FLANGED ADAPTER (RESTRAINED).
- ④ STN STL ADJUSTABLE SADDLE SUPPORTS.
- ⑤ FLOOR DRAIN WITH SUFFICIENT GRAVITY DRAINAGE TO A FREE DISCHARGE SHALL BE PROVIDED WHEN A REDUCED PRESSURE ZONE DEVICE (RPZD) IS REQUIRED.



SECTION A-A

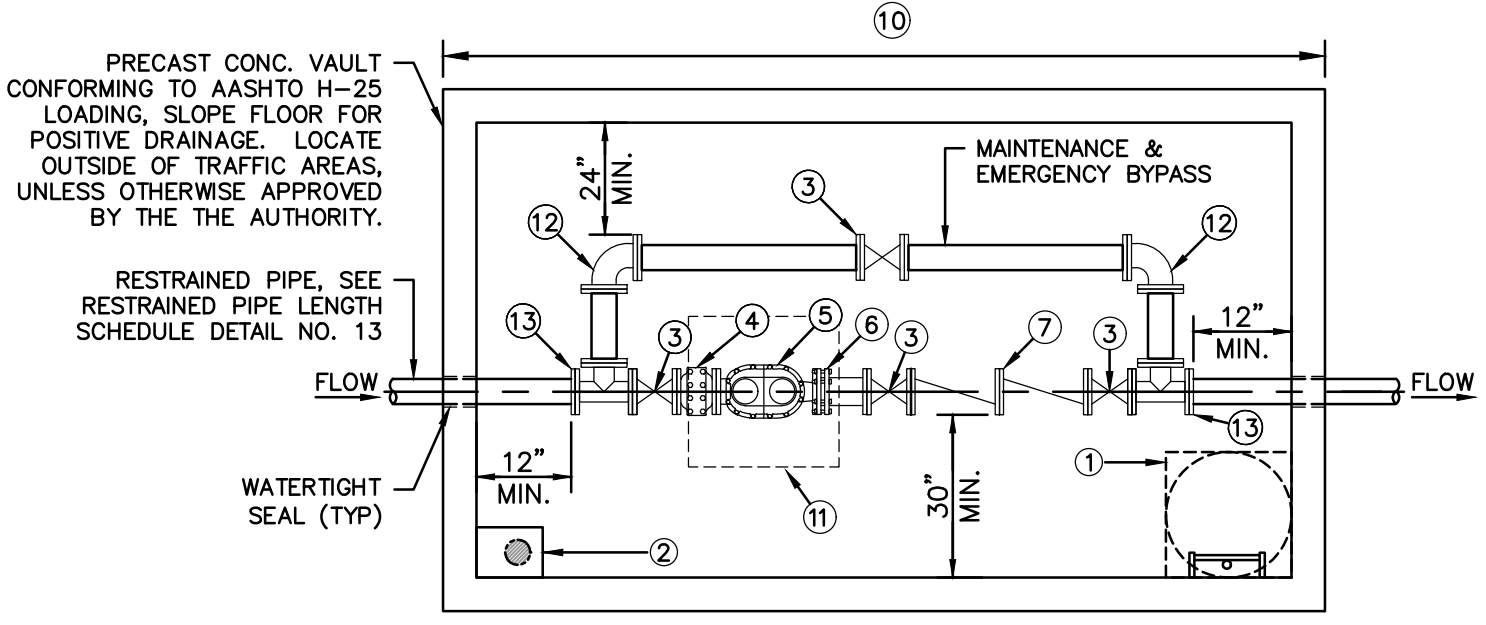
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 STANDARD WATER MAIN  
 CROSSING ABOVE UTILITIES

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 Website: www.rettew.com

DETAIL NO. 15  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

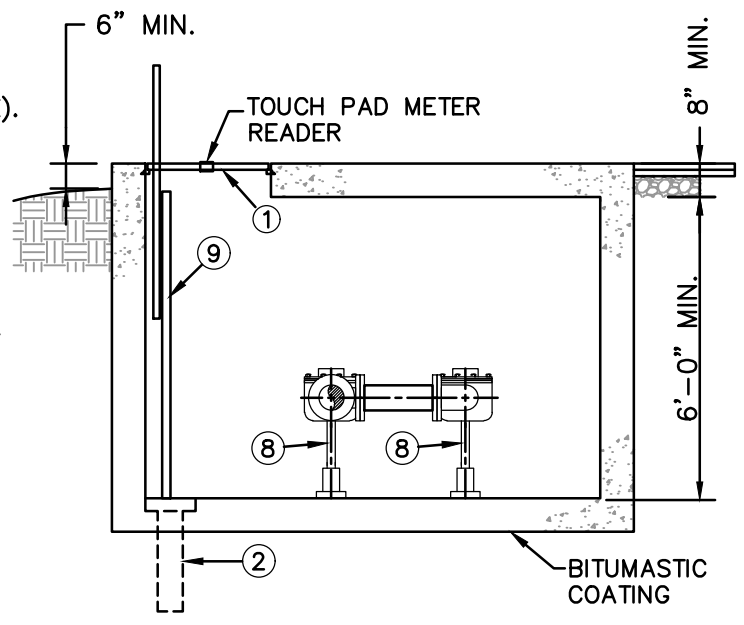
Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - Domestic Meter Setting - Vault Installation Utilizing Meters 3in & Larger.dwg



PLAN

**KEY NOTES:**

- ① 30"  $\phi$  MANHOLE COVER (TRAFFIC AREAS) OR 30" SQ. WATERTIGHT AL. ACCESS HATCH (NON TRAFFIC AREAS).
- ② 2' LENGTH OF 6" DIP HALF FILLED WITH 1" GRAVEL. PIPE SHALL CONTAIN A CHECK VALVE OR OTHER MEANS OF PROTECTION TO PREVENT GROUND WATER FLOW INTO VAULT AS APPROVED BY THE AUTHORITY.
- ③ OS&Y GATE VALVE
- ④ STRAINER MOUNTED UPSTREAM OF METER.
- ⑤ METER FURNISHED & INSTALLED BY CONSUMER (METER & PIPING SHALL BE THE SAME NOMINAL SIZE).
- ⑥ FLANGED ADAPTER (RESTRAINED)
- ⑦ BACKFLOW PREVENTOR: SHALL BE TYPE REQUIRED BASED ON SPECIFIC APPLICATION.
- ⑧ STN. STL. ADJUSTABLE PIPE SADDLE SUPPORTS.
- ⑨ AL. LADDER W/ EXTENDABLE STN STL CENTER SAFETY POST.
- ⑩ THE MINIMUM DIMENSIONS OF THE METER PIT SHALL BE INCREASED IN LENGTH ACCORDINGLY TO SATISFY METER MFGR'S STRAIGHT PIPE REQUIREMENTS.
- ⑪ 36" SQ. (MIN.) WATERTIGHT HATCH. SUITABLE FOR H-25 IMPACT LOADING IN TRAFFIC AREA. POSITION HATCH OVER METER FOR ABOVE GRADE READING.
- ⑫ 90-DEGREE (ELBOW) BEND (SHALL BE THE SAME NOMINAL SIZE) (MECHANICAL JOINT RESTRAINTS SHALL BE USED TO MFGR'S REQUIREMENTS).
- ⑬ FULL-SIZED TEE (SHALL BE THE SAME NOMINAL SIZE) (MECHANICAL JOINT RESTRAINTS & FOSTER ADAPTERS SHALL BE USED TO MFGR'S REQUIREMENTS).



TYPICAL SECTION

**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM

DOMESTIC METER SETTING DETAIL - VAULT  
INSTALLATION UTILIZING METERS 3" & LARGER  
(SPECIAL EXCEPTION ONLY)

QUARRYVILLE BOROUGH

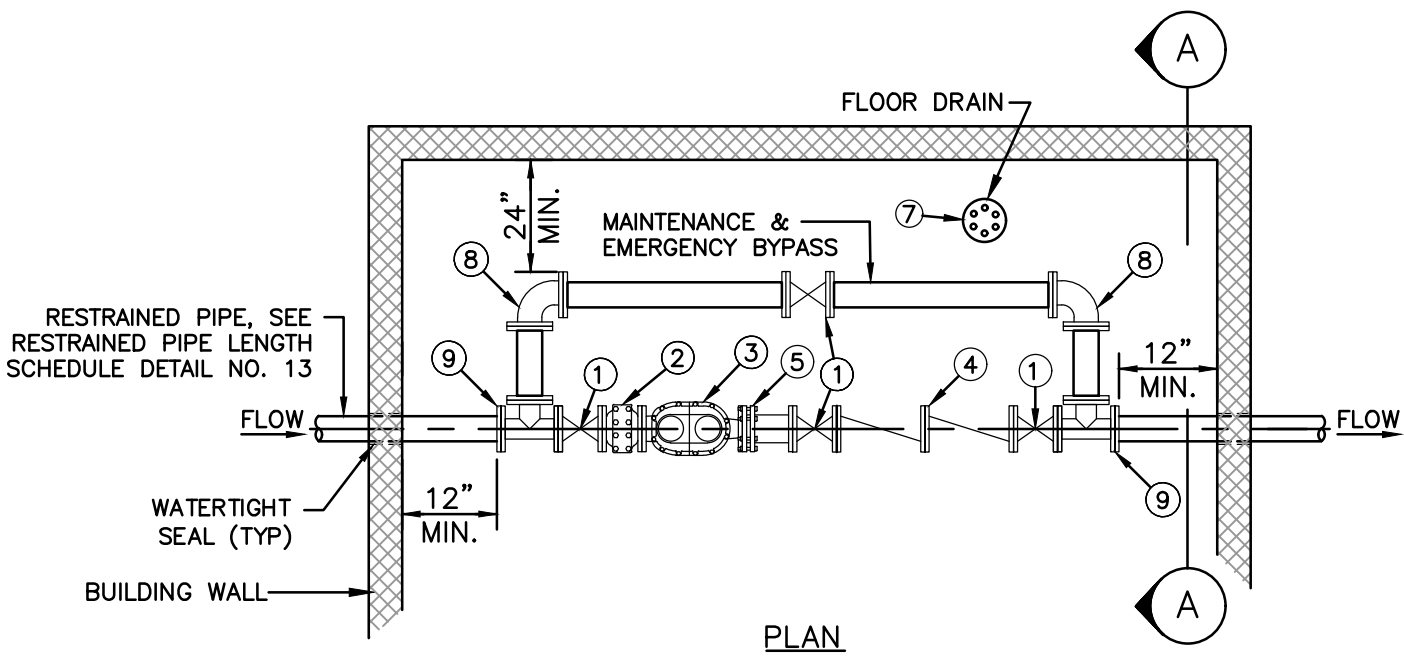
LANCASTER COUNTY



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330 Innovation Blvd., Suite 104, State College, PA 16803  
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Website: www.rettetw.com

DETAIL NO.	16
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

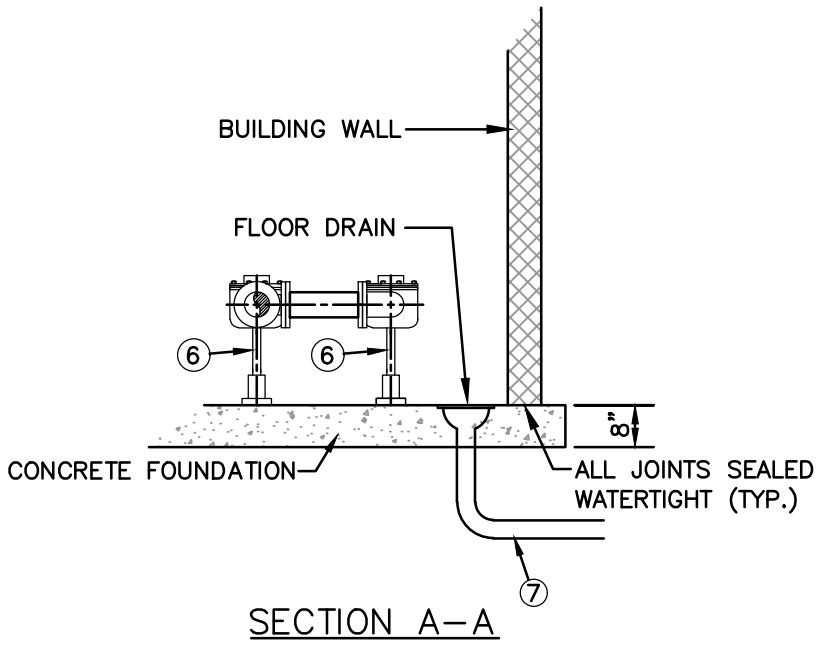
Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - Domestic Meter Setting - Bldg Installation Utilizing Meters 3in & Larger.dwg



PLAN

**KEY NOTES:**

- ① OS&Y GATE VALVE
- ② STRAINER MOUNTED UPSTREAM OF METER.
- ③ METER FURNISHED & INSTALLED BY CONSUMER. MANUFACTURER'S STRAIGHT PIPE REQUIREMENTS SHALL BE UTILIZED.
- ④ BACKFLOW PEVENTOR SHALL BE TYPE BASED ON SPECIFIC APPLICATION.
- ⑤ FLANGED ADAPTER (RESTRAINED)
- ⑥ STN STL ADJUSTABLE SADDLE SUPPORTS.
- ⑦ FLOOR DRAIN WITH SUFFICIENT GRAVITY DRAINAGE TO A FREE DISCHARGE SHALL BE PROVIDED WHEN A REDUCED PRESSURE ZONE DEVICE (RPZD) IS REQUIRED.
- ⑧ 90-DEGREE (ELBOW) BEND (SHALL BE THE SAME NOMINAL SIZE) (MECHANICAL JOINT RESTRAINTS SHALL BE USED TO MFGR'S REQUIREMENTS).
- ⑨ FULL-SIZED TEE (SHALL BE THE SAME NOMINAL SIZE) (MECHANICAL JOINT RESTRAINTS & FOSTER ADAPTERS SHALL BE USED TO MFGR'S REQUIREMENTS).



SECTION A-A

**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM

DOMESTIC METER BLDG. SETTING DETAIL - VAULT  
INSTALLATION UTILIZING METERS 3" & LARGER

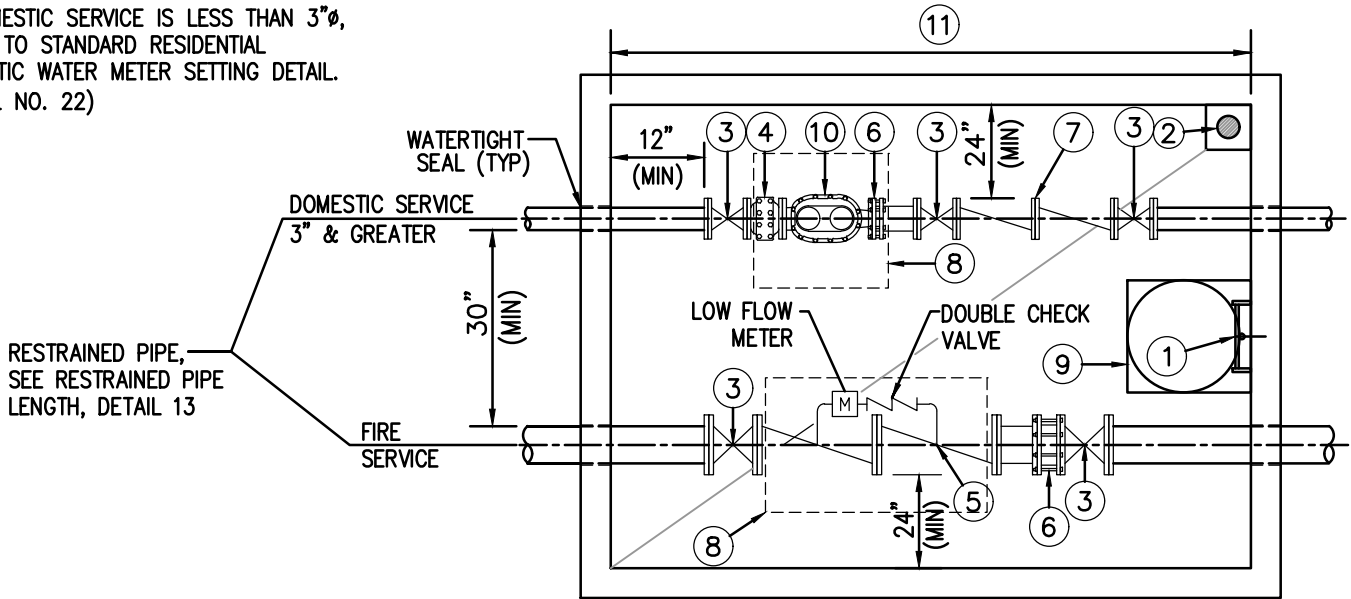


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DETAIL NO.	17
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

**NOTE:**

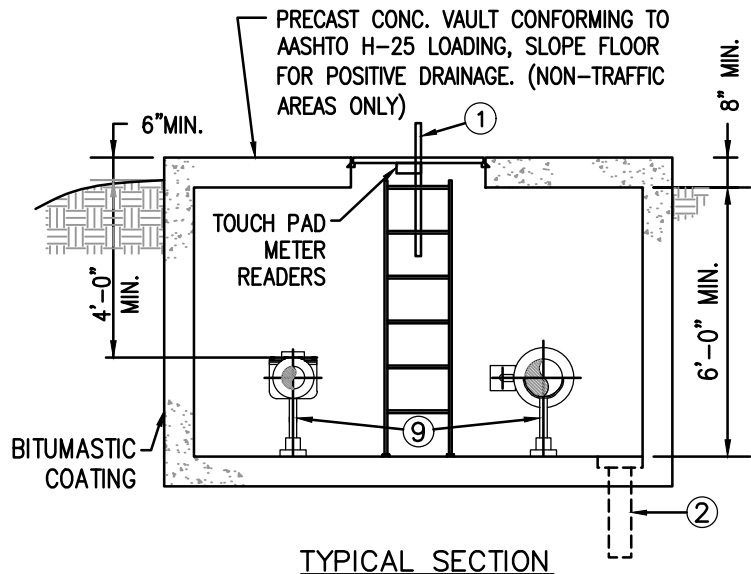
IF DOMESTIC SERVICE IS LESS THAN 3"Ø,  
REFER TO STANDARD RESIDENTIAL  
DOMESTIC WATER METER SETTING  
DETAIL. (DETAIL NO. 22)



**PLAN**

**KEY NOTES:**

- ① AL. LADDER W/EXTENDABLE STN. STL. CENTER SAFETY POST.
- ② 2' LENGTH OF 6" DIP HALF FILLED WITH 1" GRAVEL, PIPE SHALL CONTAIN A CHECK VALVE OR OTHER MEANS OF PROTECTION TO PREVENT GROUND WATER FLOW INTO THE VAULT AS APPROVED BY THE AUTHORITY.
- ③ OS&Y GATE VALVE.
- ④ STRAINER MOUNTED UPSTREAM OF METER.
- ⑤ AMES 3001 DOUBLE CHECK DETECTOR ASSEMBLY W/LOW FLOW BYPASS METER & DOUBLE CHECK VALVE.
- ⑥ FLANGED ADAPTER (RESTRAINED).
- ⑦ BACKFLOW PREVENTOR, SHALL BE TYPE REQUIRED BASED ON SPECIFIC APPLICATION.
- ⑧ 36" SQ. (MIN.) WATERTIGHT HATCH SUITABLE FOR H-25 WITH IMPACT LOADING IN TRAFFIC AREAS. POSITION HATCH OVER METER FOR ABOVE GRADE READING.
- ⑨ 30"Ø MANHOLE COVER (TRAFFIC AREAS) OR 30" SQ. WATERTIGHT AL. ACCESS HATCH (NON TRAFFIC AREAS).
- ⑩ METER FURNISHED & INSTALLED BY CONSUMER (METER & PIPING SHALL BE THE SAME NOMINAL SIZE).
- ⑪ THE MINIMUM DIMENSIONS OF THE METER PIT SHALL BE INCREASED IN LENGTH ACCORDINGLY TO SATISFY METER MFGR'S STRAIGHT PIPE REQUIREMENTS.
- ⑫ BYPASS NEED TO BE PROVIDED FOR THE DOMESTIC WATER METER, NOTE BYPASS CAN BE LOCATED ON THE INSIDE OR OUTSIDE OF METER VAULT. SHALL BE SPECIFIED BY ENGINEER ON PROJECT PLANS.



**TYPICAL SECTION**

**QUARRYVILLE BOROUGH AUTHORITY**

STANDARDIZED WATER SYSTEM  
COMBINATION FIRE & DOMESTIC METER SETTING  
DETAIL – VAULT INSTALLATION  
(BY SPECIAL EXCEPTION ONLY)

QUARRYVILLE BOROUGH

LANCASTER COUNTY



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DETAIL NO. 18

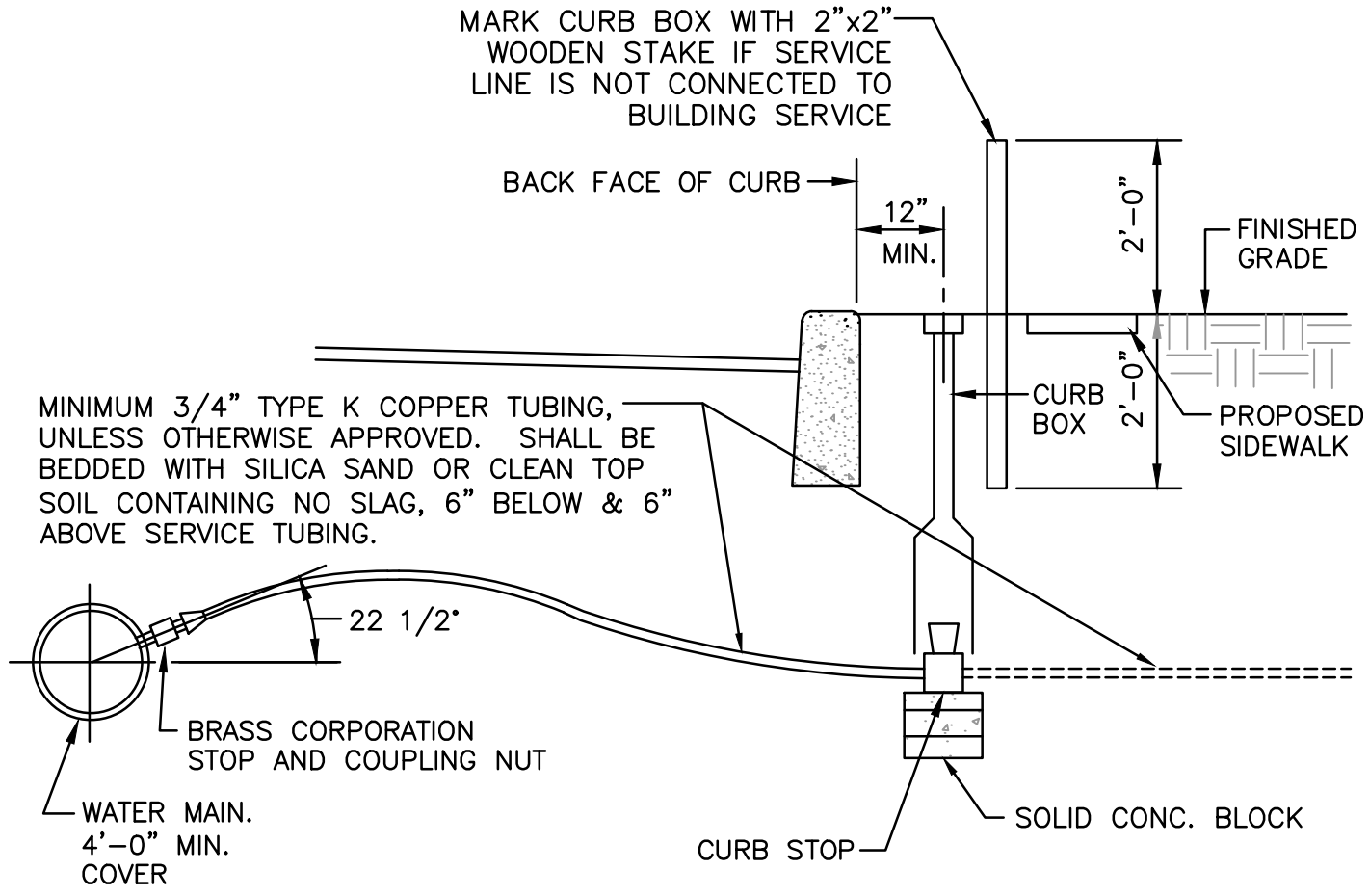
DRAWN BY: JNW

DATE: MAY 2025

SCALE: N/A

DWG. NO. 0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\19 - Std Water Service Line Installation - Roadway & Curbing.dwg



NOTES:

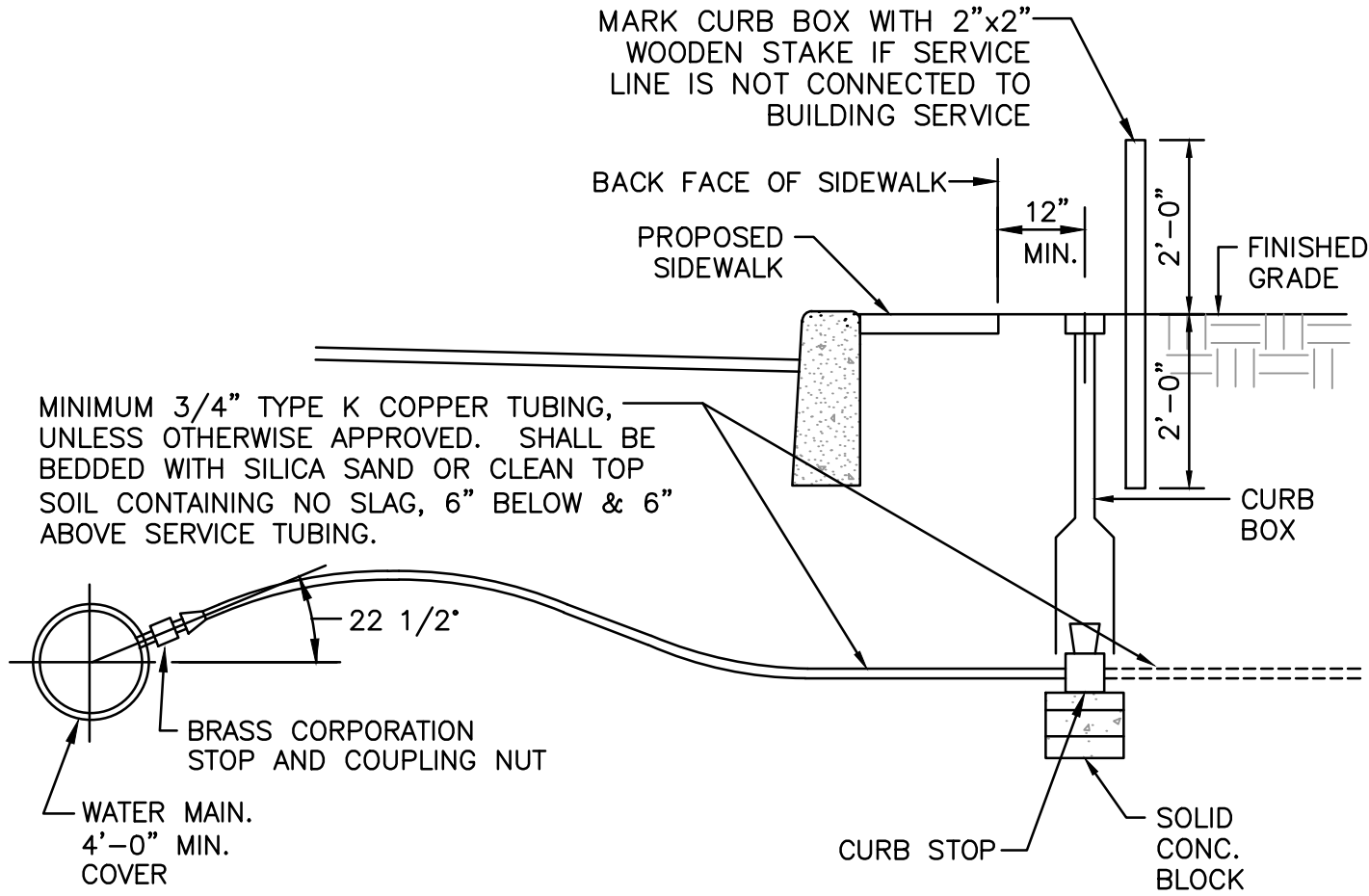
- 1) IF CURB STOP CAN NOT BE INSTALLED AT LOCATION SHOWN, THE AUTHORITY WILL DESIGNATE LOCATION.
- 2) NO CURB STOP SHALL BE LOCATED IN CURB.

**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 STANDARD WATER SERVICE LINE  
 INSTALLATION (ROADWAY W/ CURBING)



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DETAIL NO.	19
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953



NOTES:

- 1) IF CURB STOP CAN NOT BE INSTALLED AT LOCATION SHOWN, THE AUTHORITY WILL DESIGNATE LOCATION.
- 2) NO CURB STOP SHALL BE LOCATED IN CURB.

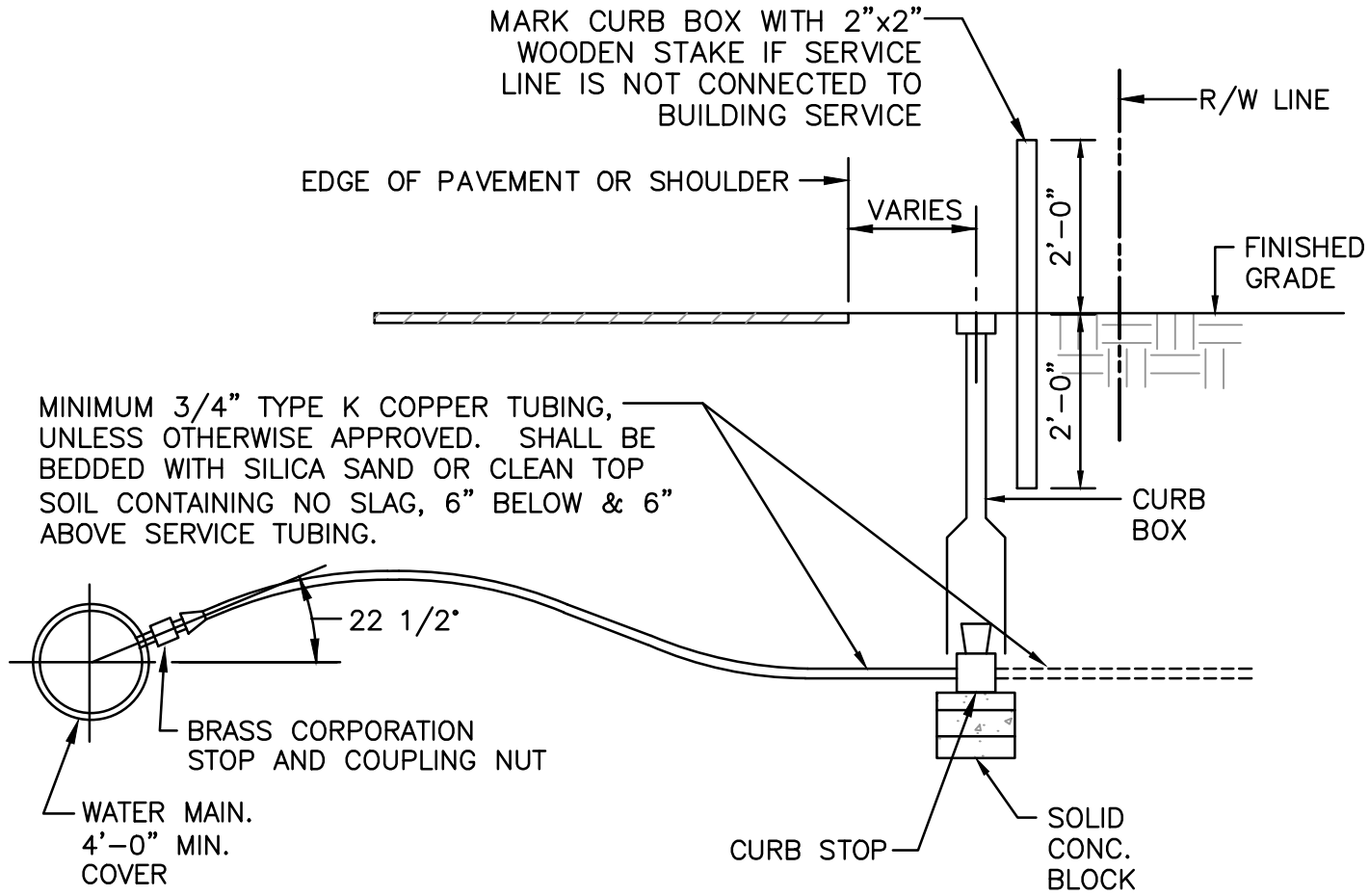
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 WATER SERVICE LINE INSTALLATION  
 (BEHIND CURB & SIDEWALK)



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DETAIL NO.	20
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\21 - Std Water Service Line Installation Roadway - No Curbing.dwg



NOTES:

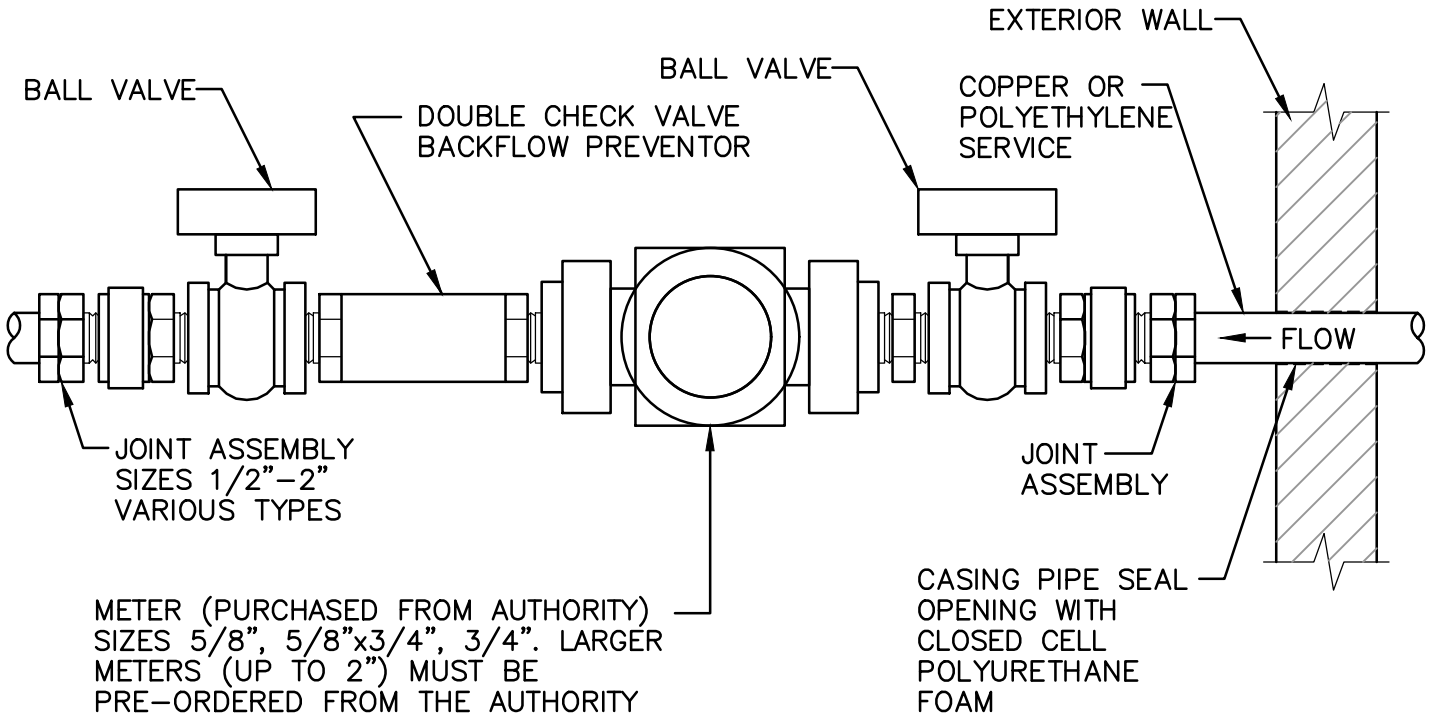
- 1) IF CURB STOP CAN NOT BE INSTALLED AT LOCATION SHOWN, THE AUTHORITY WILL DESIGNATE LOCATION.
- 2) NO CURB STOP SHALL BE LOCATED IN CURB.

**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 WATER SERVICE LINE INSTALLATION  
 (ROADWAY WITHOUT CURBING)



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DETAIL NO.	21
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953



METER (PURCHASED FROM AUTHORITY)  
 SIZES 5/8", 5/8"x3/4", 3/4". LARGER  
 METERS (UP TO 2") MUST BE  
 PRE-ORDERED FROM THE AUTHORITY

**NOTE:**

SHOULD THE AUTHORITY DECIDE THAT METER SHALL BE PLACED OUTSIDE OF BUILDING, THE REMOTE METER SHALL HAVE SAME GENERAL CONFIGURATION AS SHOWN ON THIS DETAIL AND MUST BE APPROVED BY THE AUTHORITY.

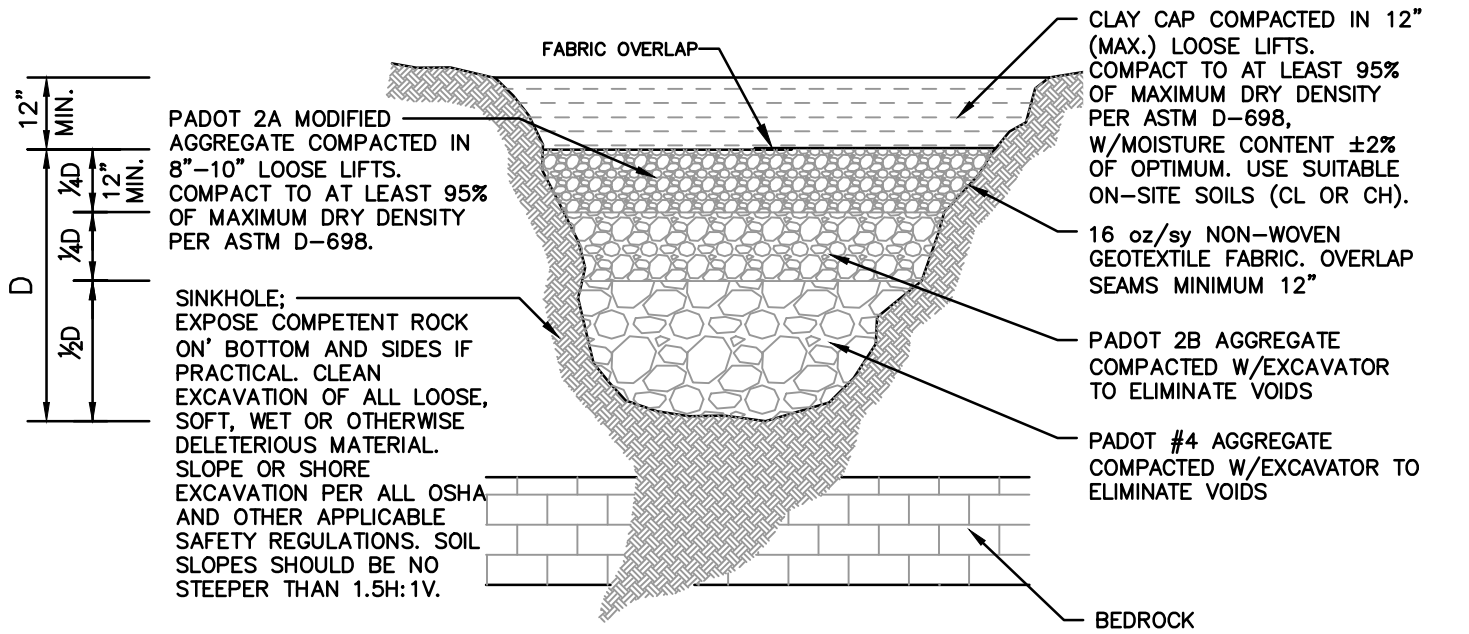
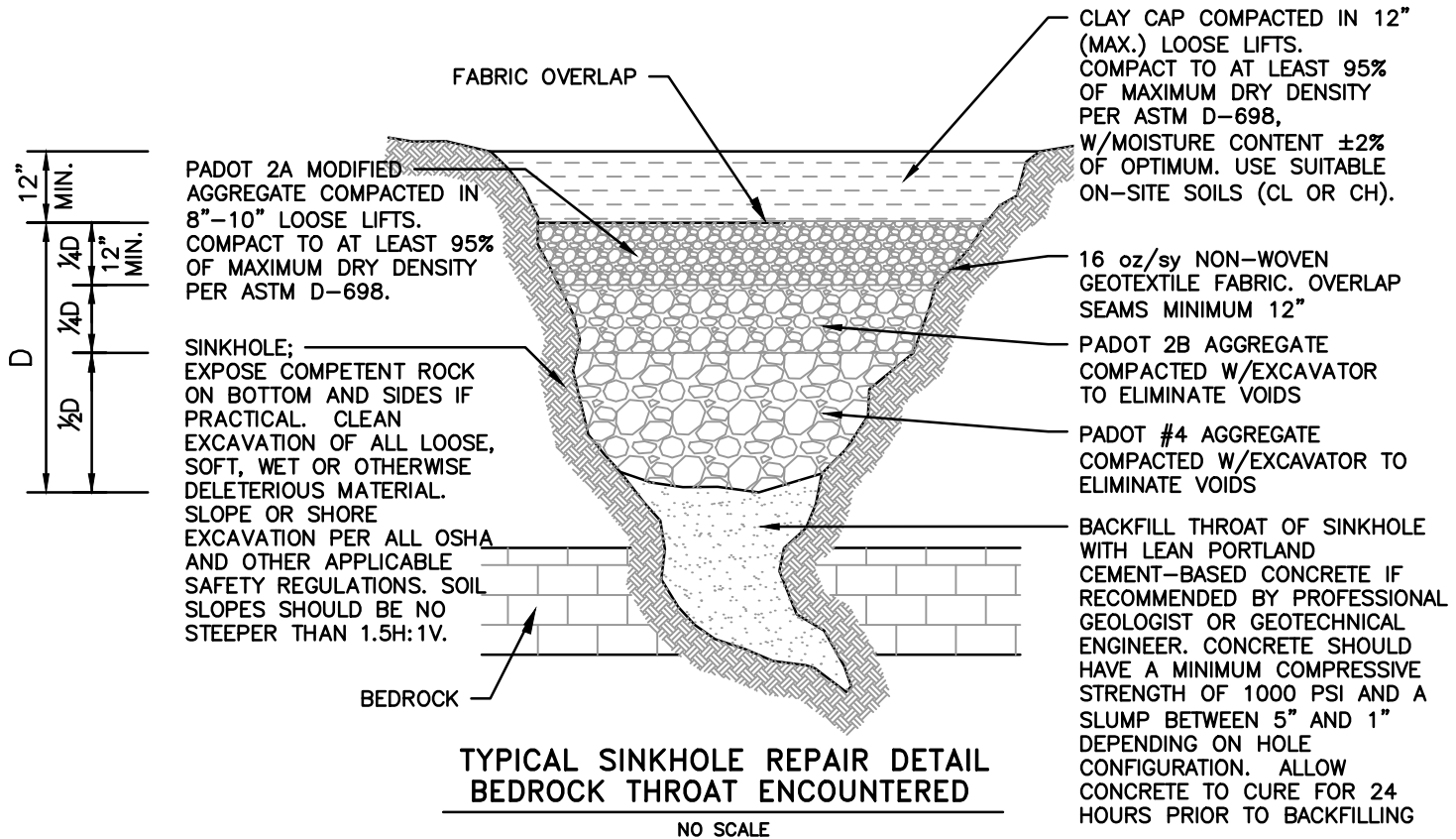
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 RESIDENTIAL DOMESTIC WATER METER  
 SETTING DETAIL



RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rette@rette.com  
 Website: www.rette.com

DETAIL NO. 22  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\23 - Sinkhole Remediation.dwg



**NOTE:**  
ACTUAL REPAIR METHOD SHOULD BE DESIGNED AND IMPLEMENTED BY CONTRACTOR BASED ON ACTUAL SINKHOLE SIZE, CONFIGURATION AND LOCATION. ALL SINKHOLE MITIGATION MEASURES SHOULD BE APPROVED BY A QUALIFIED GEOLOGIST OR GEOTECHNICAL ENGINEER PRIOR TO IMPLEMENTATION.

**TYPICAL SINKHOLE REPAIR DETAIL  
BEDROCK THROAT NOT ENCOUNTERED**

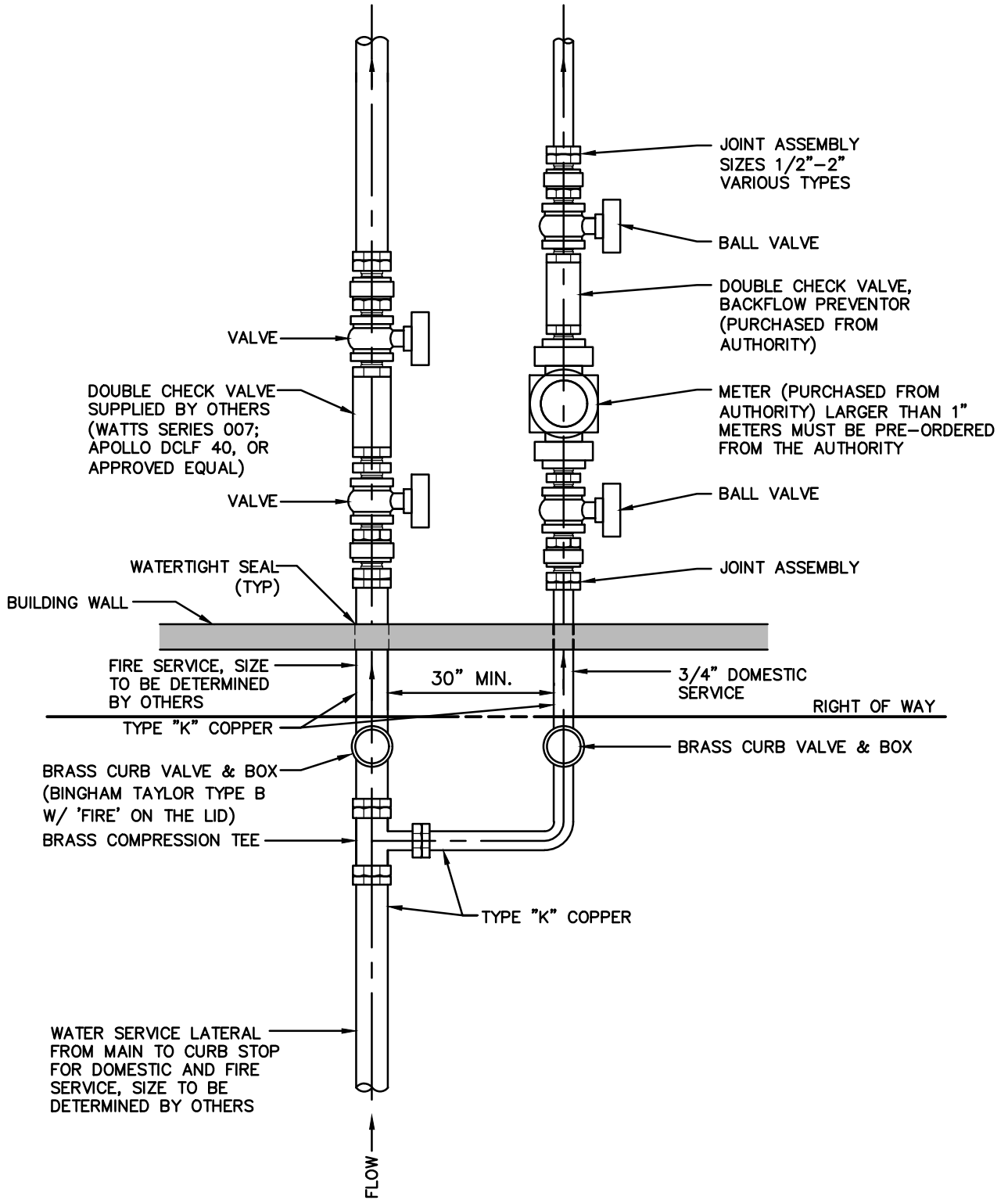
NO SCALE

**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM  
SINKHOLE REMEDIATION

**RETTEW**

RETTEW Associates, Inc.  
330 Innovation Blvd., Suite 104, State College, PA 16803  
Phone (800) 738-8395  
Email: rette@rette.com  
Website: www.rettew.com

DETAIL NO.	23
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953



**NOTE:**

BEDDING & INITIAL BACKFILL THE COPPER WITH TOP SOIL OR SILICA SAND. IF POLYETHYLENE IS UTILIZED, STONE DUST MAY BE USED FOR BEDDING & INITIAL BACKFILL.

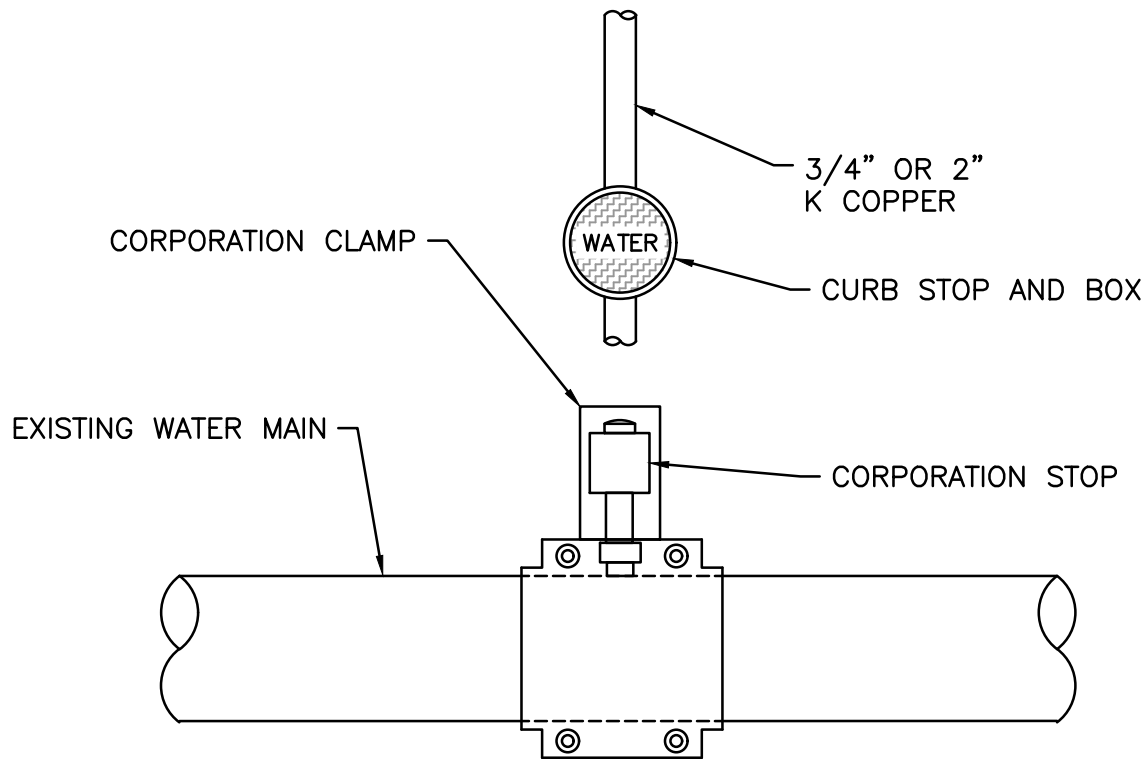
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 COMBINATION FIRE & DOMESTIC METER  
 SETTING DETAIL - RESIDENTIAL INSTALLATION

**RETTEW**

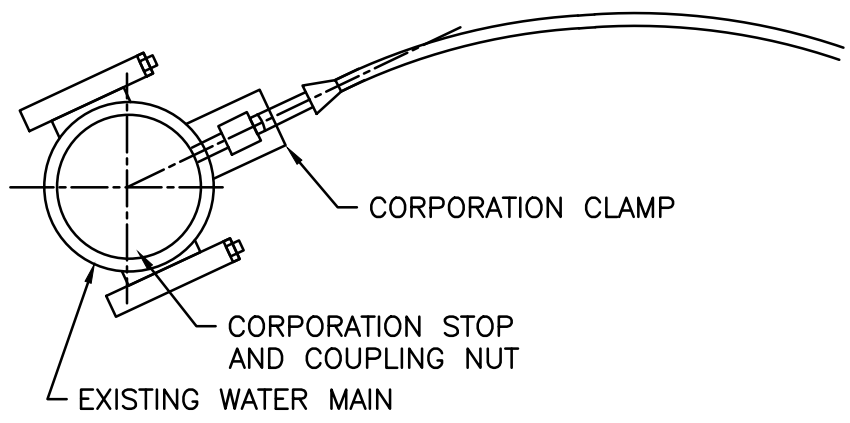
RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO. 24  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\25 - Encapsulation Clamp.dwg



PLAN



SECTION

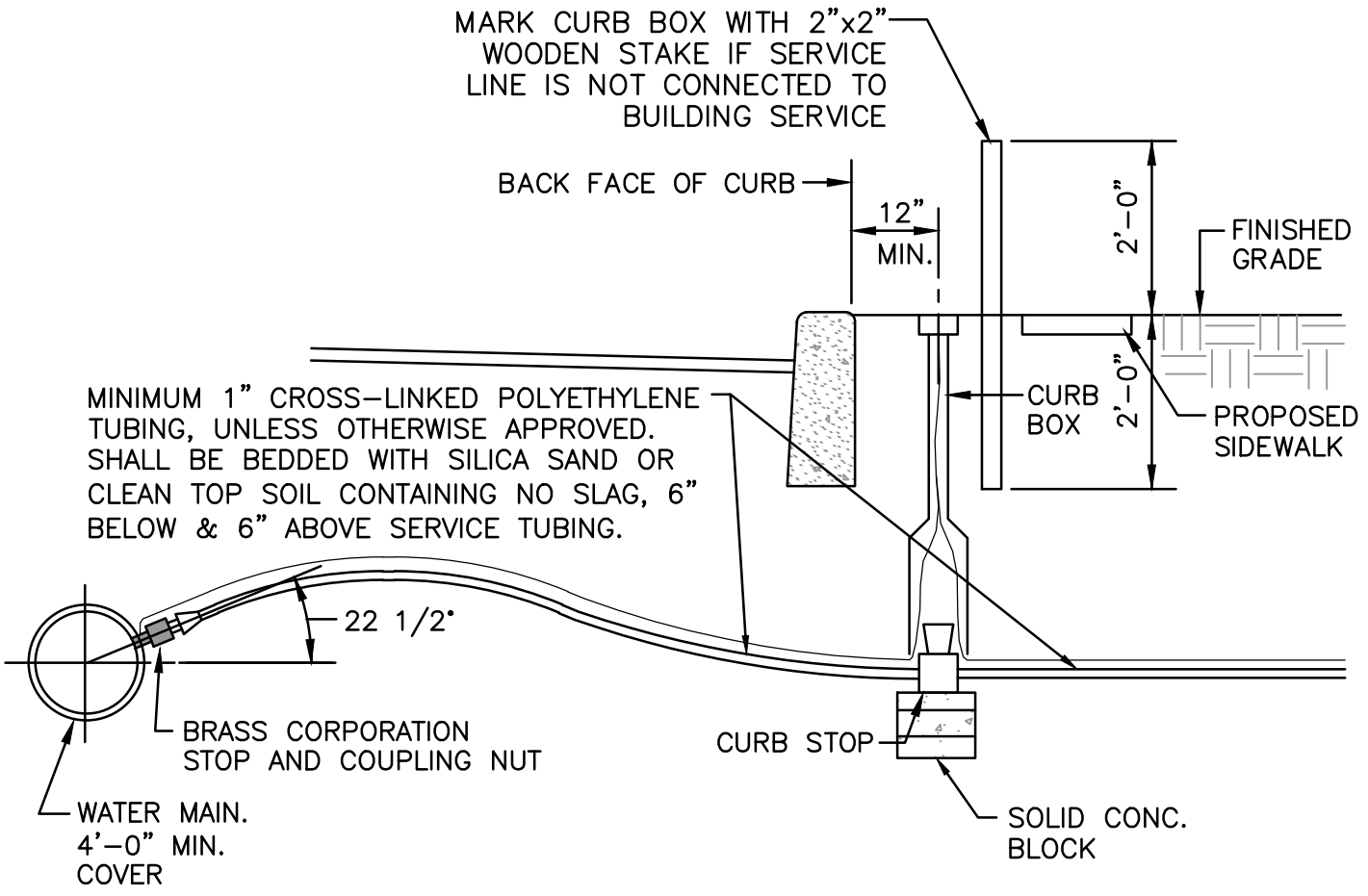
**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 ABANDONED CORPORATION CLAMP  
 (ENCAPSULATED CORPORATION STOP)

**RETTEW**

RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO. 25  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\26 - Polyethylene Service Line w Curb.dwg



NOTES:

- 1) IF CURB STOP CAN NOT BE INSTALLED AT LOCATION SHOWN, THE AUTHORITY WILL DESIGNATE LOCATION.
- 2) NO CURB STOP SHALL BE LOCATED IN CURB.
- 3) TRACER WIRE 10 GAUGE OR THICKER SHALL BE INSTALLED.

**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 CROSS-LINKED POLYETHYLENE WATER SERVICE  
 LINE INSTALLATION (ROAD W/ CURBING)  
 (BY SPECIAL EXCEPTION ONLY)

QUARRYVILLE BOROUGH

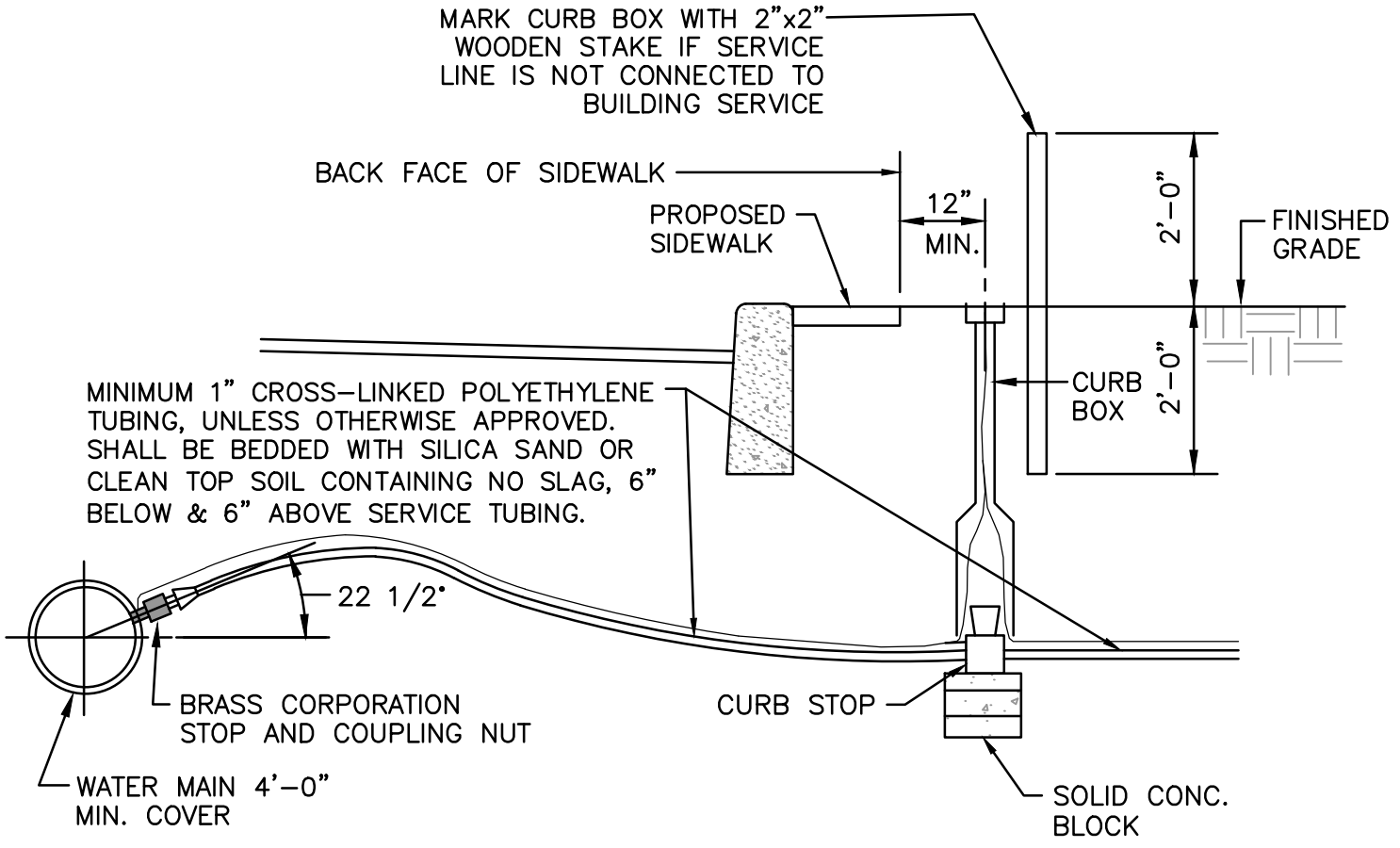
LANCASTER COUNTY

**RETTEW**

RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO.	26
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\27 - Polyethylene Service Line w Curb-Sidewalk.dwg



**NOTES:**

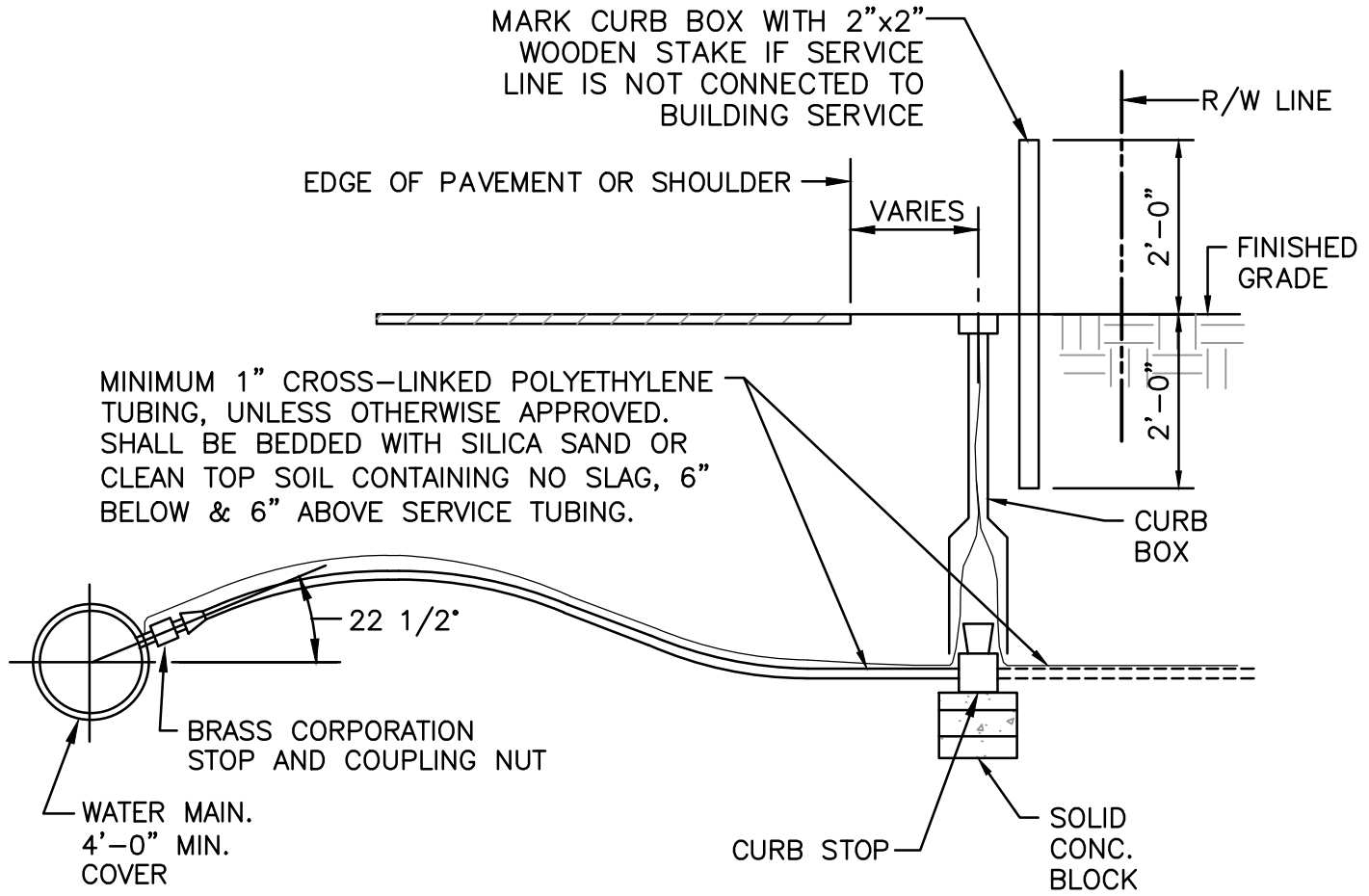
- 1) IF CURB STOP CAN NOT BE INSTALLED AT LOCATION SHOWN, THE AUTHORITY WILL DESIGNATE LOCATION.
- 2) NO CURB STOP SHALL BE LOCATED IN CURB.
- 3) TRACER WIRE 10 GAUGE OR THICKER SHALL BE INSTALLED.

**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 CROSS-LINKED POLYETHYLENE WATER SERVICE LINE  
 INSTALLATION (BEHIND CURB & SIDEWALK)  
 (BY SPECIAL EXCEPTION ONLY)  
 QUARRYVILLE BOROUGH                      LANCASTER COUNTY

**RETTEW**  
 RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rettew@rettew.com  
 Website: www.rettew.com

DETAIL NO. 27  
 DRAWN BY: JNW  
 DATE: MAY 2025  
 SCALE: N/A  
 DWG. NO. 0147102953

C:\\_Rettew\dwg\WIP\0147102953 - Water System DTLs\Sheets\EE\28 - Polyethylene Service Line - No Curb.dwg



MINIMUM 1" CROSS-LINKED POLYETHYLENE TUBING, UNLESS OTHERWISE APPROVED. SHALL BE BEDDED WITH SILICA SAND OR CLEAN TOP SOIL CONTAINING NO SLAG, 6" BELOW & 6" ABOVE SERVICE TUBING.

**NOTES:**

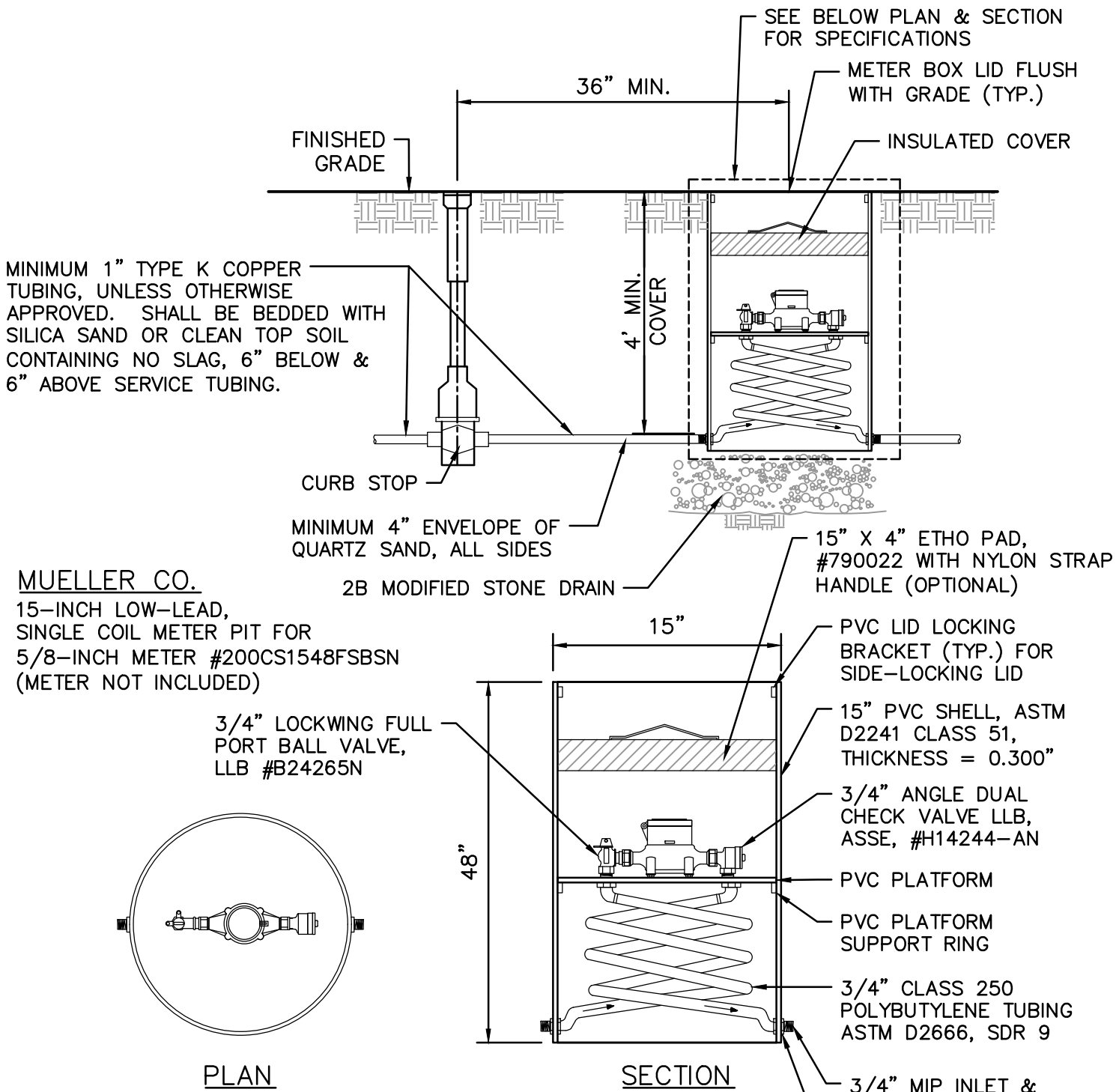
- 1) IF CURB STOP CAN NOT BE INSTALLED AT LOCATION SHOWN, THE AUTHORITY WILL DESIGNATE LOCATION.
- 2) NO CURB STOP SHALL BE LOCATED IN CURB.
- 3) TRACER WIRE 10 GAUGE OR THICKER SHALL BE INSTALLED.

**QUARRYVILLE BOROUGH AUTHORITY**  
 STANDARDIZED WATER SYSTEM  
 CROSS-LINKED POLYETHYLENE WATER SERVICE  
 LINE INSTALLATION (ROADWAY W/O CURBING)  
 (BY SPECIAL EXCEPTION ONLY)  
 QUARRYVILLE BOROUGH                      LANCASTER COUNTY

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 RETTEW Associates, Inc.  
 330 Innovation Blvd., Suite 104, State College, PA 16803  
 Phone (800) 738-8395  
 Email: rette@rette.com  
 Website: www.rette.com

DETAIL NO.	28
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953

Z:\Shared\Projects\01471\0147102953 - Water System General Services\07 CAD\00 - CAD DWGs Temp\29 - Thermal Coil Meter Pit.dwg



**NOTES:**

1. WHEN USING POLYETHYLENE SERVICE TUBING, STAINLESS STEEL INSERTS SHALL BE USED.
2. ALL MATERIALS SHALL CONFORM TO NSF 61/ANSI 61; ANNEX F; ANNEX G; AND NSF/ANSI 372.
3. 3/4" SERVICE LINES SHOWN, NOTE DETAILS ARE APPLICABLE TO 1" SERVICE LINES ADDITIONALLY.

**QUARRYVILLE BOROUGH AUTHORITY**  
STANDARDIZED WATER SYSTEM  
THERMAL COIL METER PIT INSTALLATION  
FOR 3/4" AND 1" SERVICE LINES



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330 Innovation Blvd., Suite 104, State College, PA 16803  
Phone (800) 738-8395  
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Website: www.rettew.com

DETAIL NO.	29
DRAWN BY:	JNW
DATE:	MAY 2025
SCALE:	N/A
DWG. NO.	0147102953