
West Earl Water Authority
West Earl, Lancaster County, PA

Specifications

for

Additions and Extensions

to the

Water System

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ARRO Consulting, Inc.
270 Granite Run Drive
Lancaster, PA 17601

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SECTION 1 - GENERAL INFORMATION

1.1 SCOPE

These specifications cover the requirements for additions and extensions to the West Earl Water Authority's water system. All additions and extensions shall be completed in accordance with the requirements of the West Earl Water Authority and these 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 specifications and including such detail drawings as may be required to prosecute the work. Qualified, careful and experienced workers shall execute the work in the best and most professional manner.

The West Earl Water 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 other legal or administrative reasons which the Authority may identify.

1.2 SUBMITTALS

Prior to the start of construction, the developer shall submit utility plans for the project to the Authority for review.

These plans may be part of subdivision or land development plans prepared to meet regulatory requirements pertaining to land development activities, or the plans may be specially prepared to meet the requirements of the West Earl Water Authority. Four copies of each set of submission documents will be submitted to the Authority. The Authority will cause the proposed additions or extensions, as described in the plans and supporting documentation to be reviewed by its engineer, solicitor, and Authority staff, as required. When the plans describing the proposed work are found to be acceptable for construction, four copies of the final plans shall be submitted to the Authority for its use during observation of construction. As necessary, additional sets of drawings may be required for attachments to legal agreements, which address the provisions, through which the extension or addition to the system may be constructed.

All drawings shall show the location of the water mains, valves, fire hydrants, and other necessary water appurtenances required for the completion of the work. All drawings shall incorporate both a plan view and a profile drawing, which shall contain the proposed location of the water mains, along with the location of existing water lines, and existing and proposed storm and sanitary sewer lines, and other underground utilities within the project site. Where water facilities will be located on private property, water easements shall be shown on the plans. Easements for water mains shall be twenty (20) feet wide, unless specified otherwise by the Authority.

All drawings shall contain details for the proposed water facilities. Details should be sufficient for construction of the facilities, and should include, but not necessarily be limited to, restoration details, utility crossing details, standard installation details for

valves, fire hydrants and other appurtenances, standard casing and concrete encasement details, vault and manhole details, thrust block details, restrained length table, and details of specific connections to the water system.

In the case of submissions which are clearly incomplete or which are significantly non-responsive to the Authority's standards for system additions and extensions, the Authority will reject the proposed submission without extensive review, pending the receipt of plans, which reasonably address the Authority's requirements. It shall not be the Authority's responsibility to design such extensions or additions.

1.3 REIMBURSEMENT OF AUTHORITY EXPENSES

The developer shall be required to pay all engineering, legal and administrative costs incurred by the Authority in the review of plans, easements, financial security and other documents. The developer shall also be required to pay all engineering and associated costs incurred by the Authority in the inspection of project. These costs shall be in addition to and separate from any costs, which may be required by West Earl Township, the Lancaster County Planning Commission, or any other governmental entity. The developer shall establish an escrow account with the Authority in an amount acceptable to the Authority to provide for such reimbursement not later than the date of execution of the extension agreement. Should the escrow account be depleted prior to the completion of construction and acceptance of dedication of the proposed extension, the Authority shall require developer to deposit additional funds into the escrow account. Any unused escrow funds shall be returned to the developer, without interest, upon acceptance of dedication of the proposed extension.

1.4 DEVELOPER'S AGREEMENT

In all cases where a water main will be extended, the Developer shall enter into an agreement with the Authority before commencing any work on the project. A form extension agreement between the Authority and the Developer is included in Appendix 3 for reference. The Authority reserves the right to add to, delete from, or modify this form agreement from time to time, and as required by the specific circumstances of each specific project.

1.5 CONSTRUCTION COMPLETION SECURITY

The Developer shall provide the Authority with financial security to insure completion of the extension or addition to the Authority's water system. This financial security shall be in the amount of one hundred and ten percent (110%) of the estimated cost to complete installation of such facilities, such estimate to be certified as fair and reasonable by the Developer's engineer and approved by the Authority's engineer. Such security shall be in the form of an irrevocable letter of credit in the form provided in Appendix 4, which shall be approved by the Authority's Solicitor, or in such other form reasonable acceptable to the Authority's Solicitor.

1.6 CONSTRUCTION OBSERVATION OF THE WORK

A preconstruction meeting shall be held between the developer and its contractor, and the Authority's Engineer and staff, to discuss specifics of the work. The developer shall submit drawings for all materials to be used in the project to the Authority's Engineer and the West Earl Water Department for review and approval prior to commencement of the work. The Developer, acting through its contractor, shall notify the Authority's Engineer three (3) days in advance of the commencement of construction work, so that appropriate construction observation time may be scheduled. No work may be prosecuted in the absence of construction observation, and any work performed without construction observation shall be re-excavated, exposed and observed by the West Earl Water Authority's representatives as ordered by the Authority. Any defective work or work not conforming to the specifications is to be replaced to the satisfaction of the Authority at no expense to the Authority. The allowable workdays are Monday through Friday of any week excluding holidays.

1.7 RECORD PLANS AND SHOP DRAWINGS

Before acceptance of system extensions and additions, the Developer shall prepare and deliver to the Authority; record plans (one electronic file in Auto Cadd format on CD, one (1) set of reproducible mylars and three (3) sets of prints) delineating the water facilities actually installed. The record plans shall clearly show the location of the water facilities and shall be free of extraneous markings, which may obscure the water facilities. The material, size and location of all facilities shall be shown. The location of all valves and fittings shall be triangulated on the plans. The Authority, in its sole discretion, will determine the adequacy of the record plans. In addition to the record plans, two (2) sets of equipment shop drawings shall be provided to the Authority when requested.

1.8 ACCEPTANCE OF SYSTEM EXTENSIONS AND ADDITIONS

After any water facilities have been added to or extended from the existing system, have been satisfactorily tested and approved by the Authority's representatives, and have been placed in operation, the Authority will notify the Developer of its intention to accept dedication of the facilities. No water facility shall become the responsibility of West Earl Water Authority until a bill of sale shall have been fully executed by the Developer in a form acceptable to the Authority's Solicitor and until all easements have been dedicated to the Authority and until both the bill of sale and all necessary utility easements have been formally accepted by the Authority at a public meeting. For a period of eighteen (18) months after the date of dedication, the Developer shall guarantee the stability of all materials and equipment and the workmanship of all labor, and shall correct and/or replace all defective materials, equipment and work at its own expense and to the satisfaction of the Authority when notified in writing by the Authority to do so. The Developer shall provide the Authority with security for the aforesaid guarantee in the amount of fifteen percent (15%) of the Authority Engineer's opinion of construction cost but not less than \$5,000.00. Said security shall be in the form of a letter of credit from a commercial banking institution acceptable to the Authority and approved by the Authority's Solicitor as to form and manner of execution; or a cash payment to be maintained by the Authority in a non-interest bearing escrow account. Should the

Developer not promptly address any defects in the work, the Authority will invoke its security guarantee to provide funds for the repairs.

SECTION 2 - MATERIALS

2.1 BEDDING AND BACKFILL

- A. Pipe bedding and initial backfill material shall be AASHTO No. 8 Coarse Aggregate.
- B. Aggregate backfill material shall be Penn DOT No. 2A or Penn DOT No. 2RC.
- C. Excavated backfill material shall be excavated material approved by the Authority and containing no stones larger than eight (8) inches in maximum dimensions. A maximum of 20% of the backfill volume may be stones so long as the stones are evenly distributed within the material. Excavated backfill material shall be free of organic material, refuse, and frozen material.

2.2 WATER MAIN

- A. *Minimum Diameter Pipe:* 8-inches, or as required by the Authority.
- B. Water main shall be cement lined ductile iron pipe per 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 104/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 at changes in alignment, valves or other conditions requiring restraints.
- F. Fittings shall be ductile iron compact fittings conforming to ANSI/AWWA C 153/A 21.53. All fittings shall have a minimum pressure rating of 250 psi, and shall have cement lining and joints as required above.
- G. At the option of the Authority, the contractor shall submit to the Authority, in duplicate, a certification from the manufacturer that all fittings comply with all applicable requirements and standards noted above.
- H. *Pipe Thrust Restraint:*
 - 1. Concrete Thrust Blocks, of size and shape indicated in details may only be used by special exception and with approval from the Authority. Concrete for thrust blocks shall have a 28-day compressive strength of 3,000 psi.

2. Restrained Joint Pipe, manufactured of ductile iron per ANSI/AWWA C 151/A 21.51, with restrained push-on joints. Restraint system shall be designed to allow disassembly of joints, if required.
 - a) *Acceptable Manufacturers:*
 - 1) American Pipe, Flex-Ring or Lok-Ring.
 - 2) Or Equal.
3. Restrained Joint Pipe, manufactured of ductile iron per ANSI/AWWA C 151/A 21.51, with rigid restrained mechanical joints. Restraint system shall be designed to allow disassembly of joints, if required.
 - a) *Acceptable Manufacturers:*
 - 1) American Pipe, MJ Coupled Joint.
 - 2) Or Equal.
4. Mechanical joint restraint, utilizing a ductile iron follower gland with twist-off nuts to insure proper restraint against pipe. When twist-off nuts are sheared off, standard hex-heads shall remain. Joint restraint shall have a minimum working pressure of 250 psi, and a minimum safety factor of 2:1.
 - a) *Acceptable Manufacturers:*
 - 1) EBAA Iron, Inc., Megalug.
 - 2) Or Equal.
5. Tie rods providing full joint restraint and extending to the adjacent fitting or joint as approved by the National Board of Fire Underwriters No. 24, "Standard for Outside Protection". All rods, clamps, nuts, and washers utilized for anchorage shall be stainless steel.

2.3 VALVES

A. *Gate Valves (6"-12" in diameter):*

1. Non-rising 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 Manufacturer:*
 - a) Mueller A-2360, no substitutions.
- B. *Valves (Smaller than 3" in Diameter):*
 1. Shall be curb stop (See Section 2.5.D) or quarter turn ball curb valve.
 2. *Acceptable Manufacturer:*
 - a) Mueller B-25209, no substitutions.
- C. *Butterfly Valves:*
 1. General:
 - a) All valves 16" and larger shall be butterfly valves.
 - b) Provide mechanical joint valves.
 - c) Designed for a working water pressure of 200 psi.
 - d) Valves and operators shall conform to AWWA C 504. Valves shall be bubble tight.
 2. Body: Cast iron ASTM A 126, Class B.
 3. Disc: Cast iron ASTM A 48, Class 40. Disc edge of stainless steel, Type 316 for mating with rubber seat. Flow through design.
 4. Seat: Buna N or natural rubber, mechanically retained in the valve body. No mechanical fasteners or retaining rings acceptable.
 5. Shaft: Stainless steel ASTM A 564, Type 630, Condition H-1100.
 6. Bearings: Self-lubricating.
 7. Shaft Seals: Split V-type self-adjusting packing.
 8. Operators: Designed and sized in accordance with AWWA C 504. Method for calculating torques as outlined in AWWA C 504 Appendix A. Valves shall open counterclockwise.
 9. *Acceptable Manufacturers:*
 - a) Henry Pratt Company; Triton Ground Hog.
 - b) Or Equal.
- D. *Air Release Valves:*
 1. The air release valve 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 accumulated 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.
 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) APCO.
 - b) ValMatic.
 - c) GA Industries.
 - d) Or Equal.

E. *Air/Vacuum Valves:*

1. Air/vacuum valves shall be capable of automatically exhausting large quantities of air during the filling of the water main and allowing air to re-enter during the draining or when a negative pressure occurs.
2. The body and trim shall be cast iron construction conforming to ASTM A126, Class B. The float shall be stainless steel construction conforming to ASTM A240 and A276. The seat shall be of Buna-N construction.
3. *Acceptable Manufacturers:*
 - a) APCO.
 - b) ValMatic.
 - c) GA Industries.
 - d) Or Equal.

F. *Combination Air Valves:*

1. Combination air valves shall be capable of exhausting large quantities of air during filling of the water main, releasing small amounts of accumulated air while under pressure, and allowing air to re-enter during the draining or when a negative pressure occurs.
2. The body and trim shall be cast iron construction conforming to ASTM A126, Class B. The float shall be stainless steel construction conforming to ASTM A240 and A276. The seats shall be of Buna-N construction.
3. *Acceptable Manufacturers:*
 - a) APCO.
 - b) ValMatic.
 - c) GA Industries.
 - d) Or Equal.

G. *Pressure Reducing Valve:*

1. *General:*
 - a) Designed for at least a 200 psi maximum inlet pressure with a maximum allowable outlet pressure 10% above spring setting or 5 psig, whichever is greater.
 - b) Provide bronze trimmed valve with a nitrile or 3/16 inch cloth insert neoprene rubber diaphragm.
 - c) Body: Bronze.
 - d) Spring Chamber: Cast iron.

2. *Acceptable Manufacturers:*
 - a) Hersey Products, Inc.
 - b) Watts Regulator, Inc.
 - c) Or Equal.

H. *Tapping Sleeve and Valve:*

1. *Design Working Pressure:* 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 they 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 Manufacturer:*
 - a) Mueller Company

I. *Valve Boxes:*

1. For valves 2-inches and larger, provide Buffalo style (3 piece) adjustable roadway type constructed of cast iron, with a shaft provided with screw type extension pieces, and round detachable base.
2. Valve boxes shall have a 5 1/4-inch shaft.
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.
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.
5. *Acceptable Manufacturer:*
 - a) Bingham & Taylor.
 - b) Or equal.

J. *Precast Reinforced Concrete Manholes:*

1. *Materials and Construction:* Conforming to requirements specified in ASTM C 478 except as follows:
 - a) *Concrete:* Composition and compressive strength conforming to ASTM C 478 except use Type II or Type III cement in manhole components and increase compressive strength to 4500 psi (at 28 days) in precast bases.
 - b) *Casting and Curing:* Wet cast and steam curing process in accordance with Section 3.6.11 and 3.7.2 of AWWA C 302.

- c) **Manhole Steps:** Factory installed in manhole components, prealigned vertically, spaced on equal centers, and located the minimum distance from ends of risers and top sections as required by OSHA. Steps shall be of reinforced plastic. Reinforced plastic steps shall be composed of 3/8-inch Grade 60, ASTM A 615 deformed steel reinforcing bar completely encapsulating in Grade 49108, ASTM D2146 polypropylene copolymer compound, Type II; M. A. Industries, Inc., Type PS4, or equal.
- d) **Manhole Component Seals:** Manhole component joints factory formed for self-centering concrete to concrete bearing employing either a rubber compression gasket or preformed plastic sealing compound.
 - 1) **Rubber Compression Gasket:** Composition conforming to ASTM C 361 or ASTM C 443.
 - 2) **Preformed Plastic Sealing Compound:** Fed. Spec. SS-S-210A, Type 1, Rope Form, of either bitumastic base compound or butyl rubber base compound, and shipped protected in a removable two-piece wrapper. Size cross-section of rope form to provide squeeze-out of material around entire interior and exterior circumference when joint is completed.
- e) **Precast Top Sections:** Designs as required by Drawings, of materials and construction as specified previously except additional and differing requirements as follows:
 - 1) **Hold Down Bolt Inserts:** Factory cast in top section no less than two 3/4-inch threaded inserts or slotted inserts to accommodate manhole frame hold down bolts. Threaded inserts of 3-inches depth. Both insert types designed for an ultimate load in tension of 12,500 pounds. Inserts factory plugged for shipping. Coordinate insert location with manhole component manufacturer to assure proper location in top sections. Hold down bolts to be used only outside of paved areas.
- f) **Manhole Frame and Cover:**
 - 1) **Gray iron castings** conforming to ASTM A 48, Class No. 30, designed for AASHTO Highway Loading Class HS-25.
 - 2) **Finish:** Bearing surfaces machined to prevent rocking and rattling under traffic. Casting surfaces shot blast cleaned and coated with asphalt paint, non-tacky drying.
 - 3) **Identification:** Cast the word WATER integrally on cover in 2-inch size raised letters.
 - 4) **Frame Hold-down Bolts:** ASTM A 307.
 - 5) **Cover Gasket:** One-piece O-ring gasket factory installed in a machined rectangular or dovetail groove in the cover bearing surface.

- Gasket material of neoprene composition having good abrasion resistance low compression set, Type D 40 durometer hardness determined in accordance with ASTM D2240.
 - Gluing of gasket is not permitted.
- 6) Tensile Test Bar: Size B, cast separately, but poured from same iron as castings they represent.
- g) Cast-In-Place Concrete Materials: All cast-in-place concrete materials shall be approved by the Authority Engineer.

2.4 FIRE HYDRANTS

- A. Shall be cast iron body, fully bronze mounted, suitable for a working pressure of 200 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 psi with valve in both open and closed positions.
- B. All public fire hydrants served by the water distribution facilities of the Authority 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 (NH):

<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

- C. The 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 a "0" ring type seal plate. The seal plate shall be fitted with at least two "0" rings. The lower "0" ring shall serve as the pressure seal and the upper "0" ring as a combined dirt and moisture seal.
- D. The main valve shall be 5-1/4-inch diameter and 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.
- E. Hydrants shall be equipped with a one-piece spring steel marker or approved equal. Marker shall be mounted to hydrant using the hydrant flange bolt. The marker shall measure 51" minimum with red and white reflective bands on the staff. Local supplier: Exeter Supply Inc., (717) 898-2467.

- F. *Acceptable Manufacturer:*
 - 1. American-Darling, B-62-B.
 - 2. Mueller, A-423

2.5 SERVICE CONNECTIONS

- A. *Bedding and Initial Backfill:*
 - 1. Type A Silica Sand containing no slag or screened topsoil by special exception only.
- B. *Service Tubing:* 3/4-inch diameter (minimum) Type "K" copper, ASTM B88.
- C. *Corporation Stop:* Brass, including coupling nut for compression service pipe connection.
 - 1. *Acceptable Manufacturer:*
 - a) Mueller Co. B-25208, no substitutions.
- D. *Curb Stop:* Brass compression connections.
 - 1. *Acceptable Manufacturer:*
 - a) Mueller Co. B-25209, no substitutions.
- E. *Curb Box:* Cast iron/steel extension type with arched pattern base. Bottom section shall be cast iron and belled and arched to fit curb stops. Top section shall be 1-inch steel pipe shaft and shall be forged at the top end to receive a short cut-off wrench. A 5/8-inch stainless steel rod shall be provided with valve key and connecting pin, and a centering ring to center the rod in the top section. Cast iron lid shall have water works head pentagon brass plug. Box shall have 12-inch range of extension.
 - 1. *Acceptable Manufacturer:*
 - a) Eclipse, no substitutions.
- F. *Fittings for Copper Tubing:* Fittings for use with copper tubing installed underground shall be of the compression connection type, rated for 300 psi.
 - 1. *Acceptable Manufacturer:*
 - a) Mueller H-15403, no substitutions.
- G. *Trench backfill:* Excavated material approved by the Authority and containing no stones larger than eight (8) inches in maximum dimensions. A maximum of 20% of the backfill volume may be stones so long as the stones are evenly distributed within the material. Backfill material shall be free of organic material, refuse and frozen material.

2.6 CASING PIPE MATERIALS

- A. *Steel Casing Pipe:* ASTM A 53.
 - 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 (6) 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, whichever is greater.
 6. Smooth wall steel pipes with a nominal diameter of over 54 inches will not be permitted.
- B. *Casing Cradle Spacers:* Constructed of two piece solid shell of T-304 stainless steel, 14 gauge thickness; ribbed PVC sheet, 0.090-inch 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.
1. *Acceptable Manufacturer:*
 - a) Cascade Waterworks Mfg. Co.; (Model CCS).
- C. End Seals: Rubber with T-304 stainless steel bands.

2.7 MAJOR FACILITIES

In cases where major facilities such as water supplies, water treatment facilities or booster pumping stations are proposed, the Developer shall meet with the Authority prior to commencing design of these facilities to determine the specific criteria and standards to be used in the design. As with all other facilities, the Developer must receive approval of the design before commencing construction of the facilities.

SECTION 3 - INSTALLATION

3.1 TRENCH PREPARATION AND EXCAVATION

- A. Perform sheeting and shoring as required.
- B. Submit a Soil and Erosion Plan to the County Conservation District 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 tunneling or boring is required.

2. Trenches may be excavated and backfilled either by machinery or by hand as the Contractor may elect, provided, however, the Contractor 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. *Stripping, Storing and Restoring Surface Items:* The Contractor 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. He shall properly store and preserve such materials that may be required for future use in restoring the surface. The Contractor 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.
- The Contractor 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.
- E. *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.
- F. *Length of Trench:*
1. No trench shall be opened more than 100 feet in advance of the pipelines laid.
 2. The Contractor 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 Contractor 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 contractor can complete within that working day.
- G. *Pumping and Draining:* The Contractor 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.
- H. *Accommodations of Drainage:* The Contractor 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 Contractor to plank or bridge over the gutters so that the flow of water is not impeded.

- I. *Permitting and Maintenance of Traffic:* The developer shall secure the necessary State highway and municipal permits for work within state highway and municipal streets. The developer's contractor shall comply with all PA Department of Transportation (PADOT) and municipal laws, rules and regulations, and ordinances, including but not limited to furnishing bonds and insurance required and the cost of inspection of the work. The developer shall pay all highway inspection fees charged by PADOT.

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 Contractor, 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.

Maintenance and protection of traffic on Township streets and State Highways shall be in strict accordance with PA DOT Form 408, Section 900; and Title 67, Chapter 203. The Contractor shall modify the sign locations daily during construction in order to protect that section of highway to be disturbed during that same day.

- J. *Blasting and Explosives:* The use of explosives shall be governed by the "Regulations for the Storage, Handling and the Use of Explosives" of the Pennsylvania Department of Labor and Industry.
- K. *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 Contractor to deny responsibility for their protection and/or repair during construction.
1. The Contractor shall notify all utility companies in advance of construction to request that underground facilities be located in accordance with Pennsylvania Act 287/172, and shall 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 Contractor 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 Contractor, 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 Contractor.
3. The Contractor 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.

L. *Stream Crossings:*

1. Construct stream crossings 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 coffer damming, dewatering, and removal of excess excavated material.
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.

3.2 PIPE BEDDING AND TRENCH BACKFILL

- A. *Trench Excavation:* 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. Bedding shall provide uniform and continuous bearing and support for the pipe at every point between bell ends.
- B. *Pipe Bedding Beneath and to Centerline of Pipe:* All trenches shall be backfilled, from the bottom of the trench to the centerline of the pipe with bedding material placed in layers of 4 inches or less, (uncompacted thickness) and compacted by tamping or other approved mechanical methods. Material shall be simultaneously deposited in the trench for its full width on each side of the pipe and fittings.
- C. *Initial Backfill Over Pipe:* From the centerline 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. The Contractor 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 4-inch layers or less, (uncompacted thickness) and compacted by tamping or other approved mechanical methods.

- D. *Aggregate Backfill to Restoration Depth (State and Township Roads, and 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 AASHTO No. 2A material subject to limitations specified and consolidated by tamping in four (4) inch layers or by 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.
- E. *Backfill Material to Restoration Depth (Lawns, Meadows and Cultivated Fields):* 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 excavated material subject to limitations specified and consolidated by tamping in eight (8) inch layers or by 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.
- F. *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) 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 90 percent of maximum density obtained at optimum moisture content as determined by AASHTO T 99. The contractor shall perform field determinations of density, when requested, in accordance with AASHTO T 191.
 - b) 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 that department. The contractor shall have no claim to the Authority even though such requirements may entail more labor or services than the methods herein described.
- G. *Special Bedding:*
1. *Concrete Cradle and Concrete Encasement:* If concrete cradle and/or encasement are required, the trench shall be excavated to a depth of six (6) inches below the outside of the barrel of pipes.

2. *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 Contractor shall excavate and remove such unsuitable material to a width and depth approved by the Authority. The contractor shall have no claim to the Authority for this additional excavation.
3. *Excavation in Fill:* When the pipe is laid in fill, the compacted embankment shall be brought to a height of at least 9 inches above the proposed top of the pipe before the trench is excavated.

3.3 PIPE

- 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 the backfill materials as specified in Section 3.2.
 2. A construction sequencing plan, including proposed methods of connection to existing, active waterlines, of filling new waterlines for testing, and of testing new waterlines, shall be submitted to the Authority before beginning any waterline construction work.
 3. All water mains shall extend to the far property line of the last property proposed to be served during a given system extension or addition.
- 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 release manhole, or point of discharge. The Contractor shall provide sufficient construction control to assure that there are no sags or loss in grade in the pipeline, which could tend to accumulate air. Failure to comply with this requirement shall necessitate that the Contractor take remedial steps to correct this situation.
- 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. *Anchorage:* All plugs, caps, tee, and bends (both horizontal and vertical) shall be restrained to prevent movement. The Contractor shall submit a drawing and obtain the Authority's approval for the anchorage of the pipe 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 restraint 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 10 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 10-foot separation, deviations may be allowed, subject to the approval of the Authority, and provided that, in all cases, water and sewer mains are installed in separate trenches.
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 10 feet horizontally of any sewer or drain it crosses. The 10 feet is to be measured as a perpendicular distance from the drain or sewer line to the waterline.
 - 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, 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 Contractor 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 Resources 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 shall be provided and used by the Contractor 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 backfill material tamped under it except at the joints. Pipe and fittings, which 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.
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.
- 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.
- 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. *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.
- M. *Unsuitable Conditions for Laying Pipe:* No pipe shall be laid in water or when, in the opinion of the Authority, trench conditions are unsuitable.
- N. *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.
- b) If effective sealing is not attained at the maximum torque recommended by the manufacturer, 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. *Restrained Joints:* The joint shall be assembled in accordance with the manufacturer's recommendations.
- O. *Placing Concrete Thrust Blocks:* By special exception only. Blocking shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be as shown on the Standard Details. The thrust blocking shall be formed, unless otherwise directed, so that the pipe and fitting joints will be accessible for repair, and so that the entire bolt circle will be kept free of concrete.
- P. *Testing of Installed Pipe:*
1. *Hydrostatic Tests:*
 - a) *Pressure Test:* After the pipe has been laid and backfilled 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. Operation of valves, blowoffs or other water system appurtenances is restricted to authorized Authority personnel. The contractor is required to coordinate his work with the Authority in advance of performing or needing to perform such work. This includes but is not limited to operation of valving required to extend, test, or connect to the existing system.
 - 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 Contractor and is subject to approval by the Authority. The Contractor will make all taps into the pipe, and furnish all necessary assistance for conducting the tests. The Contractor 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 Contractor shall make the necessary taps at such points before the test is made. After the test has been completed the Contractor 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 Contractor with sound material, and the test shall be repeated until satisfactory to the Authority.
- 5) *Test Pressure Variations:* Test pressures shall not vary by more than 5 psi for the duration of the test.
- 6) *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 Contractor will furnish laboratory calibrated test gauge and measuring device, as described above, 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 5 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 existing 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 15-minute intervals during the test period.
- 2) Should any test of pipe laid disclose leakage greater than that specified above, the Contractor 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 shall monitor the pressure and leakage tests. The Contractor shall notify the Authority of the test day at least two 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) Where multiple sections are tested the allowable loss shall be limited to the loss for the smallest main line valve section or 1000 feet whichever is less unless otherwise approved by the Authority.
- 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.
- f) *Services:* When services are connected to the main prior to testing, testing shall be conducted against the curb stops.
- g) *Acceptance:* Observation of successful testing of water mains by the Authority does not constitute acceptance of the system or any portion thereof. Only upon final inspection by Authority and upon written acceptance for same will the system or portion thereof be considered substantially completed. Upon such acceptance, the warranty period as specified for the water main will commence. If, during this final inspection, any irregularities are observed, the condition must be corrected at the Contractor's expense prior to acceptance.
- h) If the test is applied against an existing valve and the Contractor has determined that said valve is passing, Contractor 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 should remain at system pressure if valve is passing.

Q. *Disinfection of Installed Pipe:*

- 1. *General:* After completion of satisfactory 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 and disposal
 - d) Bacteriologic tests
- 2. *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.

3. *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 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. Flushing shall be monitored by the Authority. Dispose of flushing water in accordance with all applicable federal, state and local regulatory agencies.
4. *Chlorine Application:*
 - a) *Tablet Method:* The tablet method consists of placing calcium hypochlorite granules and tablets in the water main as it is being installed and then filling the main with potable water when installation is completed. This method may be used only if the pipes and appurtenances are kept clean and dry during construction, and only with the approval of the Authority. It shall not be used if trench water or foreign material has entered the main, or if the water temperature is below 41°F.
 - 1) 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 C651 for quantity of granules to be used.
 - 2) During construction, place sufficient number of 5g calcium hypochlorite tablets in each section of pipe, in hydrants, hydrant branches, and other appurtenances. Refer to AWWA C651 for the proper number of 5g calcium hypochlorite tablets required. Attach tablets to the crown of pipe sections with adhesive (Permatex No. 1, or equal). Apply adhesive only to the broad side of the tablet next to the pipe surface.
 - 3) When pipeline installation is completed, fill the main with water at a maximum velocity of one foot per second. Remove all air pockets. This water shall remain in the pipe for at least 24-hours. If the water temperature is less than 41°F, the water shall remain in the pipe for at least 48 hours. Position valves so that the chlorine solution does not flow back into the line supplying the water.
 - b) *Continuous Feed Method:* The continuous feed method consists of placing calcium hypochlorite granules in the main with potable water during construction, completely filling the main to remove air pockets, flushing to remove particulates, and filling 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 10 mg/L.

- 1) At the option of the Owner, place calcium hypochlorite granules in pipe sections during construction as detailed in Section 3.3.Q.4.a.1.
 - 2) Conduct preliminary flushing to remove particulates using a flushing velocity of not less than 2.5 feet per second.
 - 3) At a point not more than 10 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. To assure that this concentration is provided, measure the chlorine concentration at regular intervals in accordance with AWWA Manual M-12. Chlorine application shall not cease until the entire line is filled with heavily chlorinated 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 10 mg/L free chlorine.
 - e) Repeat the disinfection process until the minimum available chlorine is present at the end of the treatment sequence. The tablet method cannot be used in these subsequent disinfections.
5. *Final Flushing and Disposal:* 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 preliminary flushing.
- It shall be the Contractor's sole responsibility to dispose of the chlorinated water in a manner acceptable to the Pennsylvania Department of Environmental Resources. If it is determined that the chlorinated discharge will cause damage to the environment or to sanitary treatment facilities then a neutralizing agent acceptable to the Authority shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water.
6. *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 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. When sampling is complete, remove gooseneck and cap corporation stop with copper slug.
- e) Provide bacteriological test reports to the Authority. Failure to meet State health standard requirements will be cause for Contractor to rechlorinate and retest the system.
 - 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 Contractor to rechlorinate the system.

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 that is buried. 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. The Authority reserves the right to require that a valve pit be constructed in lieu of a valve box in certain circumstances.

S. *Fire Hydrant Installation:*

1. *Location:* Hydrants shall be located at a maximum separation distance of 500 feet between hydrants, or 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 2-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 aggregate as shown on the standard details, 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 2-feet in diameter and 3-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 6-inches above the waste opening, assuring that the hydrant drain hole is clear.

3.4 SERVICE LINE

- A. Connections to existing mains shall be done by the Authority or under the inspection of the Authority. Coordination of the work with the Authority shall be done at least 2 weeks prior to the start of the work to be done.
- B. Screw corporation stops directly into a tapped and threaded ductile iron main as required. Locate corporation stops at least 12-inches apart longitudinally.
- C. 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.
- D. All water service lines or portions thereof installed by open cut shall utilize silica sand or screened topsoil for the bedding and initial backfill. Topsoil or excavated material that has been manually sifted, containing no rocks or organic material may be used only if applied by hand and when approved by the Authority on an individual basis.
- E. 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.
- E. Compression connections shall be utilized at water service joints. The minimum spacing between compression joints shall be as follows:
 - 1. ¾-inch – 100-feet
 - 2. 1-inch – 100-feet
 - 3. 1 ½-inch – 60-feet
 - 4. 2-inch – 60-feet
- G. 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 lines.
- H. The Contractor shall install all services to the edge of the rights-of-way at predetermined locations or as directed by the Authority. Where service lines exist adjacent to and outside of the right-of-way, Contractor shall connect the new service line to the existing, unless otherwise instructed by the Authority.
- I. Service lines shall not be less than four (4) feet below the surface and shall not be re-covered until the Authority has inspected the service, the tap on the main has been made, and the service line has been tested.
- J. All plumbing shall be able to withstand the pressure of at least one hundred fifty (150) pounds per square inch, unless otherwise required by the Authority.
- K. The maximum length of a service line shall be:
 - 1. ¾-inch and 1" Copper – 300 feet. Any service line greater than 300 feet must install an approved meter pit at a location approved by the Authority.
 - 2. The length of all service lines larger than 1" must be reviewed and approved by a representative of the Authority.

- L. No service pipes shall be laid in the same trench with gas pipe, sewer pipe, or any other facility of a public service company, nor within ten (10) feet of any open excavation, fault, conduit, or vault.
- M. When pressures exceed 80 psi, the applicant shall, at his own expense, install and maintain on the system side of the meters pressure regulating valves meeting Authority specifications.
- N. Mobile homes and doublewide homes without basements must install the meter in an approved meter pit.
- O. When two (2) water service laterals are proposed for the same structure a four (4) foot separation of those laterals must be maintained.
- P. When the service lateral passes through a concrete wall or floor through the concrete, the lateral must be sleeved with an approved PVC sleeve and filled w/silicone caulking.

3.5 REPLACEMENT OF SERVICES CONNECTED TO AN EXISTING MAIN

- A. Where services are required to be removed or broken into for the making of new connections, the work should be done in such a manner as to prevent damage to the remaining work and in an expedient manner to minimize the time that the property owner will be disconnected from the service. Wherever existing work is damaged in making such connections or removals the Contractor will be responsible for the replacement of the damaged section. 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 removed or broken into for the making of new connections and the existing service being severed is still attached to an active main, the Contractor shall be responsible for locating said connections to existing main and make all necessary repairs to disconnect the service from existing water main. The Contractor shall submit to the Authority a description and list of material he proposes to use in such a repair. Approval shall be obtained before using the preceding method of repair from the Authority.
- C. Unless otherwise directed, materials resulting from removal operations of service connections shall become the property of the Contractor and shall promptly be removed from the project at his expense.
- D. Connections to existing mains shall be done by the Authority or under the inspection of the Authority. Coordination of the work with the Authority shall be done at least 2 weeks prior to the start of the work.
- E. *Temporary Services:* In the event it is necessary to interfere with any services, temporary lines shall be installed by the Contractor at his expense. Prior to commencing any work requiring temporary service, the Contractor shall acquire approval from the Authority for the proposed methods to be used to provide the temporary service. When residences or businesses are without water service

overnight or for longer periods due to the neglect of the Contractor, the Authority may remedy the situation at the Contractor's expense without written notice.

3.6 CASING SPACERS AND END SEALS INSTALLATION

- A. Secure spacers to the carrier pipe such that movement along carrier pipe barrel will not occur when carrier pipe is inserted into casing pipe.
- B. Size spacers such that bell of the carrier pipe does not rest on casing and adequate clearance exists at top of cradle for ease of inserting the carrier pipe into the casing.
- C. Placement and spacing of spacers shall be in accordance with manufacturer's recommendations or as indicated on the Drawings.
- D. Install end seals in accordance with manufacturer's instructions.
- E. All waterlines passing through casing pipes shall have restrained joints.

3.7 CONCRETE CRADLE AND ENCASEMENT INSTALLATION

- A. *Preparation:* Prior to the formation of the cradle or 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 (7) days or until backfilling is begun.
 - 7. In no case shall backfilling begin within 36 hours of the time of placing.

3.8 RESTORATION

- A. *Replacement of Structures by Contractor:* The contractor shall restore (unless otherwise stipulated) all sidewalks, curbings, 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.
- B. Pavement restoration of State and Township roads shall be in accordance with the Authority's Standard Details unless otherwise directed by the State or municipality.

3.9 CLEAN-UP AND MAINTENANCE DURING INSTALLATION

- A. During construction, surfaces of all areas including, but not limited to, roads, 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 backfilling, and recleaned as dust, mud, stones and debris caused by the work, or related to the work again accumulates.
 - 2. Failure of the Contractor to perform this work shall be cause for the Authority to order the work to be done by others, and backcharge all costs to the Contractor.
- B. *Repair or Correction of Unsatisfactory Conditions:* All unsatisfactory conditions resulting from the work shall be corrected.
- C. *Temporary Pavement:* Temporary pavement shall be continuously maintained until it is replaced with permanent pavement.
- D. *Emergency Phone Numbers:* Before commencing any work on the project, the Contractor shall provide the Authority with a list of phone numbers at which responsible Contractor's personnel can be reached 24 hours per day to respond to emergencies.
- E. Any subnormal or dangerous condition caused by the work, on any surface, shall be repaired or corrected within two hours of observance or notification of its existence. If repairs or corrections are not made within this period, the Authority shall cause to have the work completed with the resulting cost charged to the Contractor.

APPENDICES

APPENDIX 1

WATER MAIN LEAKAGE TEST FORMS

WATER MAIN LEAKAGE TEST REPORT

Time	Pressure (psi)	Depth (ft)	Volume of Water Added		Comments
			(ft ³)	(gal)	
					Starting Conditions
		-----	-----	-----	½ Hour Reading
					Re-pressure No. 1
		-----	-----	-----	1-½ Hour Reading
					Re-pressure No. 2
		-----	-----	-----	1-½ Hour Reading
					Re-pressure No. 3
		-----	-----	-----	2 Hour Reading
					Re-pressure No. 4
					2-½ Hour Reading
					Re-pressure No. 5

Total Water Added Over 2 Hour Period: _____

Total 2 Hour Leakage: _____

Allowed 2 Hour Leakage: _____

Line Passes or Fails Test (circle one): **PASS / FAIL**

Date: _____
 Development: _____
 Drawing No. _____
 Contractor: _____
 Computed By: _____
 Checked By: _____
 Sheet No. _____ of _____
 Test Pressure (P): _____ psi
 Pipe Length (S): _____ ft
 Pipe Diameter (D): _____ in
 Test Start/Finish Time: _____ / _____
 Location: _____

CALCULATIONS

$L = \text{allowed leakage in gallons per hr} = (SD(P)^{1/2}) / 133,200$

$S = \text{Length of pipe(ft)}; D = \text{Diameter of Pipe(in)};$

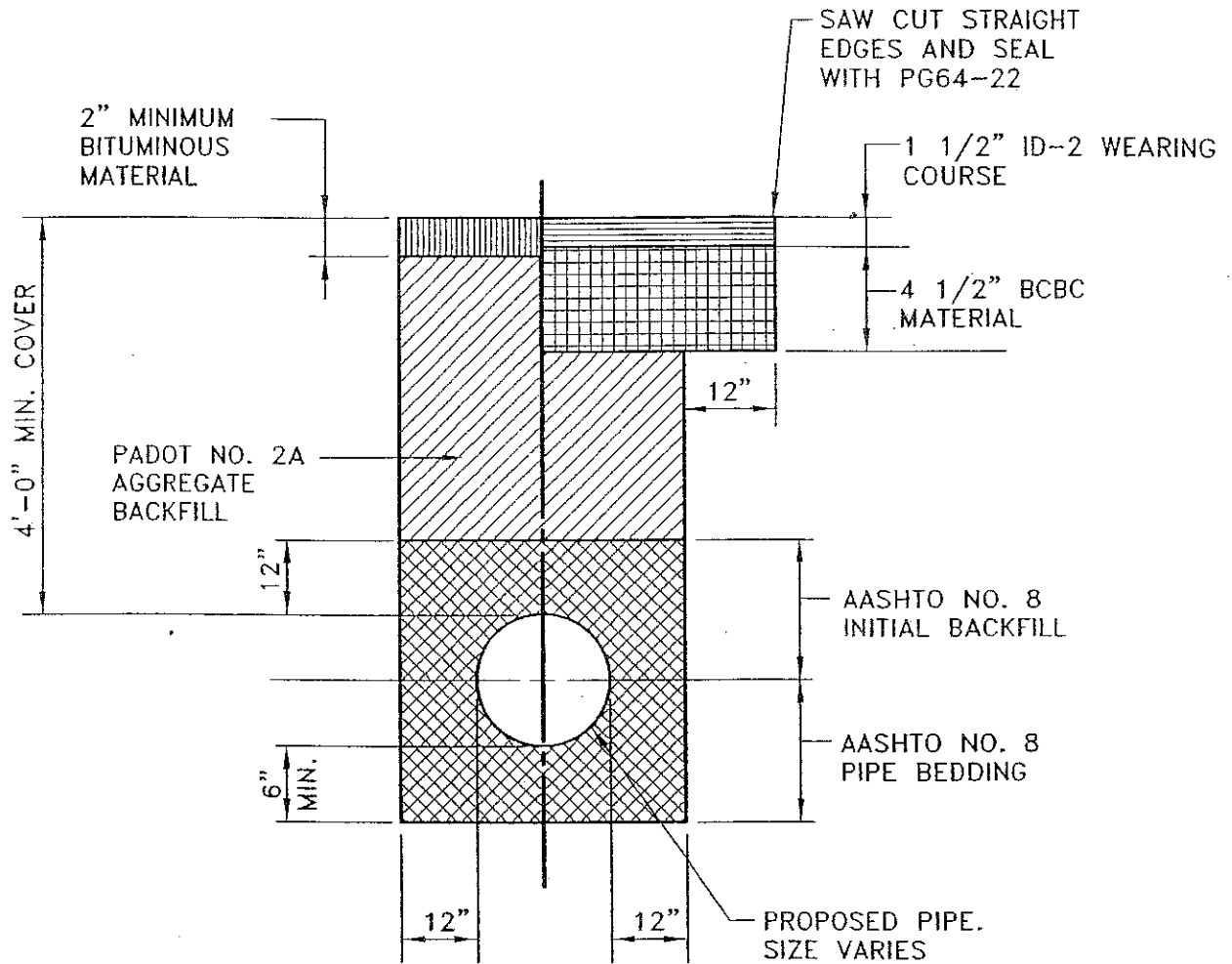
$P = \text{Test Pressure(psi)}$

APPENDIX 2

STANDARD DETAILS

TEMPORARY

PERMANENT



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**PAVEMENT RESTORATION DETAIL
FOR WEST EARL TOWNSHIP ROADS**

DATE: FEBRUARY 2001

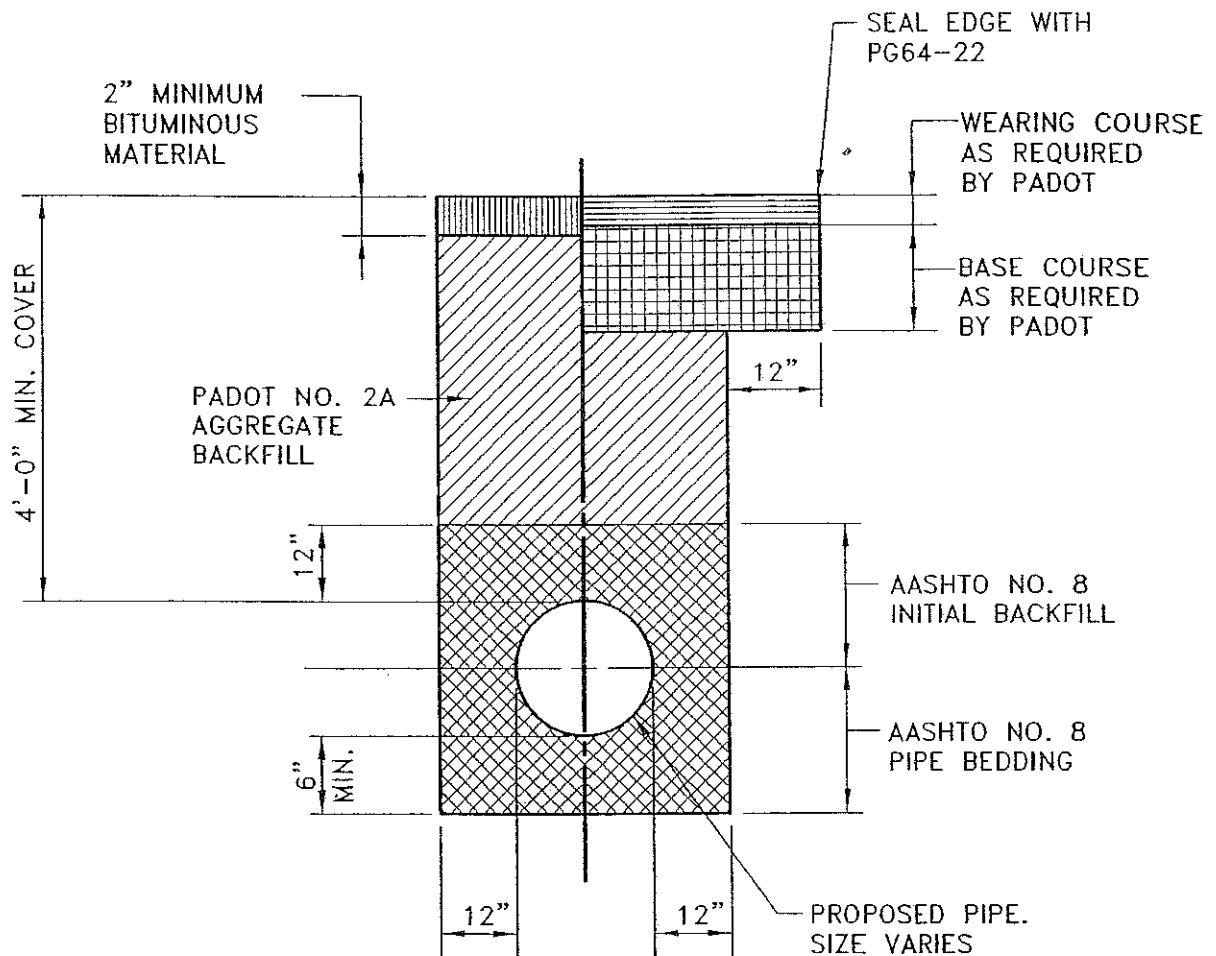
DETAIL:

1

Dwg. Name: 2837910.DWG Last Revised: 04/06/01 07:18

TEMPORARY

PERMANENT



ALL WORK TO BE IN ACCORDANCE WITH PADOT PUBLICATION 408.

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

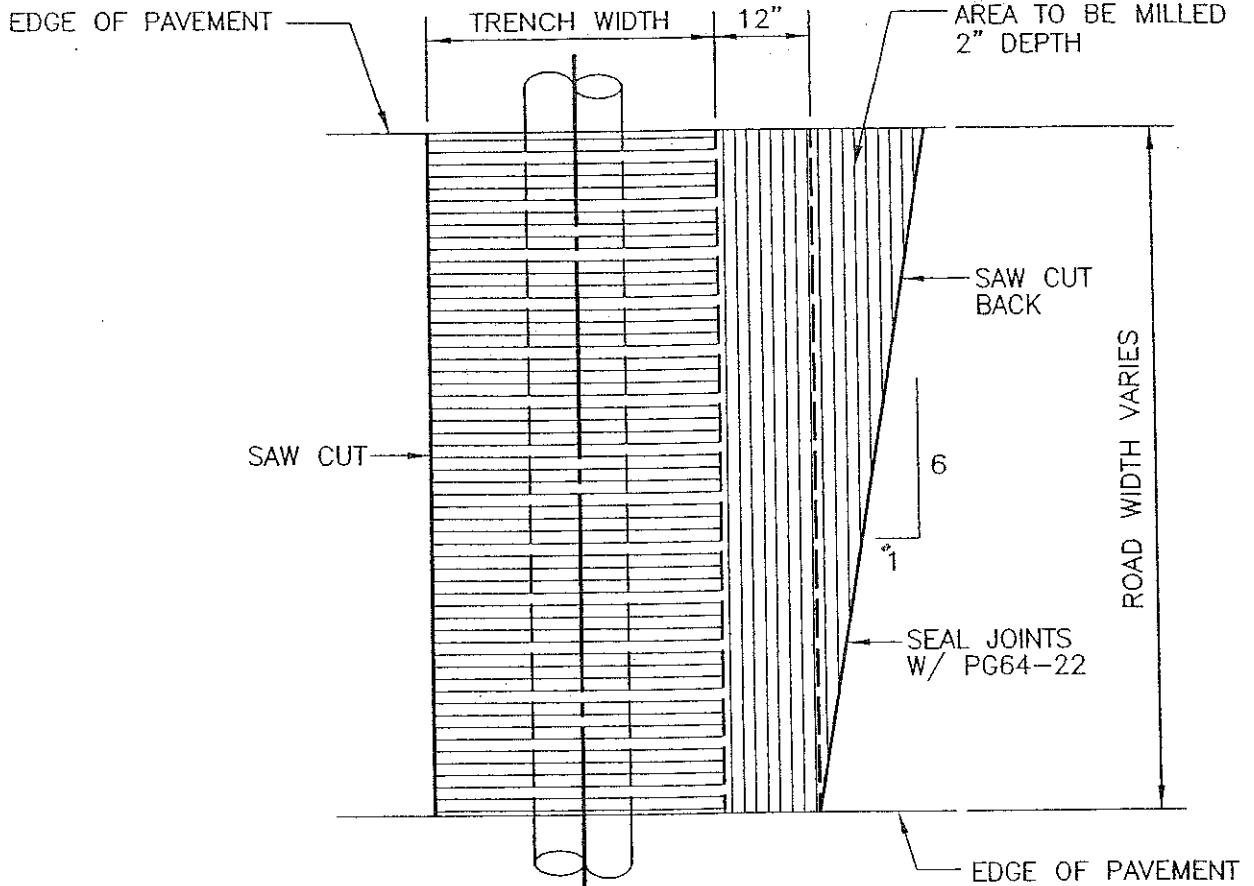
270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**PAVEMENT RESTORATION DETAIL
FOR STATEROADS**

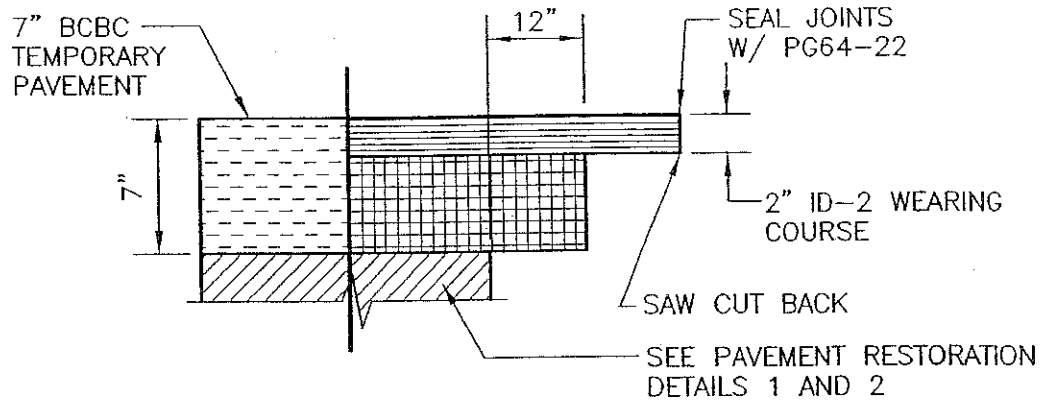
DATE:
FEBRUARY 2001

DETAIL:

2



PLAN



TEMPORARY

PERMANENT

SECTION

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

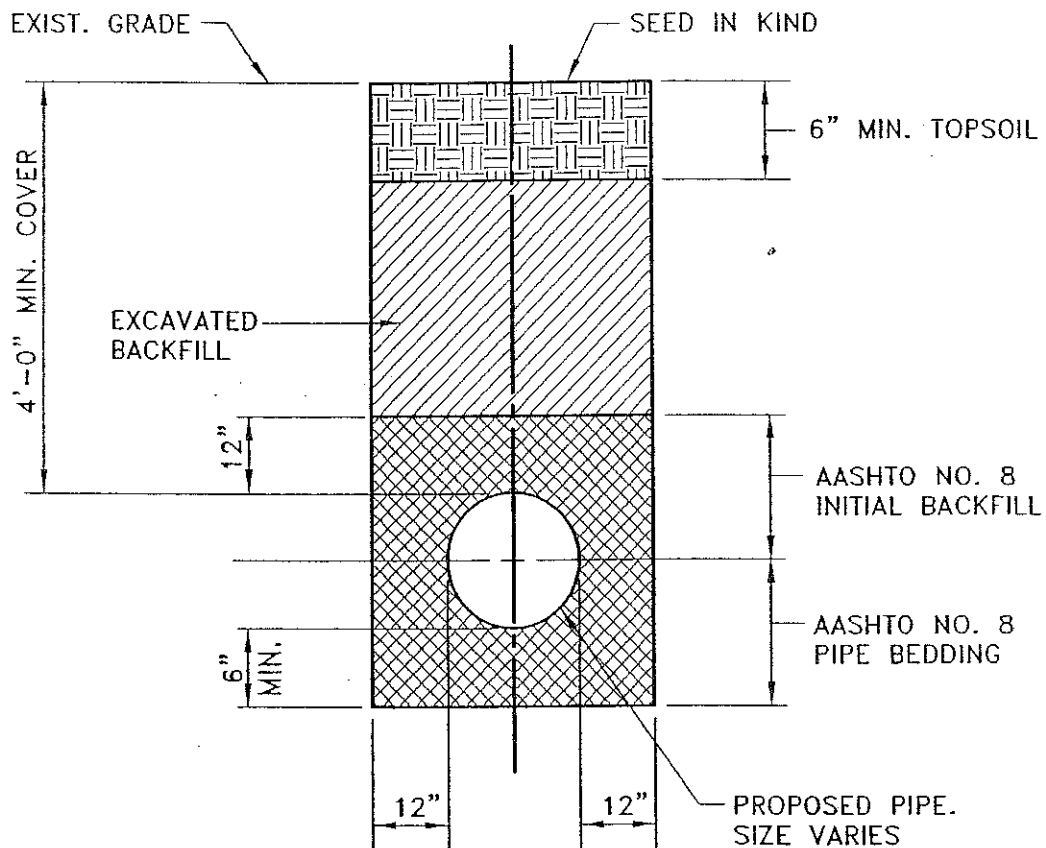
270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**PAVEMENT RESTORATION DETAIL
AT ROAD CROSSINGS**

DATE:
FEBRUARY 2001

DETAIL:
2A

Dwg. Name: 02837912.DWG Last Revised: 10/31/03 08:10



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRG
ARRG Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

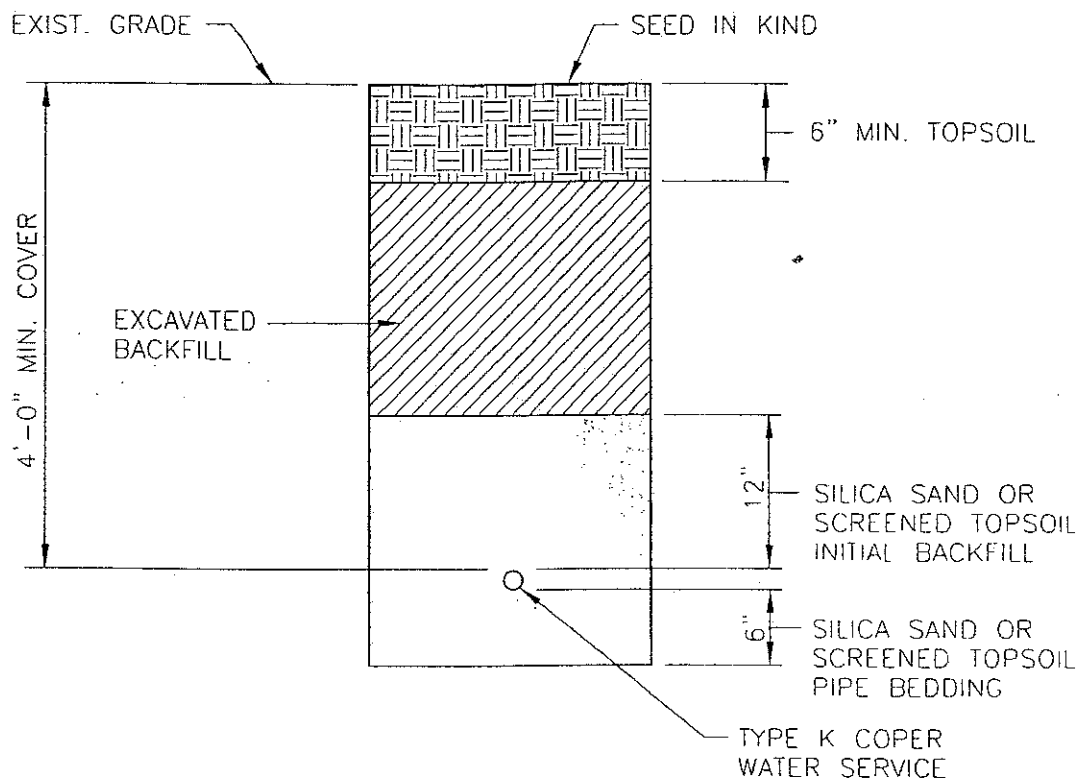
**LAWN RESTORATION
DETAIL**

DATE: OCTOBER 2003

DETAIL:

3

Dwg. Name: 02837818.DWG Last Revised: 10/08/09 09:30



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

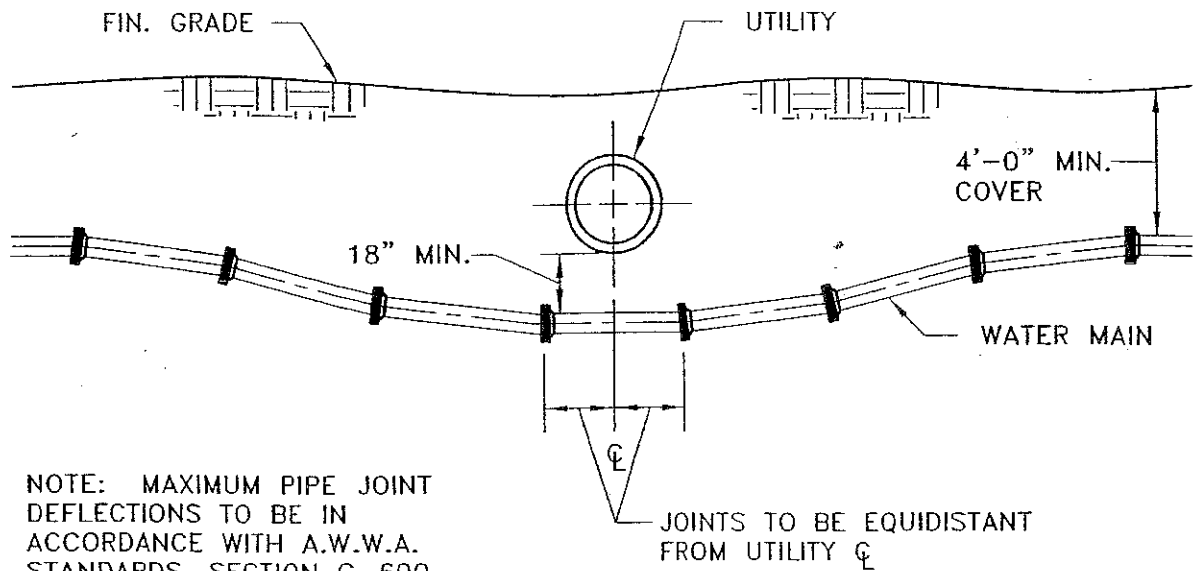
ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

TRENCH DETAIL
TYPE K COPPER WATER SERVICE

DATE:
SEPTEMBER 2009

DETAIL:
3a



NOTE: THE UTILITY OWNER MAY, AT THEIR DISCRETION AND IN CONSULTATION WITH THE AUTHORITY, REQUIRE CONCRETE ENCASEMENT OF EITHER THE UTILITY OR THE WATER LINE.

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

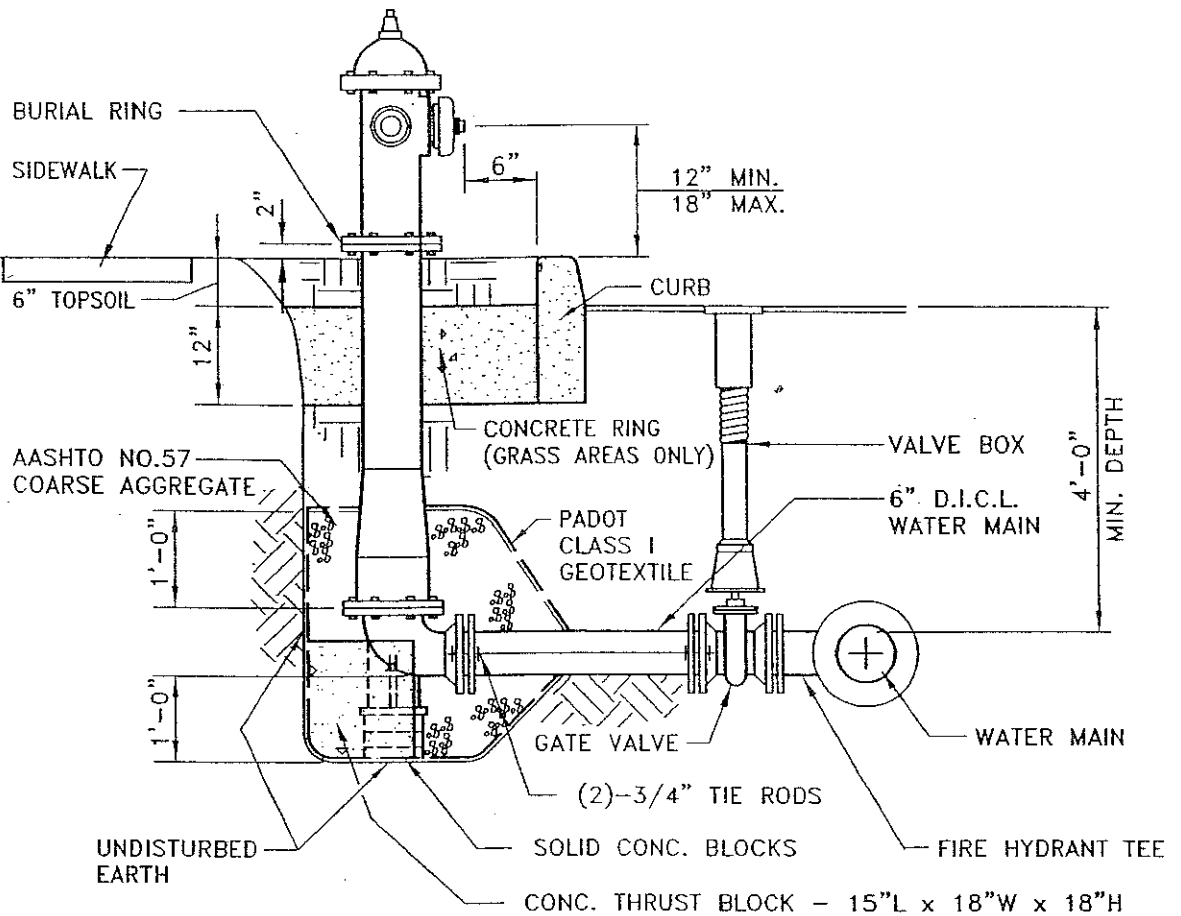
**WATER MAIN CROSSING UTILITIES
USING JOINT DEFLECTIONS**

DATE: FEBRUARY 2001

DETAIL:

4

R/W



NOTES:

1. RESTRAIN FIRE HYDRANT WITH TIE RODS AS REQUIRED.
2. IN AREAS WHERE SIDEWALKS ARE NOT REQUIRED, FIRE HYDRANTS SHALL BE SET WITH THE PUMPER NOZZLE CAP LOCATED 2 FEET BEHIND THE BACK FACE OF CURB.

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

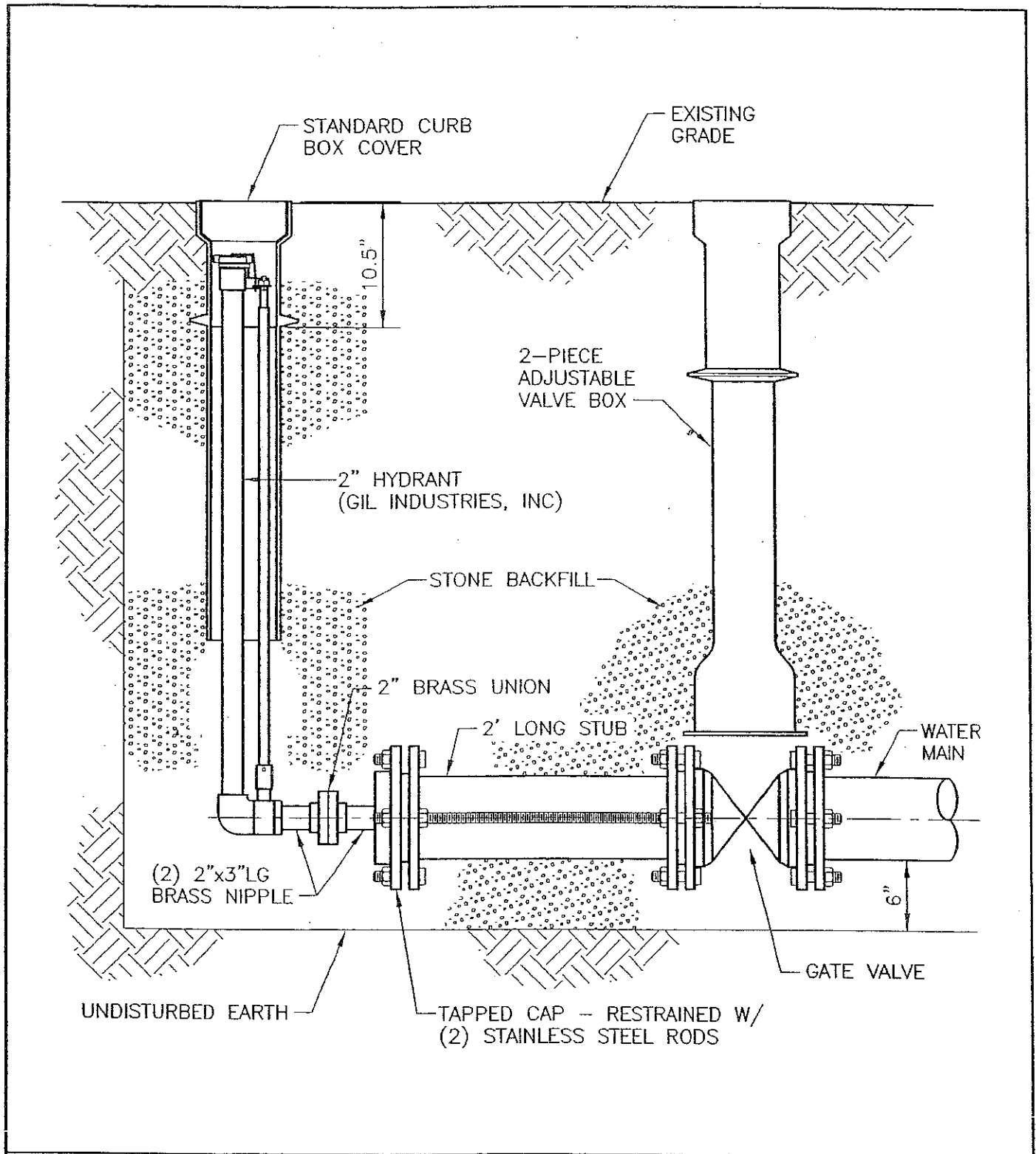
**STANDARD FIRE HYDRANT
SETTING DETAIL**

DATE:
FEBRUARY 2001

DETAIL:

5

Dwg. Name: 02837914.DWG Last Revised: 04/06/01 07:42



Dwg. Name: 01792202.DWG Last Revised: 04/06/01 07:43

West Earl Water Authority
STANDARD DETAIL - WATER SYSTEM

ARRG
 ARRG Consulting, Inc.

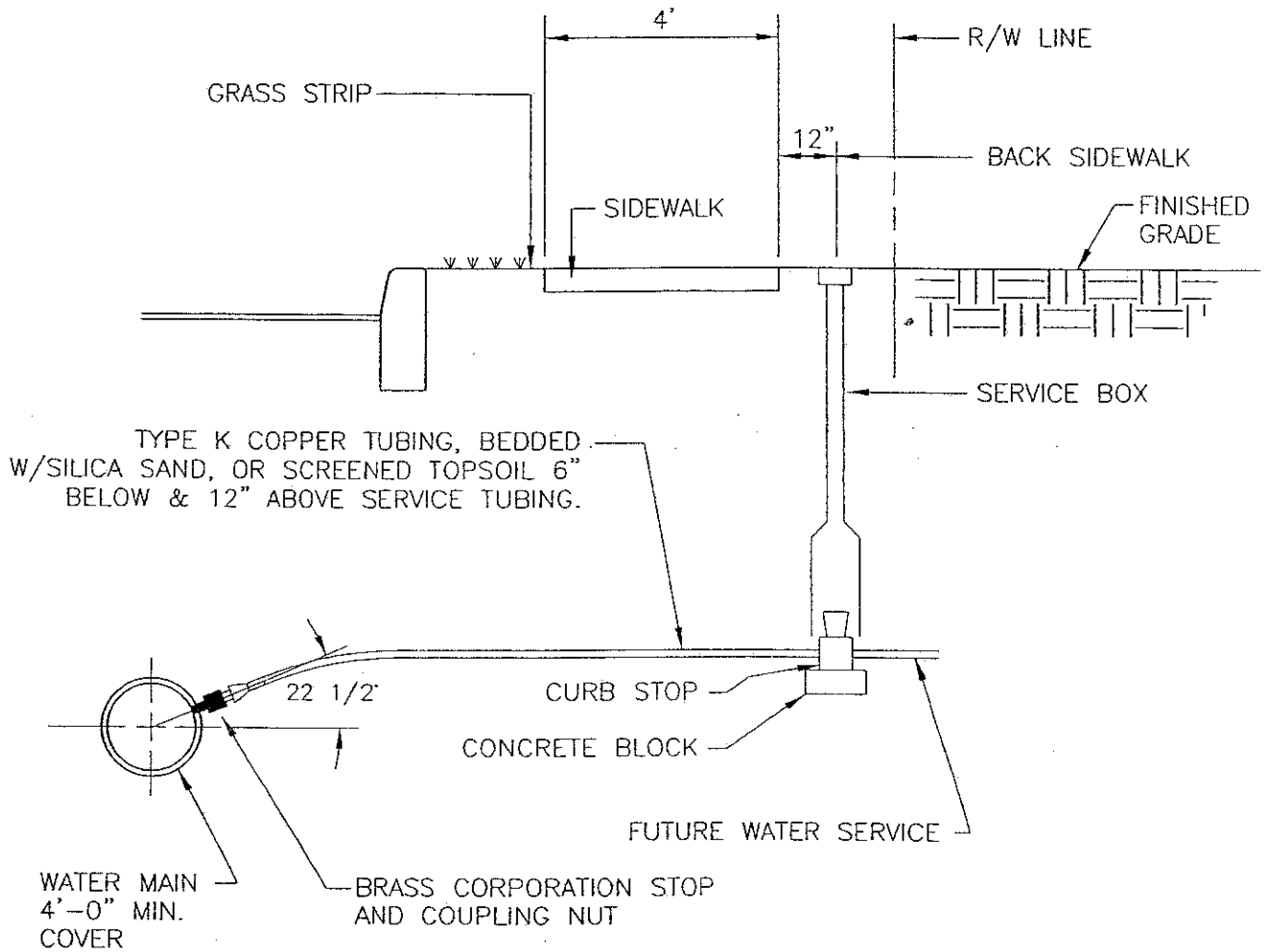
270 Granite Run Drive
 Lancaster, Pennsylvania 17601
 Tel 717.569.7021

**TYPICAL BLOW-OFF
 HYDRANT**

DATE:
 FEBRUARY 2001

DETAIL:
 5A

Dwg. Name: 02837915.DWG Lost Revised: 10/08/09 09:38



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

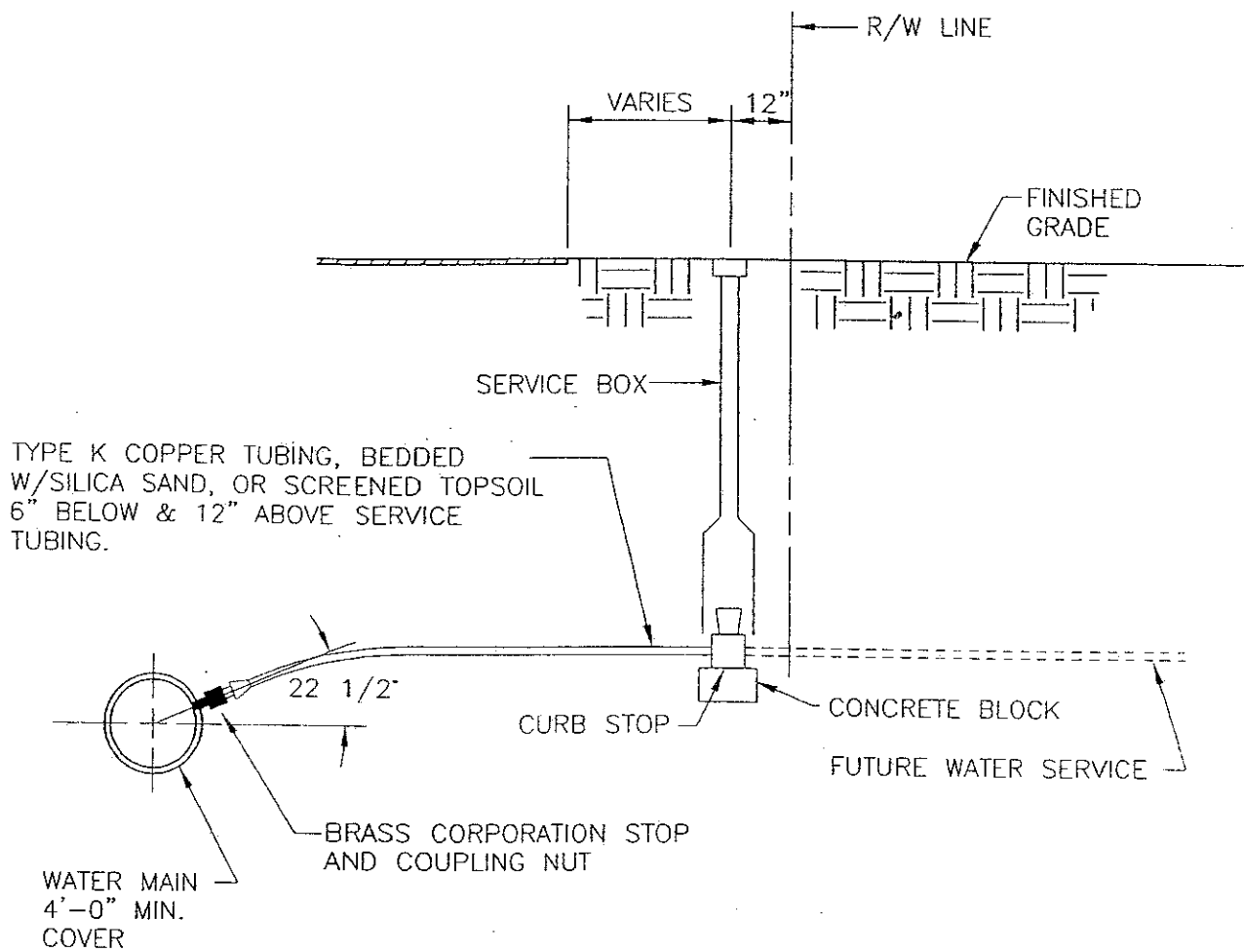
270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**STANDARD WATER SERVICE LINE
INSTALLATION (ROADWAY W/ CURBING)**

DATE:
SEPTEMBER 2009

DETAIL:
6

Dwg. Name: 02837916.DWG Lost Revised: 10/08/09 09:44



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

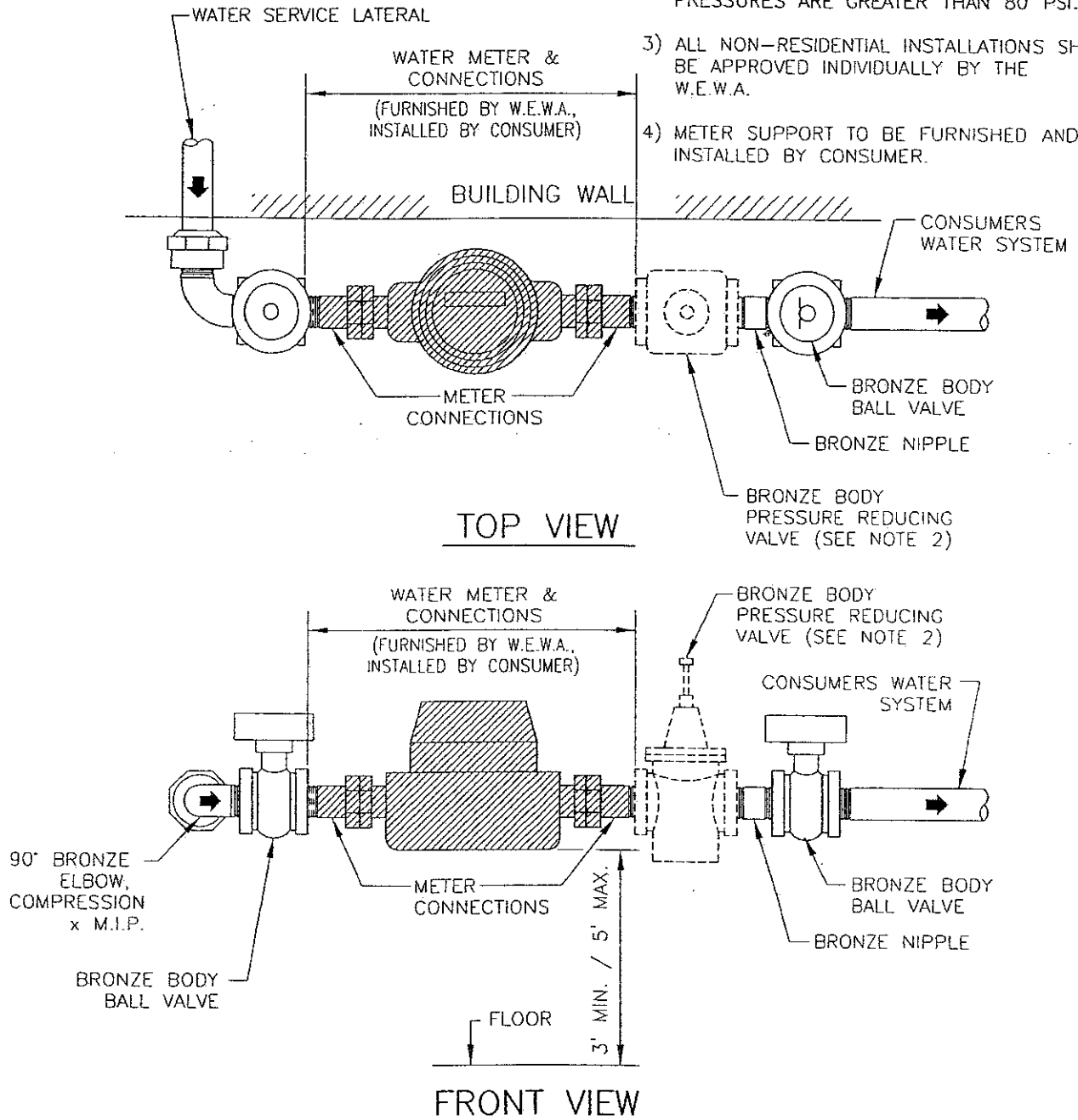
**STANDARD WATER SERVICE LINE
INSTALLATION (ROADWAY W/O CURBING)**

DATE:
SEPTEMBER 2009

DETAIL:
7

NOTES:

- 1) ALL PIPING, VALVES, FITTINGS, ETC., TO BE FURNISHED & INSTALLED BY CONSUMER, UNLESS NOTED OTHERWISE.
- 2) PRESSURE REDUCING VALVE REQUIRED WHEN DISTRIBUTION SYSTEM OPERATING PRESSURES ARE GREATER THAN 80 PSI.
- 3) ALL NON-RESIDENTIAL INSTALLATIONS SHALL BE APPROVED INDIVIDUALLY BY THE W.E.W.A.
- 4) METER SUPPORT TO BE FURNISHED AND INSTALLED BY CONSUMER.



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

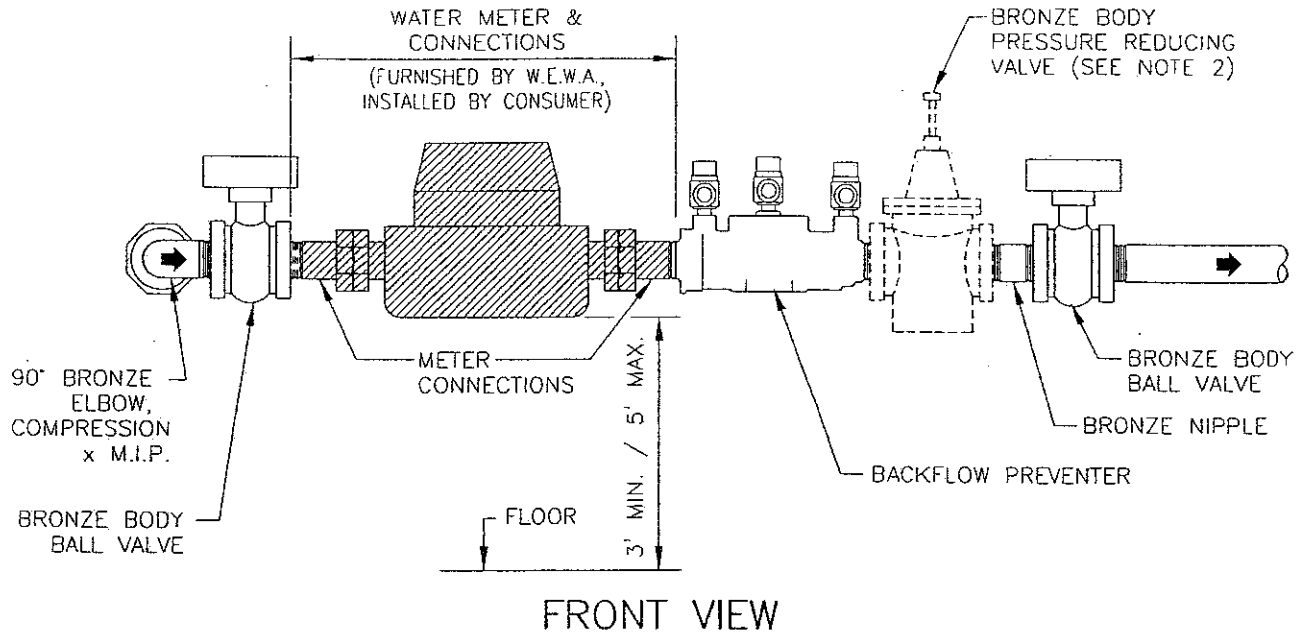
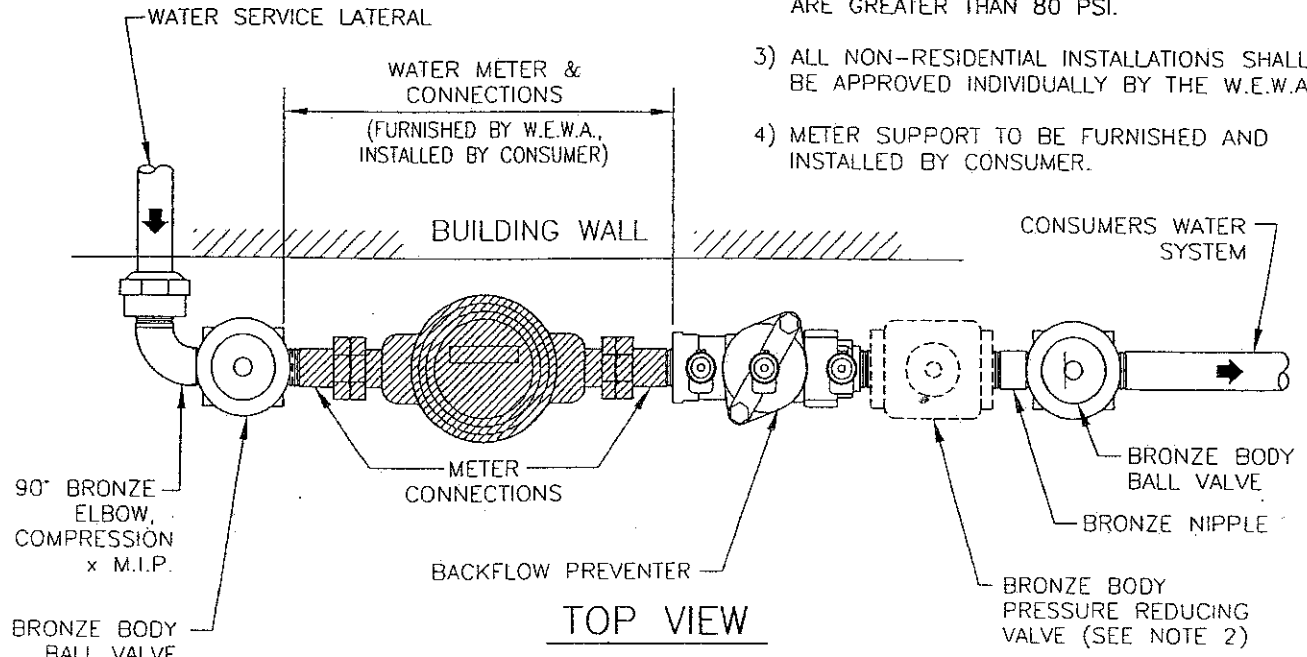
**TYPICAL WATER SERVICE CONNECTION
UTILIZING 5/8" x 3/4" METER**

DATE:
SEPTEMBER 2009

DETAIL:
7A

NOTES:

- 1) ALL PIPING, VALVES, FITTINGS, ETC., TO BE FURNISHED & INSTALLED BY CONSUMER, UNLESS NOTED OTHERWISE.
- 2) PRESSURE REDUCING VALVE REQUIRED WHEN DISTRIBUTION SYSTEM OPERATING PRESSURES ARE GREATER THAN 80 PSI.
- 3) ALL NON-RESIDENTIAL INSTALLATIONS SHALL BE APPROVED INDIVIDUALLY BY THE W.E.W.A.
- 4) METER SUPPORT TO BE FURNISHED AND INSTALLED BY CONSUMER.



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17603
Tel 717.569.7021

**TYPICAL WATER SERVICE CONNECTION
UTILIZING 1", 1 1/2" & 2" METERS**

DATE:
SEPTEMBER 2009

DETAIL:
7B

INLET ANGLE
METER VALVE

METER

METER SET ANCHORED TO
MOVEABLE PLATFORM

DUAL ANGLE CHECK VALVE

METER BOX TO HAVE FLAT LID
WITH CENTER MOUNTED PENTAGON
KEY LOCK AND TOUCH READ
METER PAD.

WATER METER
(FURNISHED BY
W.E.W.A. INSTALLED
BY CONSUMER)

INSULATING PAD MADE FROM
CLOSED CELL FOAM POLY MATERIAL
IS TO BE USED.

RIGID PVC MATERIAL

MOVEABLE PLATFORM

POLYBUTYLENE COIL TUBING

SERVICE TUBING

METER SETTER BOX
AND APPURTANCES
FURNISHED & INSTALLED
BY CONSUMER

SERVICE TUBING

METER SETTER BOX— 15"Øx48"
FOR 5/8"x3/4" METER

METER SETTER BOX— 18"Øx48"
FOR 1" METER

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

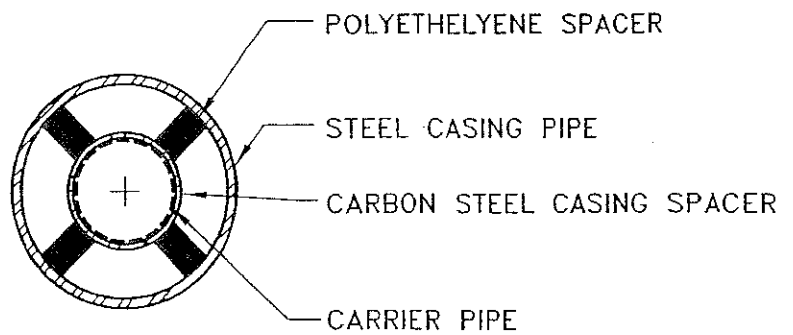
ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

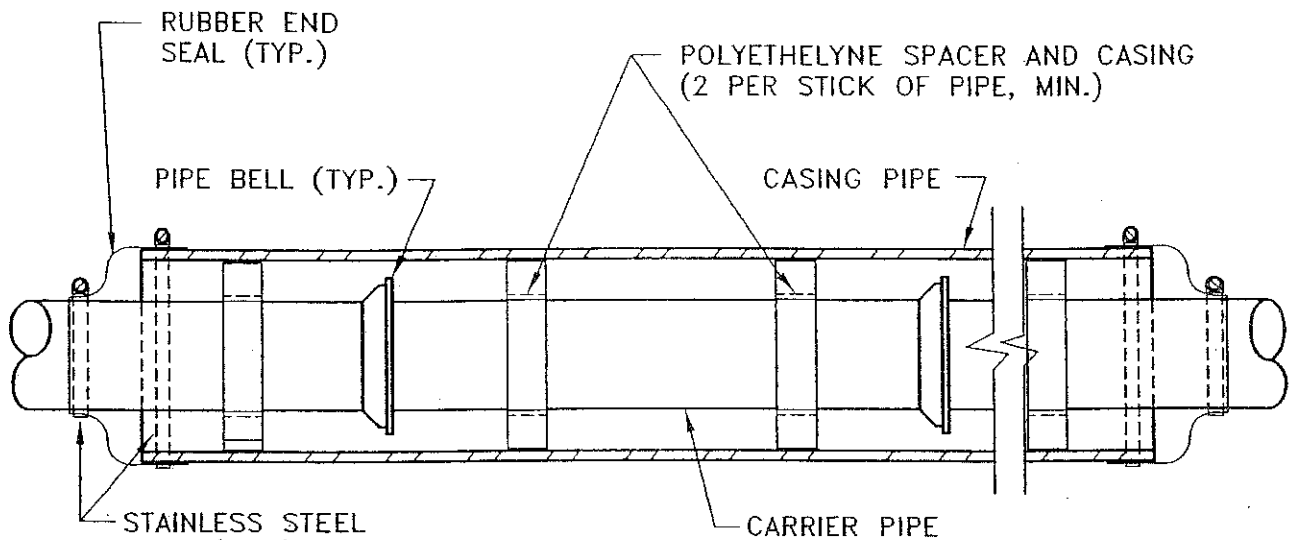
**THERMAL-COIL METER BOX
FOR 5/8"x3/4" AND 1" METERS ONLY**

DATE:
FEBRUARY 2003

DETAIL:
7C



SECTION



ELEVATION

West Earl Water Authority
STANDARD DETAIL - WATER SYSTEM

ARRO
 ARRO Consulting, Inc.

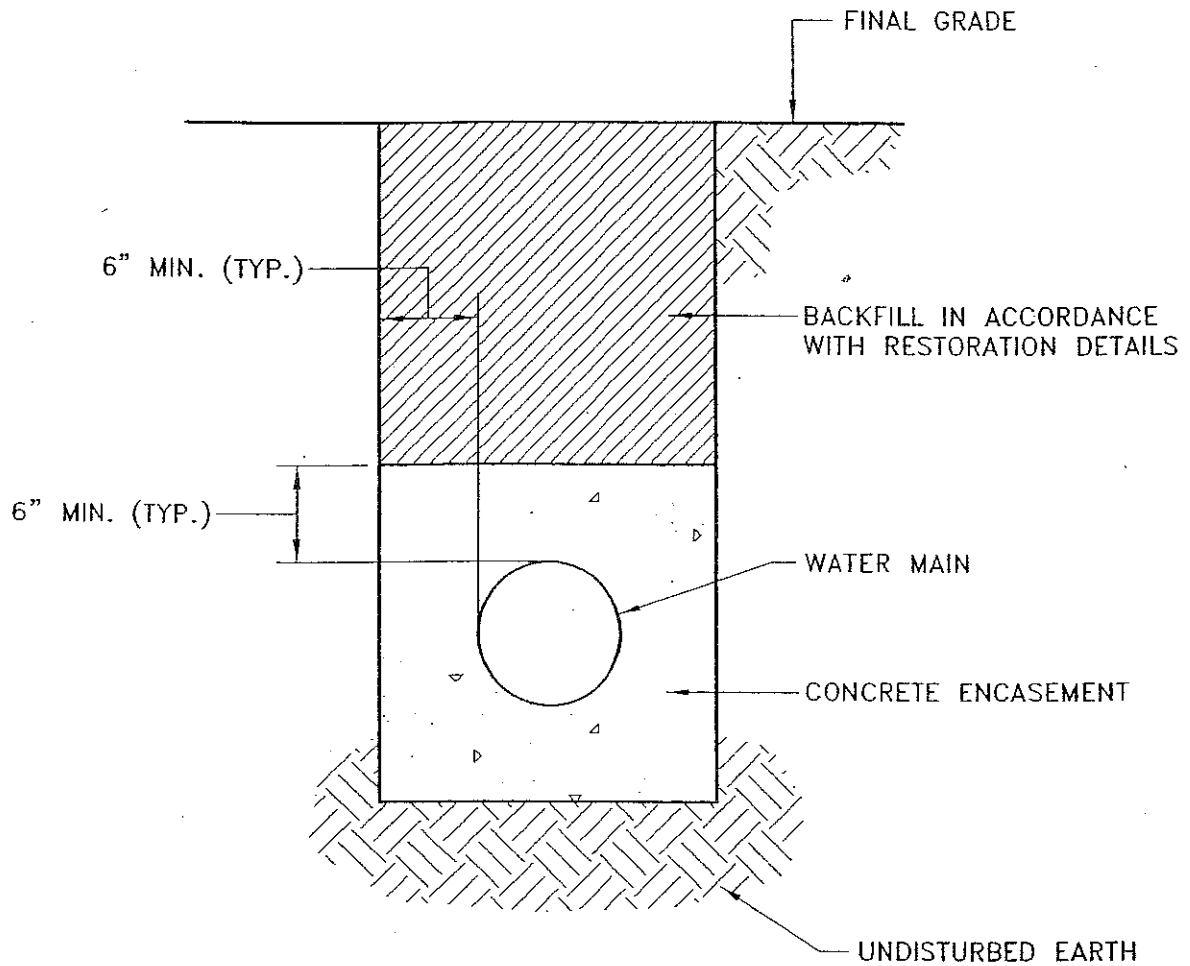
270 Granite Run Drive
 Lancaster, Pennsylvania 17601
 Tel 717.569.7021

**STANDARD CASING
 CRADLE DETAIL**

DATE: **FEBRUARY 2001**

DETAIL:

8



West Earl Water Authority
STANDARD DETAIL - WATER SYSTEM

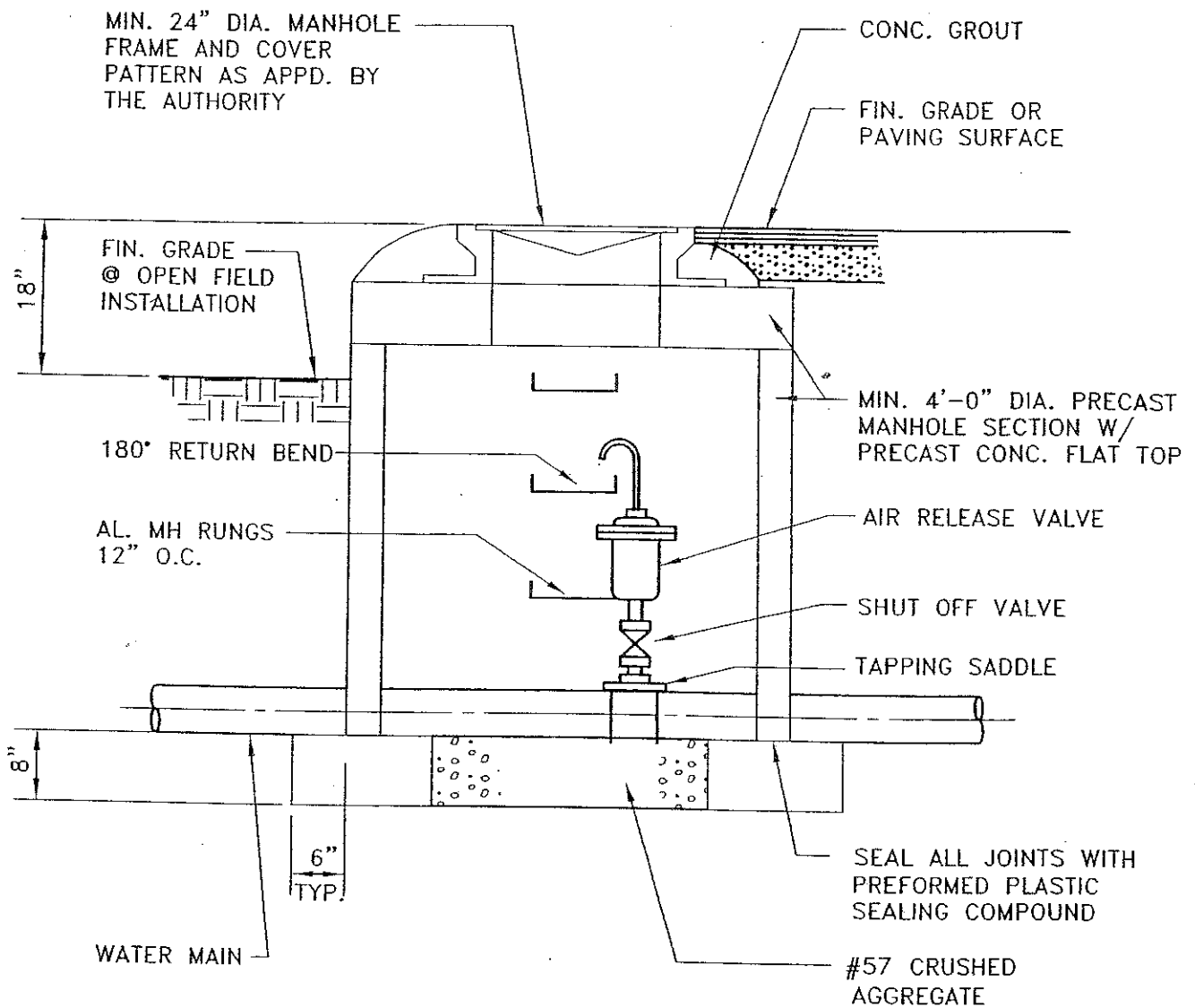
ARRO
 ARRO Consulting, Inc.

270 Granite Run Drive
 Lancaster, Pennsylvania 17601
 Tel 717.569.7021

**STANDARD CONCRETE
 ENCASING DETAIL**

DATE:
 FEBRUARY 2001

DETAIL: 9



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

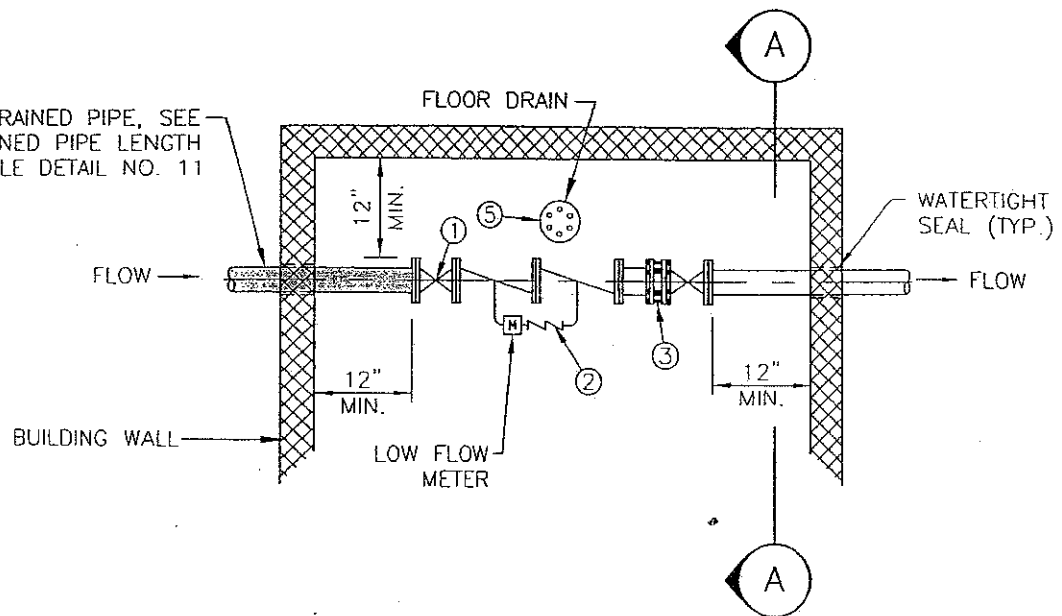
270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**AIR RELEASE VALVE
MANHOLE DETAIL**

DATE:
FEBRUARY 2001

DETAIL

RESTRAINED PIPE, SEE
RESTRAINED PIPE LENGTH
SCHEDULE DETAIL NO. 11



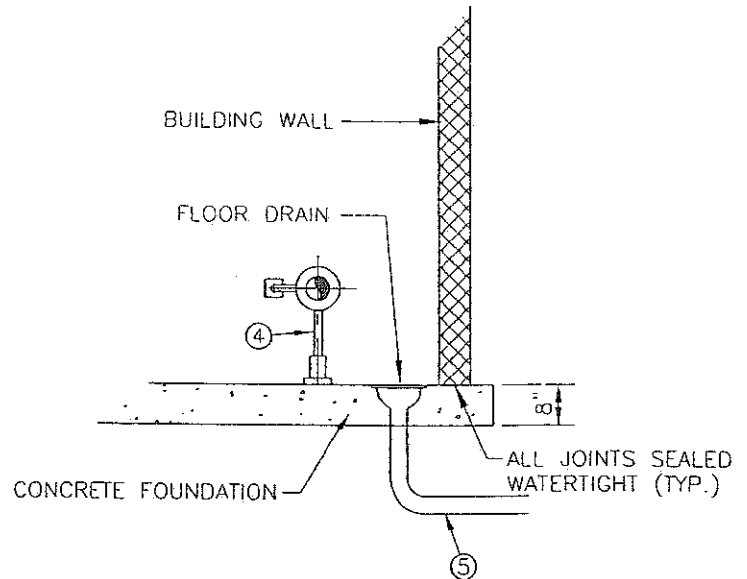
PLAN

KEY NOTES:

- ① OS&Y GATE VALVE
- ② AMES 3001 DOUBLE CHECK DETECTOR ASSEMBLY W/LOW FLOW METER & DOUBLE CHECK VALVE WITH READER MOUNTED ON BUILDING EXTERIOR
- 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 (RPZ) IS REQUIRED

NOTE:

1. RPZ REQUIRED WHEN ALCOHOL BASED SPRINKLER SYSTEM IS UTILIZED.



SECTION A-A

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

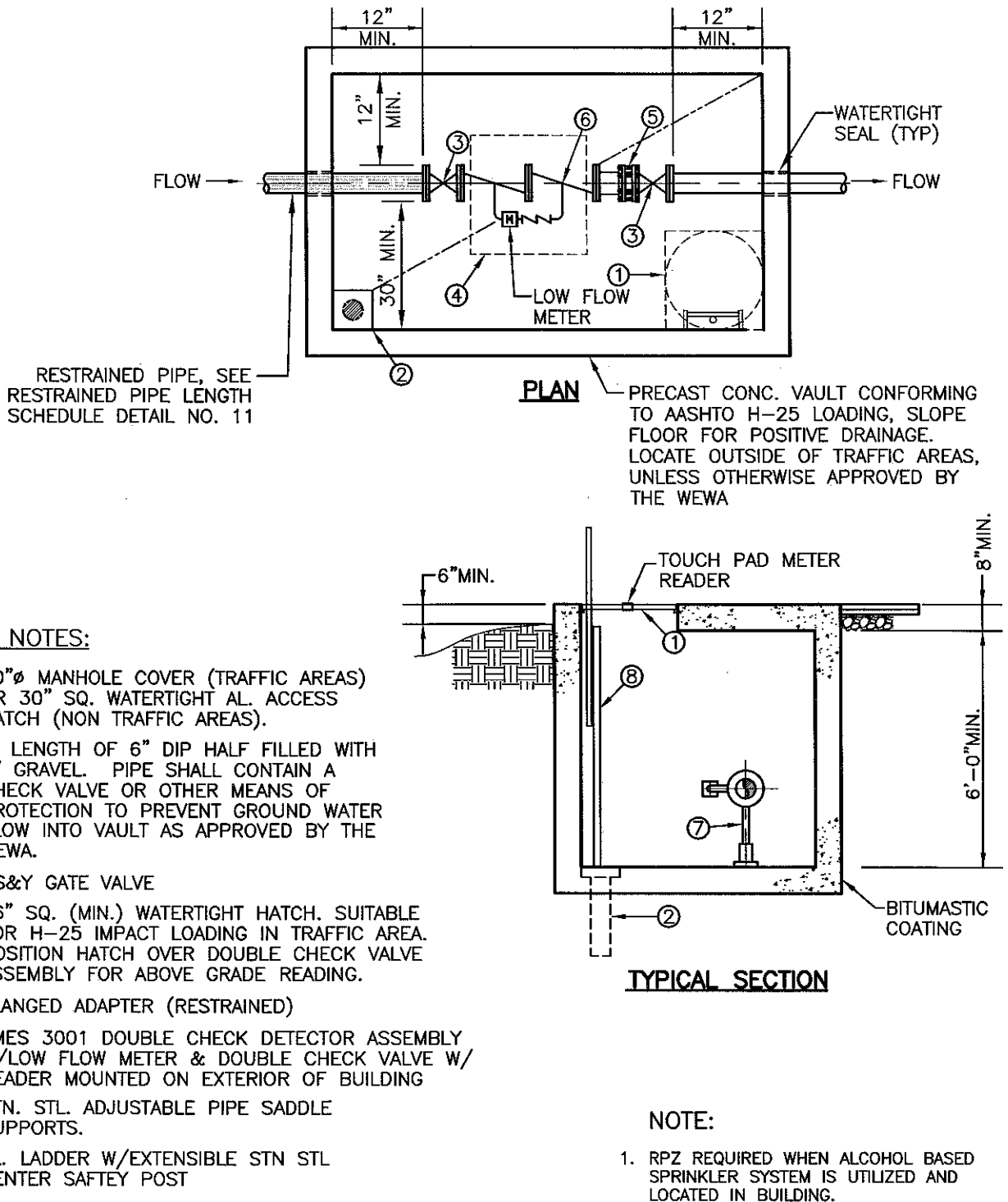
ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**FIRE PROTECTION SERVICE DETAIL
BUILDING INSTALLATION**

DATE:
SEPTEMBER 2009

DETAIL:
10A



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

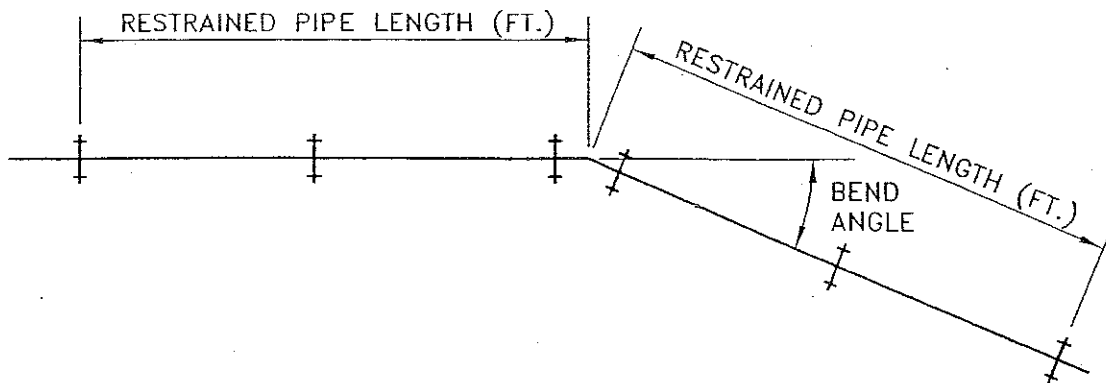
ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**FIRE PROTECTION SERVICE DETAIL
VAULT INSTALLATION
BY SPECIAL EXCEPTION ONLY**

DATE:
SEPTEMBER 2009

DETAIL:
10B



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 ENCASED.

RESTRAINED PIPE LENGTH SCHEDULE			
PIPE DIAMETER	VERTICAL DOWN BENDS		
	45°	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 ENCASED.

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

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

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Tel 717.569.7021

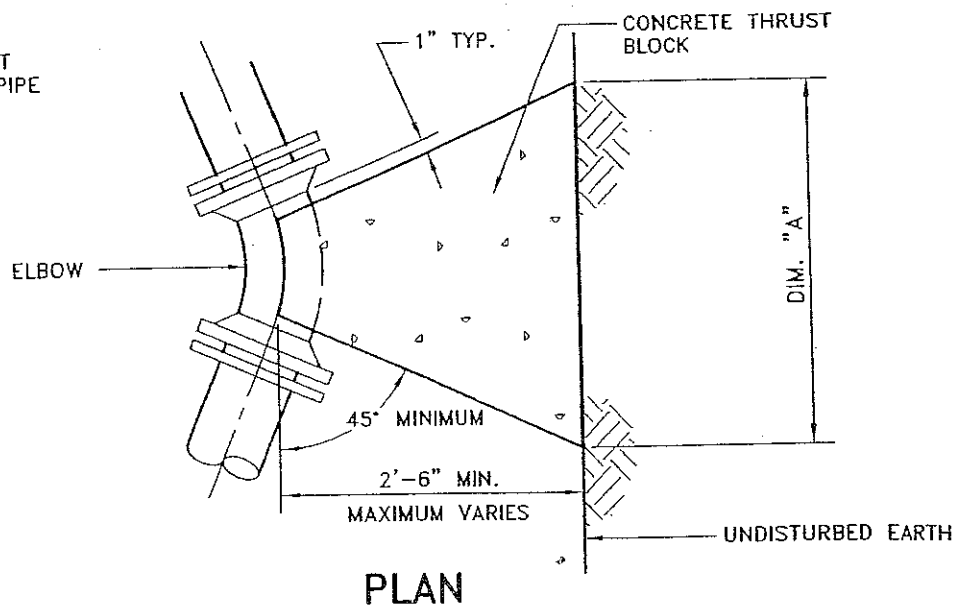
**RESTRAINED PIPE
LENGTH SCHEDULE**

DATE:
FEBRUARY 2001

DETAIL:
11

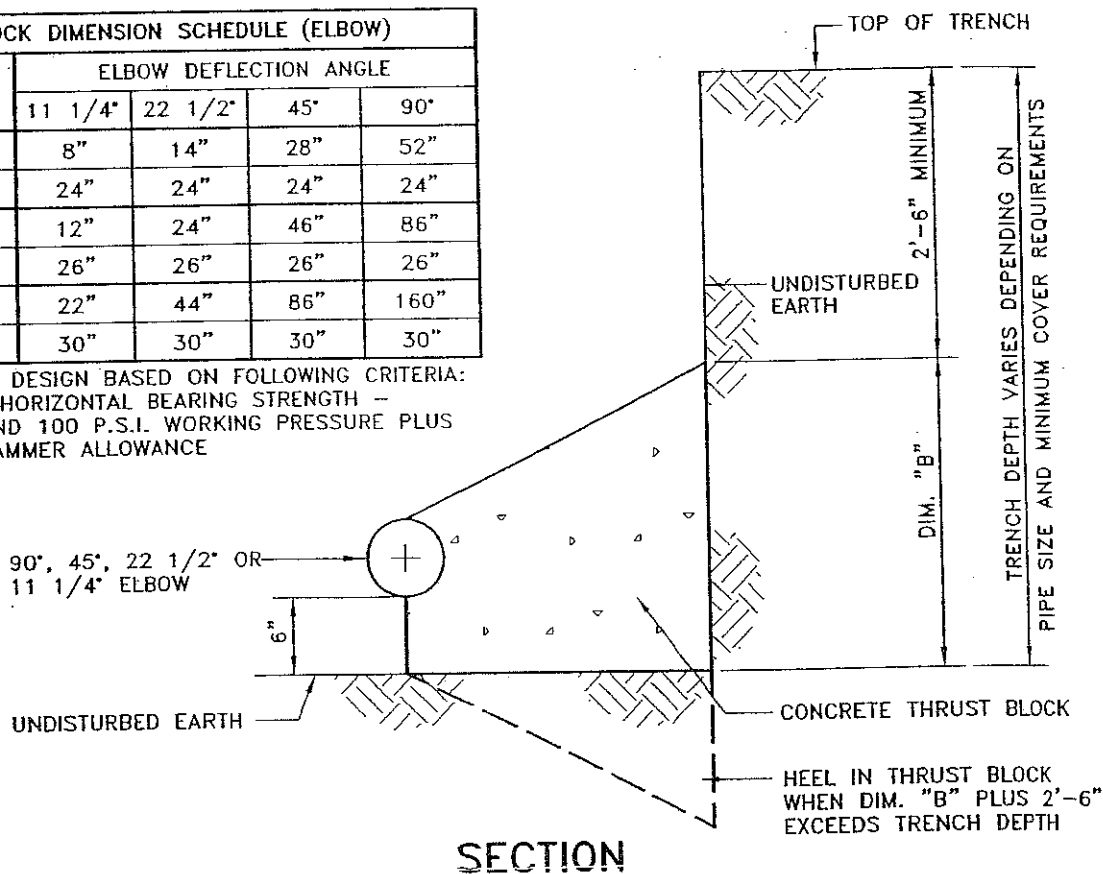
NOTE:

A POLYETHYLENE FILM MUST BE PLACED BETWEEN THE PIPE AND THE CONCRETE.



THRUST BLOCK DIMENSION SCHEDULE (ELBOW)					
PIPE DIAM.	DIM.	ELBOW DEFLECTION ANGLE			
		11 1/4°	22 1/2°	45°	90°
6"	A	8"	14"	28"	52"
	B	24"	24"	24"	24"
8"	A	12"	24"	46"	86"
	B	26"	26"	26"	26"
12"	A	22"	44"	86"	160"
	B	30"	30"	30"	30"

THRUST BLOCK DESIGN BASED ON FOLLOWING CRITERIA:
MINIMUM SOIL HORIZONTAL BEARING STRENGTH -
3000 P.S.F. AND 100 P.S.I. WORKING PRESSURE PLUS
50% WATER HAMMER ALLOWANCE



West Earl Water Authority
STANDARD DETAIL - WATER SYSTEM

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Lancaster, Pennsylvania 17601
Tel 717.569.7021

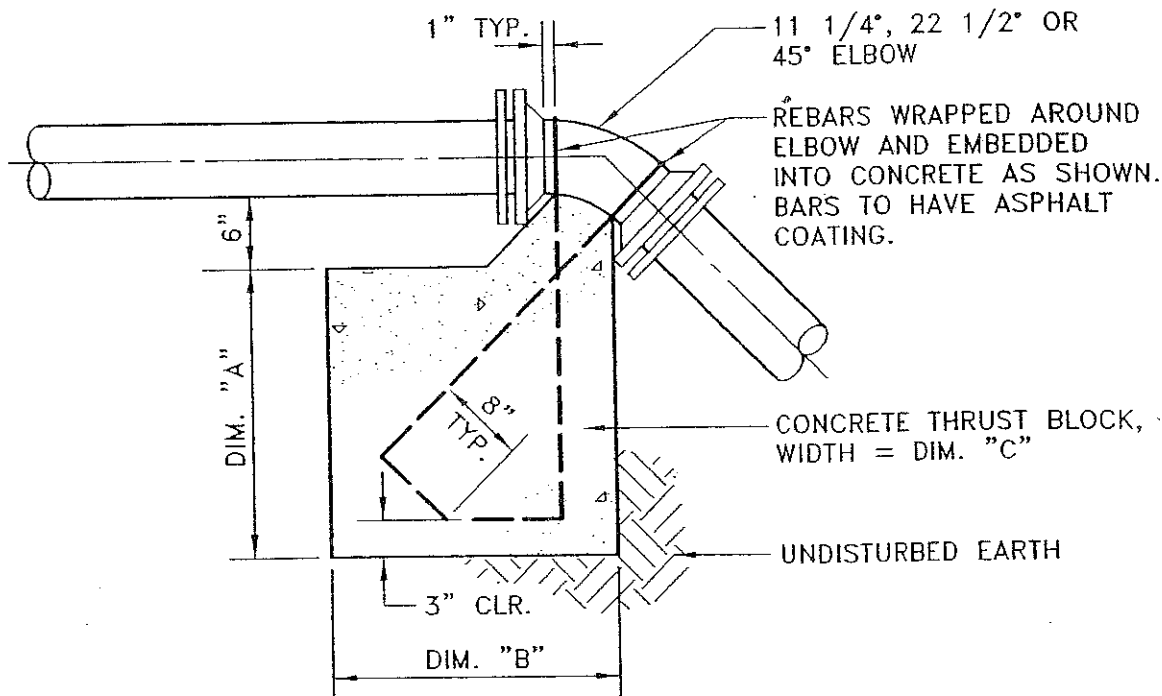
HORIZONTAL BENDS & VERTICAL BENDS UP
THRUST BLOCKING DETAIL
BY SPECIAL EXCEPTION ONLY

DATE:
FEBRUARY 2001

DETAIL:
12

VERTICAL ELBOW DIMENSION SCHEDULE

DIM.	6"-11 1/4"	8"-11 1/4"	12"-11 1/4"	6"-22 1/2"	8"-22 1/2"	12"-22 1/2"	6"-45°	8"-45°	12"-45°
A	12"	18"	36"	18"	36"	54"	36"	48"	54"
B	18"	24"	36"	24"	36"	48"	36"	48"	54"
C	18"	24"	24"	24"	24"	30"	24"	30"	48"
REBAR	#4	#4	#6	#4	#4	#6	#4	#4	#6



THRUST BLOCK DESIGN BASED ON
FOLLOWING CRITERIA: MINIMUM SOIL
HORIZONTAL BEARING STRENGTH
OF 3000 P.S.F. AND 100 P.S.I.
WORKING PRESSURE PLUS 50%
WATER HAMMER ALLOWANCE

NOTE:

A POLYETHYLENE FILM MUST
BE PLACED BETWEEN THE PIPE
AND THE CONCRETE.

West Earl Water Authority
STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

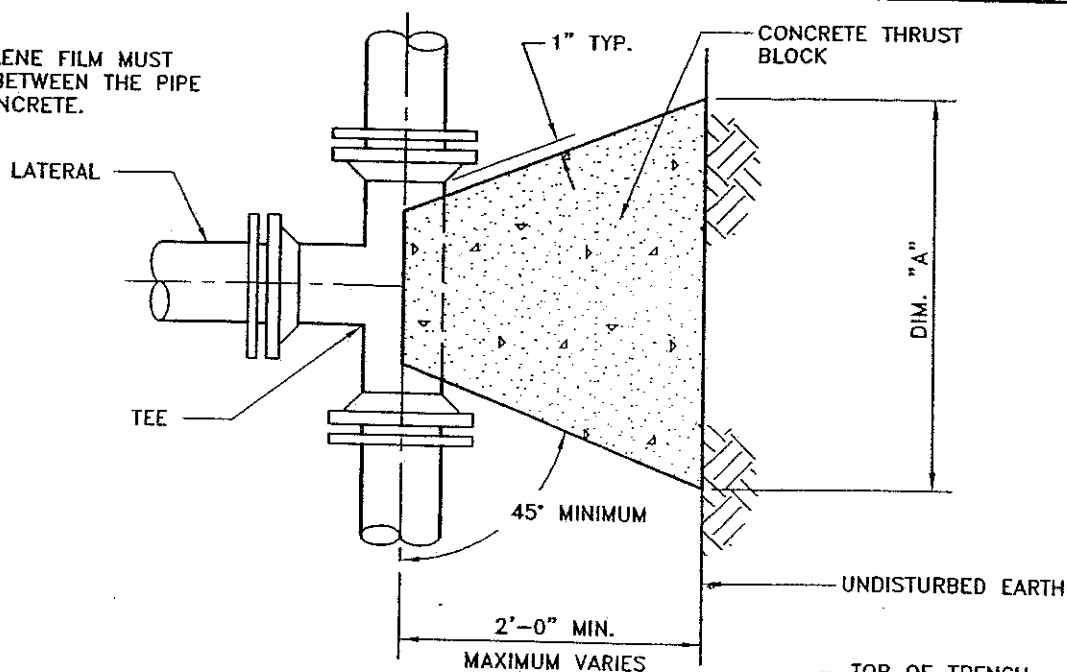
270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

VERTICAL BENDS DOWN
THRUST BLOCKING DETAIL
BY SPECIAL EXCEPTION ONLY

DATE:
FEBRUARY 2001

DETAIL
13

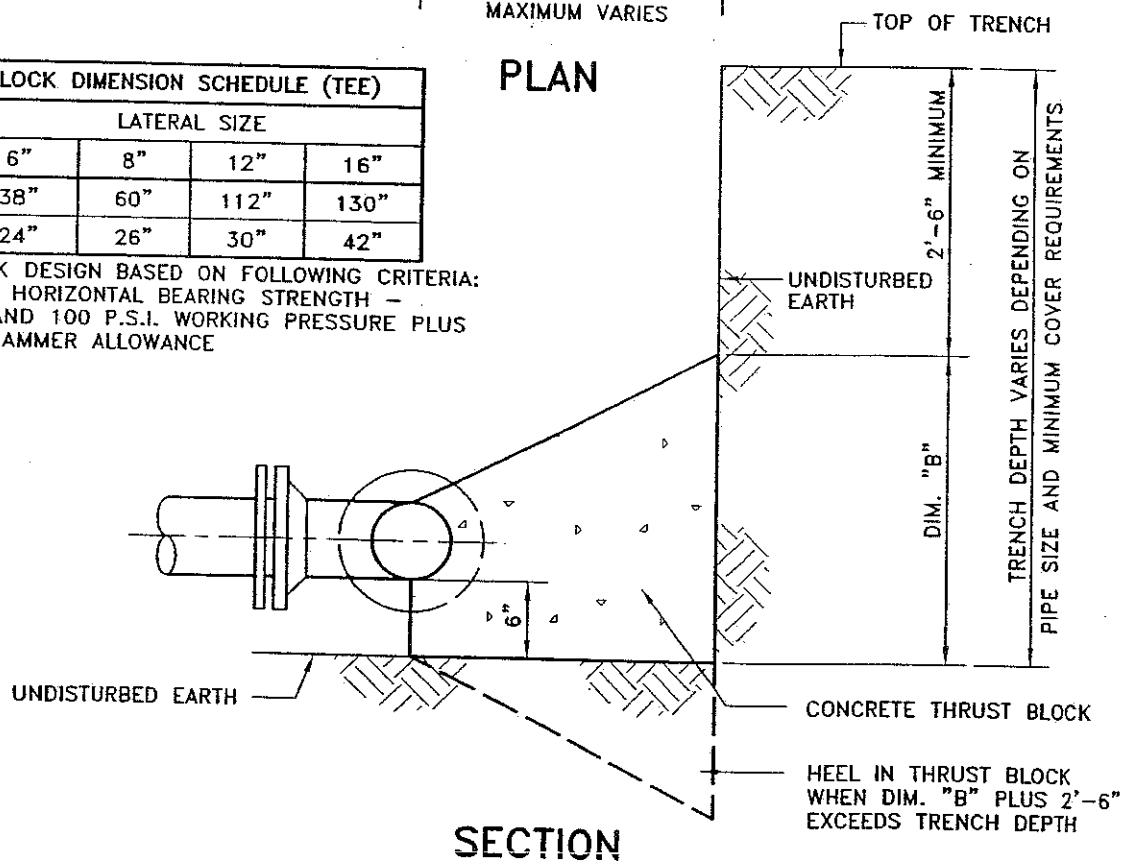
A POLYETHYLENE FILM MUST
BE PLACED BETWEEN THE PIPE
AND THE CONCRETE.



PLAN

THRUST BLOCK DIMENSION SCHEDULE (TEE)				
DIM.	LATERAL SIZE			
	6"	8"	12"	16"
A	38"	60"	112"	130"
B	24"	26"	30"	42"

THRUST BLOCK DESIGN BASED ON FOLLOWING CRITERIA:
MINIMUM SOIL HORIZONTAL BEARING STRENGTH -
3000 P.S.F. AND 100 P.S.I. WORKING PRESSURE PLUS
50% WATER HAMMER ALLOWANCE



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

TEES
THRUST BLOCKING DETAIL
BY SPECIAL EXCEPTION ONLY

DATE: FEBRUARY 2001

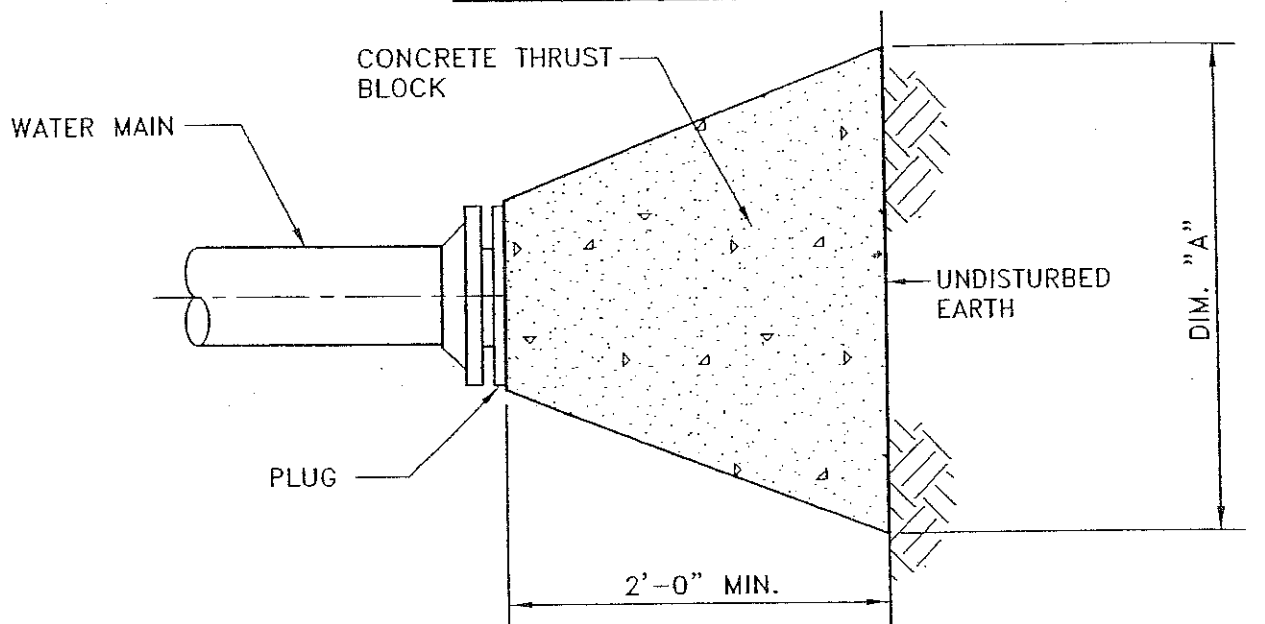
DETAIL: 14

NOTE:

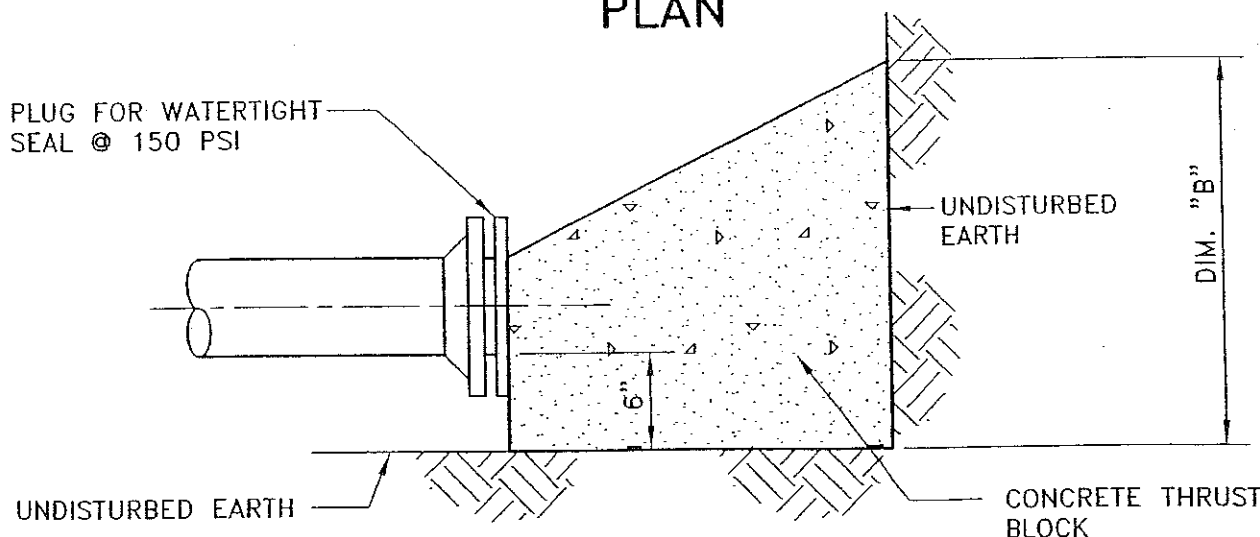
A POLYETHYLENE FILM MUST
BE PLACED BETWEEN THE PIPE
AND THE CONCRETE.

**THRUST BLOCK DIMENSION SCHEDULE
(PLUG)**

DIM.	LATERAL SIZE			
	6"	8"	12"	16"
A	38"	60"	112"	130"
B	24"	26"	30"	42"



PLAN



SECTION

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

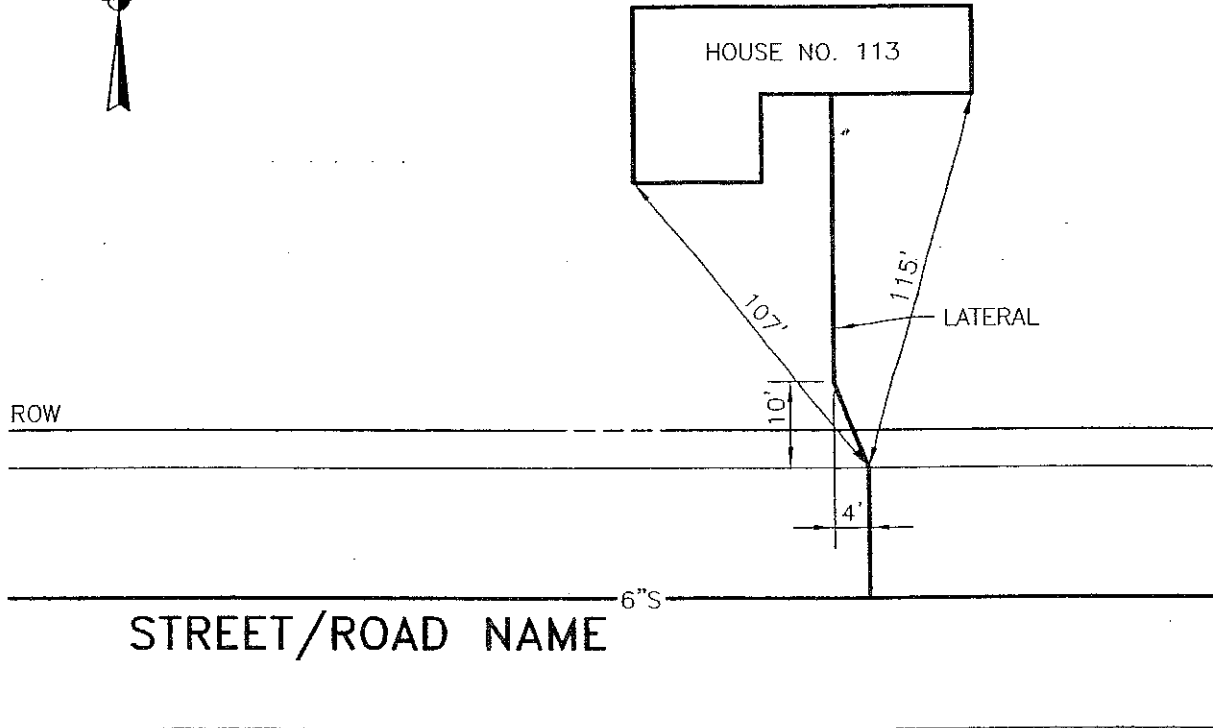
ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**PLUGS
THRUST BLOCKING DETAIL
BY SPECIAL EXCEPTION ONLY**

DATE:
FEBRUARY 2001

DETAIL:
15



West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

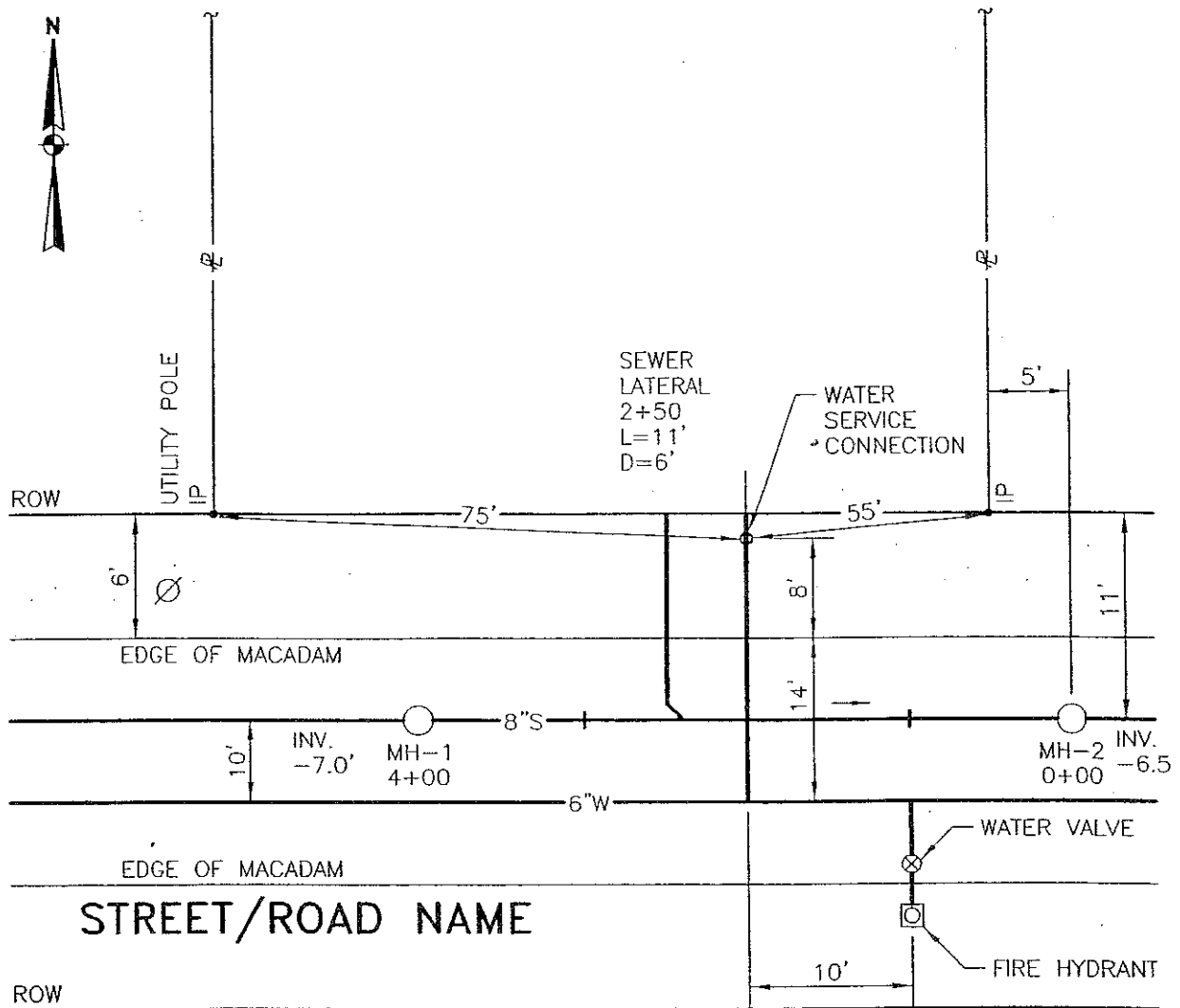


270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**TYPICAL DIMENSIONED SKETCH OF
NEW SERVICE INSTALLATION**

DATE: **FEBRUARY 2001**

DETAIL: **16**



MH-1 TO MH-2
TOTAL LENGTH = 400 L.F.

NOTES:

1. DIMENSIONS OF WATER AND SEWER UTILITIES SHALL BE PROVIDED ON A FULL SET OF APPROVED FINAL SUBDIVISION PLANS.
2. AS A MINIMUM, LOCATE SERVICE LINE AND CURB BOX FROM TWO PROPERTY PINS AND ANY OTHER AVAILABLE PERMANENT STRUCTURES.

West Earl Water Authority

STANDARD DETAIL - WATER SYSTEM

ARRO
ARRO Consulting, Inc.

270 Granite Run Drive
Lancaster, Pennsylvania 17601
Tel 717.569.7021

**TYPICAL DIMENSIONED SKETCH OF
NEW UTILITY INSTALLATION**

DATE:
FEBRUARY 2001

DETAIL:
17

APPENDIX 3

FORM EXTENSION AGREEMENT

AGREEMENT

THIS AGREEMENT made this _____ day of _____, 1994, by and between WEST EARL WATER AUTHORITY, a municipality authority organized and existing under the laws of the Commonwealth of Pennsylvania and specifically organized under the Municipality Authorities Act of 1945, as amended, having its principal office at 157 West Metzler Road, P.O. Box 787, Brownstown, Pennsylvania 17508, party of the first part, hereinafter called the "Authority", and _____, with a business address of _____, Pennsylvania, _____, party of the second part, hereinafter called the "Developer".

WITNESSETH:

WHEREAS, Authority owns and operates a municipal water supply and distribution system (the "Water System") within the Township of West Earl, Lancaster County, Pennsylvania (the "Township"); and

WHEREAS, Developer desires to install water mains to serve Developer's project known as _____, hereinafter sometimes referred to as the "Project", and to connect (and, if necessary, extend) the same to Authority's Water System; and

WHEREAS, Authority is willing to permit the installation of water mains by the Developer and the connection of such water mains to the Authority's Water System subject to compliance by Developer with the Authority's policies, rules, regulations, standards and specifications.

NOW, THEREFORE, in consideration of the promises, terms and conditions of this Agreement more fully hereinbelow set forth, and intending to be legally bound hereby, the parties agree as follows:

1. Developer agrees to furnish to Authority the Developer's complete and

accurate development plans and rights-of-way surveys to show the following items: (a) location of buildings, roads and streets and other land use facilities; (b) location of existing utilities; (c) proposed easements and rights-of-way other than for street and road use; (d) land to be dedicated to the Authority; and (e) such other details of the Project as may influence the design and/or construction of the water mains.

2. Developer agrees to establish a final rough grade on all roads, streets, easements and rights-of-way within which water mains are to be installed prior to the installation thereof.

3. Upon the execution of this Agreement Developer shall deposit with the Authority the sum of _____ to be used by the Authority to apply against the cost of obtaining any necessary permits and approvals from governmental bodies, supervision of final stake-out, inspection of the water mains, testing of water mains and appurtenances, preparation of "as constructed" drawings, any PennDOT inspection fees if state roads are involved in the Project, and any legal expenses (including expenses relating to the preparation of this Agreement) Authority may incur in the furtherance of the design, installation or dedication to the Authority of the proposed municipal water facilities for the Project. In the event said sum deposited is insufficient to pay such costs, Authority shall bill Developer for the actual or anticipated additional costs, and the Authority shall have the right to suspend work pending receipt of the sum billed. In the event said sum deposited is in excess of such costs, Authority shall refund such excess money without interest to Developer upon completion of the work and acceptance of dedication of said water mains. Authority is hereby irrevocably authorized to withdraw from time to time any monies deposited by Developer in escrow in order to pay expenses and fees, including legal and

engineering fees, incurred by Authority pursuant to or in connection with the administration of this Agreement.

4. Upon receipt of the sums required under Paragraph 3 hereinabove, Authority agrees to cooperate with Developer to obtain any necessary permits and to perform the Authority's other obligations hereunder. Developer or its engineer shall coordinate with the Authority's engineer the responsibility for preparing permit applications and "as constructed" drawings and the performance of the other engineering work related to this Agreement.

5. Developer shall install the water mains and appurtenances with its own forces; provided, however, the work shall not be undertaken intermittently, but shall be rapidly prosecuted to completion on or before _____, said time being of the essence. Developer or its contractors shall obtain and maintain in force liability insurance at all times during the installation of the water mains. The minimum limits and coverages of such insurance shall be approved by the Authority's engineer, and any policy or policies shall name the Authority, its agents, servants and employees, as additional insureds. Developer shall indemnify and hold the Authority, its agents and servants harmless from any and all claims arising from the construction of the water mains and related appurtenances.

6. All construction of water facilities by Developer shall be completed in strict conformity to the Authority's policies, rules, regulations, standards and specifications which are on file in the office of the Authority located at 157 West Metzler Road, Brownstown, Pennsylvania 17508, and which are incorporated herein by reference thereto.

7. Upon the completion of the installation of the water mains, the Authority's engineer will, at Developer's expense, finalize all contract drawings to

record the water mains as actually constructed (unless the Developer's engineer agrees to prepare such "as constructed" drawings), make a final inspection, prepare the necessary closing documents, and, if the work is satisfactory, recommend that the water mains be accepted by the Authority.

8. Developer hereby irrevocably dedicates the water mains to the Authority, and Authority agrees to accept said water mains upon completion, provided:

(a) The location, plans and specifications for said water mains have been approved or prepared by the Authority's engineer prior to the start of construction;

(b) Approval of grades and locations has been obtained from all appropriate governmental bodies;

(c) Said water mains have been constructed in accordance with the aforesaid plans and specifications which are to be approved by the engineer for the Authority prior to the beginning of construction thereof;

(d) Inspection by the Authority's engineer or employees is permitted during the entire course of construction, during which Developer shall comply with reasonable requirements of said engineer or employees as to advance notice of time when the inspections are to be made;

(e) Developer shall cooperate with and assist the Authority to obtain any necessary Highway Occupancy Permits from PennDOT for any laying of water mains on public highways, shall pay all expenses in connection with compliance with state or local requirements, and shall hold Authority harmless from any cost, including inspection fees, in connection with state or local requirements;

(f) The water mains are in use at the time the mains are accepted by the Authority;

(g) Developer has obtained all rights-of-way and easements for the water mains and has transferred such rights-of-way and easements to the Authority; and

(h) Developer has complied with all the terms of this Agreement.

Developer hereby agrees that its offer to dedicate the water distribution facilities and related accessories and appurtenances shall be enforceable by the Authority in an action in equity, and Developer shall be responsible for all court costs and reasonable legal fees incurred by the Authority in the event it becomes necessary to seek such specific performance.

9. Prior to the commencement of any construction or the recording of any plans relating to the Project, Developer shall furnish Authority with an improvement guarantee in the form and the amount required by the Municipality Authorities Act of 1945, as amended. Such improvement guarantee must be approved by the Authority's solicitor and engineer. Developer's improvement guarantee shall not be released until all water distribution facilities and related land rights, including easements, have been properly dedicated to the Authority and until all "as constructed" drawings have been furnished to the Authority.

10. Developer shall guarantee the correction of all defective work and material discovered during a period of eighteen (18) months from the date of acceptance of the water mains. All water mains shall be tested by Developer under the supervision of the Authority's engineer or employees eighteen (18) months following acceptance, and Developer shall correct any defective work and material discovered during such inspection at its sole expense. Authority may, at its option, require Developer to post financial security to secure the structural integrity and the functioning of the water mains in accordance with the approved design and specifications and the Authority's rules and regulations

during said eighteen (18) month period as a condition to acceptance of said water mains.

11. Prior to and as a condition precedent to Authority's final acceptance of the water mains, Developer shall transfer to the Authority full and absolute ownership, free and clear of all liens and encumbrances, to all water mains, fittings, valves, meters, hydrants, accessories, and appurtenances as required to be constructed in the construction plans and specifications and title to all easements and rights-of-way through, in or on private property for ingress to, egress from, and maintenance and replacement of the water mains, all of which shall be subject to the approval of the Authority's solicitor.

12. In further consideration of the Authority's undertakings herein, Developer hereby irrevocably dedicates to the Authority, free of all liens and encumbrances, all necessary rights-of-way, which shall include rights-of-way and easements within all streets whether or not such streets are or will be offered for dedication (as determined in the sole discretion of the Authority's engineer), for the reconstruction, enlargement, repair, inspection, maintenance, removal, relocation and extension of the water mains on, upon, under and through Developer's tract of land.

Developer shall furnish Authority with legal descriptions for said rights-of-way, if such descriptions are requested by the Authority, together with evidence satisfactory to the Authority's solicitor (either a policy of title insurance or an attorney's certificate of title) that title to the said rights-of-way is good and marketable and free of all liens and encumbrances.

13. It is understood by the parties hereto that title to the aforementioned water mains shall be and remain in Developer until such time as said water mains are accepted by the Authority and that Developer may not connect to the

Authority's Water System until permission to do so has been obtained from an authorized representative of the Authority.

14. Developer agrees that upon Authority's acceptance of said water mains, title to said mains, together with all accessories and appurtenances thereto, shall be and remain at all times in the Authority, its successors and assigns.

15. In addition to all other responsibilities of Developer under this Agreement, Developer shall be responsible for all maintenance and repairs to all portions of the water mains and any related accessories and appurtenances which are located on or above the surface of the ground until the water mains are officially accepted by the Authority and the term of the maintenance security posted by the Developer has expired, and:

(i) if the water mains are located within the right-of-way of a street which has been offered for dedication to the Township, until the final wearing course has been installed and the Township has accepted dedication of such street; or

(ii) if the water mains are located within a private street or access drive which will not be dedicated to the Township, until the final wearing course has been installed on such private street or access drive and the Authority has been granted all necessary easements for the water mains.

During such time as Developer is responsible for the maintenance and repair of the water mains and any related accessories and appurtenances which are located on or above the surface of the ground, Developer will repair any damage, or at the option of the Authority will reimburse the Authority for repairs made by employees, agents or contractors of the Authority for any damage, to the water mains. Such damage includes but is not limited to damage to facilities caused

by the plowing of snow or other maintenance of the streets. The provisions of this Paragraph shall not be interpreted to diminish or affect the rights of the Authority upon acceptance of dedication of the water mains.

16. Developer agrees to secure a permit from the Authority and to pay the appropriate connection and/or tapping fees as established by the Authority from time to time prior to commencing construction of the water mains. A copy of the Authority's tapping and connection fee resolution, as amended and as may be amended in the future, is on file at the office of the Authority and is incorporated herein by reference hereto. Developer acknowledges that a tapping fee will be payable to the Authority for each dwelling unit or equivalent dwelling unit in the Project prior to the commencement of the construction of each dwelling unit or nonresidential facility.

17. Developer shall be responsible for compliance with all applicable soil erosion and sedimentation control requirements. All charges, fees and filings in connection with these requirements shall be the Developer's responsibility.

18. Developer agrees to give the Authority ten (10) days' written notice of Developer's intention to begin construction of the water mains so that the construction may be properly inspected by the Authority. Any work which has begun without the consent of the Authority will not be approved. In addition, any improperly constructed work will not be accepted. Inspection by the Authority is solely for the purpose of determining that the water mains are constructed in accordance with the Authority's specifications. Methods of construction and conformance with all applicable local, state and federal laws and regulations are the responsibility of the Developer. At all times, the contractor installing the water mains shall keep on the construction site, available to the Authority, one (1) copy of the approved plans and specifications, any shop drawings approved by

the Authority and the Authority's current Standard Construction and Material Specifications for Water Main Extensions.

19. Developer shall hire, employ, and pay its own contractor or contractors to construct the water mains according to the aforesaid approved plans and specification, and the Authority, its servants, agents and/or employees shall have no responsibility or liability for payment of any part of the cost or expenses arising out of or relating to said construction or the labor, materials and equipment used therein or thereon or the acquisition of any rights-of-way. The Authority, its servants, agents and employees, including its engineer, shall have no responsibility or liability whatsoever for any injury or damage to any persons or property occurring upon or associated with the construction of the Project. Developer shall be responsible for any and all safety measures or procedures required by statute, regulation, resolution or good construction practice, and the Authority, its servants, agents and/or employees, including its engineer, shall have no responsibility therefor.

Developer agrees to indemnify and hold harmless the Authority, its engineer, servants, agents and/or employees from any claim for any injury or damage of any nature or kind whatsoever, including costs of investigation and defense and including but not limited to reasonable attorneys' fees, brought by any third party, including Developer's employees or Developer's contractors and their employees, arising from a breach of this Agreement, a breach of the rules and regulations of the Pennsylvania Department of Environmental Resources, the standards of the Pennsylvania Department of Environmental Resources, or from Developer's breach of any other statute, regulation, resolution, ordinance or accepted construction practice, whether relating to the design or installation of the water mains.

APPENDIX 4

FORM CONSTRUCTION COMPLETION LETTER OF CREDIT

Letter of Credit No. _____ (1)

Dated: _____ (2)

West Earl Water Authority
157 West Metzler Road
P. O. Box 725
Brownstown, PA 17508

Dear Members of the Authority:

We hereby issue our irrevocable Letter of Credit in favor of West Earl Water Authority (the "Authority") for any sum or sums not exceeding \$ _____ (3) for the account of _____ (4) (hereinafter called "Developer"). This Letter of Credit pertains to the plan of _____ (5) which was prepared by _____ (6).

Intending to be legally bound, we hereby agree:

1. That demands, in an aggregate amount not exceeding \$ _____ (7) accompanied by a document in the form attached hereto and marked Exhibit X (executed by the Chairman or Vice Chairman of the Board of Authority), shall be duly honored if presented to us, at our office at _____ (8), Pennsylvania, before _____ (9) (such date hereinafter referred to as the "expiration date").

2. That the expiration date of this Letter of Credit shall be automatically extended for additional one (1) year periods, beginning with the expiration date and upon each anniversary of such date, unless at least thirty (30) days prior to such expiration date or each anniversary of such date we notify the Authority in writing, by certified mail, addressed to the Authority at 157 West Metzler Road, P. O. Box 725, Brownstown, Pennsylvania 17508, that we elect not to renew this Letter of Credit.

3. That for each yearly period that this Letter of Credit is automatically extended beyond _____ (10), the amount of this letter of credit shall be increased by an additional _____ (11) or ten (10%) percent of the outstanding balance, whichever is less, but such increases shall not exceed a total of more than \$ _____ (12) in the aggregate in any event.

Payment of this Letter of Credit shall be made without determination of conditions or facts pertaining to related contractual agreements between the Developer and the Authority.

Except as otherwise provided herein, this Letter of Credit is subject to the Uniform Customs and Practice for Documentary Credits (1983 Revision), International Chamber of Commerce Publication No. 400, and the Uniform Commercial Code.

Intending to be legally bound hereby, this Letter of Credit has been executed by a duly authorized officer of the undersigned Bank.

Sincerely,

_____(13)

By: _____(14)
(15)

APPENDIX 5

FORM BILL OF SALE

IN WITNESS WHEREOF, _____
has caused this Bill of Sale to be duly executed this _____ day
of _____, 19____.

Attest: _____
Secretary

By: _____
President

[CORPORATE SEAL]

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF LANCASTER)

On this _____ day of _____, 19____, before me, a
notary public, the undersigned officer, personally appeared _____
_____, who acknowledged himself to be the
_____ of _____, a
Pennsylvania corporation, and that as such _____
_____ being authorized to do so, acknowledged the foregoing
Bill of Sale for the purpose therein contained, by signing the name
of the Corporation by himself as _____.

WITNESS my hand and notarial seal.

Notary Public

IN WITNESS WHEREOF, _____
has caused this Bill of Sale to be duly executed this _____ day
of _____, 19____.

Attest: _____
Secretary

By: _____
President

[CORPORATE SEAL]

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF LANCASTER)

On this _____ day of _____, 19____, before me, a
notary public, the undersigned officer, personally appeared _____
_____, who acknowledged himself to be the
_____ of _____, a
Pennsylvania corporation, and that as such _____
_____ being authorized to do so, acknowledged the foregoing
Bill of Sale for the purpose therein contained, by signing the name
of the Corporation by himself as _____.

WITNESS my hand and notarial seal.

Notary Public

APPENDIX 6

FORM AGREEMENT PROVIDING FOR GRANT OF UTILITY EASEMENT

Instructions to Complete Agreement Providing for Grant of Utility Easement

1. On Page 1 insert name of landowner in the first blank. The name of the developer or individual or husband and wife should be exactly as it or they appear on the deed by which the developer, individual or husband and wife took title to the property. If the developer does not presently own the land to be developed, the standard form and process cannot be used. Contact the Authority Solicitor for further information. If husband and wife own the property or if the landowner is married, both names must be included and both persons must sign. The second blank on page 1 should be completed with a description of the landowner. The permitted descriptions are adult individual; adult individuals and husband and wife; Pennsylvania (or appropriate state) partnership; Pennsylvania (or appropriate state) limited partnership; Pennsylvania (or appropriate state) corporation. The last blanks on Page 1 should be completed with the address of the landowner.
2. On Page 2, the name of the development and the date of the Agreement with the Authority should be inserted in the appropriate blanks.
3. The Agreement Providing for Grant of Utility Easement must be signed by the landowner(s) in the presence of a notary who must acknowledge the signature(s). If the land is owned by husband and wife, or if the landowner is married, both must sign. If the land is owned by a general partnership, all partners must sign. Appropriate forms for signature based on the status of the landowner are included.
4. The signature of the grantor(s) must be acknowledged before a notary public in order for the easement to be recorded. The proper acknowledgement should be selected, completed by the notary public, and attached.
5. Attach Exhibits "A" and "B". Exhibit "A" must include a metes and bounds legal description of the easement. Exhibit "B" must include a plan of the easement and its location. The plan should be on a sheet 8 1/2" x 11".
6. If the property has or will have a mortgage placed on it before the recording of the Agreement Providing for Grant of Utility Easement, the Mortgagee will have to join in the Easement. A form of Joinder by Mortgagee is attached. If the landowner does not submit a Joinder by mortgagee, a lien search indicating that the property is free of all liens and encumbrances must be submitted.
7. The developer must provide the Authority with the name of the landowner(s), a copy of the recorded deed for the property and with the tax parcel number for the property so that the Authority can verify the information concerning title to the property and any liens affecting it.

permanent right-of-way as described in Exhibit "A" and as shown on the plan marked Exhibit "B", at all times and in all seasons forever hereafter, in order to construct, reconstruct, enlarge, repair, inspect, maintain, operate, use, remove or relocate any water main or mains, manholes, hydrants or other accessories and appurtenances.

And together with such reasonable ingress, egress, and regress to and for the said Grantee over and through the lands of the Grantor to enable the said Grantee to obtain access to the permanent right-of-way as described in Exhibit "A" and as shown on the plan marked Exhibit "B".

The Grantor herein, as a covenant running with the land, for itself, its successors and assigns, covenants that no building or other structure shall be erected or maintained within the boundary lines of the permanent right-of-way as described in Exhibit "A" and as shown on said plan marked Exhibit "B".

Grantor is developing a tract of land in the Township of West Earl (of which the tract described in Exhibit "A" is a part), said development to be known as _____ (the "Development"). Grantor, under the terms of an agreement or agreements with Grantee dated _____, 199__ (the "Agreement"), has agreed to construct a water distribution system for the Development in accordance with Grantee's rules and regulations, said water distribution system to be conveyed and dedicated to Grantee upon completion subject to the terms and conditions specified in the Agreement. Until such time as the distribution

system is conveyed and dedicated to Grantee and until Grantee accepts such dedications, Grantor retains the right (which shall not be in limitation of Grantee's rights hereunder) to exercise any and all rights granted to Grantee hereunder in order for Grantor to complete the construction of the water distribution system pursuant to the Agreement.

TO HAVE AND TO HOLD all and singular the privileges, rights-of-way and appurtenances above mentioned to it, the said Grantee, its successors and assigns, to the proper use and benefit of it, the said Grantee, its successors and assigns, forever.

The Grantor hereby warrants specially the permanent right-of-way and easement hereby granted.

This Agreement shall be binding upon and inure to the benefit of the heirs, personal representatives, successors and assigns and the lessees of Grantor and Grantee.

For the purpose of this Agreement, the neuter gender shall be deemed to include the feminine and the masculine, and vice versa. Unless the context otherwise requires, the use of the singular and plural shall be interchangeable.

IN WITNESS WHEREOF, Grantor has executed or caused these presents to be executed this _____ day of _____, A.D., 199__.

(Individual or Husband and Wife Developer)

Witness:

(Signature of Individual) (SEAL)

(Signature of Spouse if Husband and
Wife are Co-Developers or if
Developer is married) (SEAL)

if individual or spouses operate a
business:

Trading and doing business as:

(Partnership Developer*)

(Name of Partnership)

Witness:

By: _____
Partner

By: _____
Partner

By: _____
Partner

*All Partners must execute this Agreement. Additional signature
lines should be attached if necessary.

(Corporation Developer)

(Name of Corporation)

Attest: _____
(Assistant) Secretary

By: _____
(Vice) President

[CORPORATE SEAL]

(INDIVIDUAL OR HUSBAND AND WIFE ACKNOWLEDGEMENT)

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF LANCASTER)

On this the ____ day of _____, 19____, before me,
the subscriber, a notary public in and for the aforesaid Common-
wealth and County, came the above-named _____,
known to me (or satisfactorily proven) to be the person(s) whose
name(s) is(are) subscribed on the within instrument, and acknowl-
edged the foregoing Agreement Providing for Grant of Utility Ease-
ment to be his/her/their act and deed and desired the same to be
recorded as such.

Witness my hand and notarial seal.

Notary Public

My commission expires:

Figure 1

—

10

10. 10

Notary Public

My commission expires:

(CORPORATE DEVELOPER ACKNOWLEDGEMENT)

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF LANCASTER)

On this _____ day of _____, 19____, before me, a
notary public, the undersigned officer, personally appeared _____
_____, who acknowledged _____self to be the _____
_____ of _____, a corporation, and
that as such officer, being authorized to do so, acknowledged the
foregoing Agreement Providing for Grant of Utility Easement for the
purpose therein contained by signing the name of the corporation by
_____self as _____.

Witness my hand and notarial seal.

Notary Public

My commission expires:

Joinder by Mortgagee

_____ ("Mortgagee") as holder of a certain mortgage on the within-described Premises, which mortgage, in the amount of \$_____, is dated _____, and was recorded on _____, 199__, in the Recorder of Deeds Office in and for Lancaster County, Pennsylvania, in Record Book _____, Page _____, or will be recorded in the Recorder of Deeds Office in and for Lancaster County, Pennsylvania, as well as any other mortgages which Mortgagee may now or hereafter hold on the Premises (all such mortgages hereinafter collectively referred to as the "Mortgages"), joins in, consents to, and expressly approves the grant of easements and other rights and privileges described in the attached Agreement Providing for Grant of Utility Easement (the "Agreement").

The Mortgagee, for itself, its successors and assigns (which shall include any assignee of the Mortgages and any purchaser of the Premises at a sale in foreclosure of the Mortgages or otherwise), hereby covenants and agrees that the rights and privileges herein granted with respect to the Premises shall not be terminated or disturbed by reason of any foreclosure or other action which may be instituted by the Mortgagee, its successors and assigns, as a result of any default under the Mortgages or the debt instruments that such Mortgages secure. Mortgagee by consenting to the Agreement shall not by virtue of its interest as Mortgagee be deemed to

IN WITNESS WHEREOF, Mortgagee hereby joins in the execution of
this Agreement as of the day and year first above written.

By: _____

[SEAL]

On this _____ day of _____, 19____,
before me, a notary public, the undersigned officer, personally
appeared _____, who ac-
knowledged _____ self to be the _____ of
_____, a corporation, and that as such
officer being authorized to be so, acknowledged the foregoing
instrument for the purpose therein contained by signing the name of
the Bank by _____ self as _____.

Notary Public

My commission expires:

APPENDIX 7

FORM MAINTENANCE LETTER OF CREDIT

Letter of Credit No. _____(1)

Dated: _____(2)

West Earl Water Authority
157 West Metzler Road
P. O. Box 725
Brownstown, PA 17508

Dear Members of the Authority:

We hereby issue our irrevocable Letter of Credit in favor of West Earl Water Authority (the "Authority") for any sum or sums not exceeding \$ _____(3) for the account of _____(4) (hereinafter called "Developer"). This Letter of Credit pertains to the plan of _____(5) which was prepared by _____(6).

Intending to be legally bound, we hereby agree that demands made as a result of deficiencies in the structural integrity of, or as a result of the improper functioning of, any improvement installed as a part of the Development which was dedicated to the Authority by the Developer and accepted by the Authority, in an aggregate amount not exceeding \$ _____(7) accompanied by a document in the form attached hereto and marked Exhibit X (executed by the Chairman or Vice Chairman of the Board of the Authority), shall be duly honored if presented to us, at our office at _____(8), Pennsylvania, before _____(9). We fully understand that the improvements were required to be installed in accordance with the design and specifications as depicted on the approved plans and as set forth in the Authority's rules and regulations.

Payment of this Letter of Credit shall be made without determination of conditions or facts pertaining to related contractual agreements between the Developer and the Authority.

Except as otherwise provided herein, this Letter of Credit is subject to the Uniform Customs and Practice for Documentary Credits (1983 Revision), International Chamber of Commerce Publication No. 400, and the Uniform Commercial Code.

Intending to be legally bound hereby, this Letter of Credit has been executed by a duly authorized officer of the undersigned Bank.

Sincerely,

_____(10)

By: _____(11)

(12)

EXHIBIT X

TO: _____ (13)

We hereby demand payment to West Earl Water Authority of the sum of \$ _____, and certify that this demand is made because of the failure of _____
_____ (14) to properly install and/or to repair or replace any deficiencies in the structural integrity of, or to enable the proper functioning of, and in order to enable us to repair to our satisfaction, manholes, water mains, hydrants and other appurtenances and/or other improvements required to be installed in connection with the Development known as _____
_____ (15), which improvements were dedicated to and accepted by West Earl Water Authority.

WEST EARL WATER AUTHORITY

By: _____
(Vice) Chairman

INSTRUCTIONS TO COMPLETE LETTER OF CREDIT

This form is only to be used as a maintenance guarantee after improvements have been constructed. The Authority has available a separate form to be used as an improvement guarantee to insure the initial construction of improvements.

(1) Number assigned to Letter of Credit by lending institution.

(2) Date of Letter of Credit.

(3) Amount of Letter of Credit (must be fifteen (15%) percent of the actual cost of installation of the improvements dedicated to and accepted by the Authority).

(4) Full name of developer.

(5) Name of subdivision or land development.

(6) Location of subdivision or land development.

(7) Same as No. 3 above.

(8) Address of lending institution.

(9) Expiration date of Letter of Credit (shall be at least eighteen months from the date of the meeting of the Board of the Authority at which dedication of the improvements will be accepted).

(10) Name of the lending institution issuing Letter of Credit.

(11) Signature of officer of lending institution executing the Letter of Credit.

(12) Name and title of officer executing the Letter of Credit.

(13) Same as No. 10 above.

(14) Same as No. 4 above.

(15) Same as No. 5 above.