STRASBURG BOROUGH AUTHORITY

WATER SPECIFICATIONS

JANUARY 2025

SECTION 1 – GENERAL REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Capacity, Design, & Construction Approval Process Policy.

B. Design considerations and requirements.

C. Easement requirements.

1.02 CAPACITY, DESIGN, & CONSTRUCTION APPROVAL PROCESS POLICY

A. DEVELOPER shall refer to "Strasburg Borough Authority Capacity, Design, & Construction Approval Process Policy" for information on the following items:

1. Minimum submission requirements for sewer capacity requests.

2. Initial plan submission requirements.

3. The comment response process and final design approval requirements.

4. Items required prior to acquiring construction permits.

5. Construction closeout procedures.

6. Dedicated facilities closeout procedures.

1.03 DESIGN CONSIDERATIONS AND REQUIREMENTS

A. Water Services:

1. The AUTHORITY will allow one (1) domestic water and one (1) fire suppression water connection to the AUTHORITY system per established lot.

2. In the event that a new water service is desired on a lot with an existing water service, the existing water service shall be demolished in accordance with AUTHORITY regulations.

3. For new water services, the AUTHORITY's Engineer shall have the ability to require additional valves to be installed at their sole discretion.

B. Water Mains:

1. For new connections to the AUTHORITY system, DEVELOPER may be required to extend water mains within the public right-of-way to the furthest property lines or corners of the development under consideration.

The location of such extensions shall be determined or approved by the AUTHORITY Engineer so as to comply with the AUTHORITY's long-range facilities planning.

2. Sizes, materials, and locations of waterlines and hydrants intended for dedication shall be determined or approved by the AUTHORITY Engineer so as to comply with the AUTHORITY's long-range facilities planning.

C. Improvements in Flood-Prone- or High-Water-Table Areas:

1. Manholes in flood-prone or high-water-table areas shall be subject to additional requirements as compared to manholes in other areas. These requirements may include:

a. Clay dikes (refer to SECTION 3 – TRENCHING, BACKFILLING, AND COMPACTION for detailed information).

b. Watertight manhole frames and covers (refer to SECTION 6 – MANHOLES for detailed information).

c. Heat-shrinkable manhole seals (refer to SECTION 6 – MANHOLES for detailed information).

1.04 EASEMENTS

A. Water Easements:

1. Easements shall be provided for water mains within private property that are intended for dedication to the AUTHORITY.

2. All easements shall be a minimum of 30 feet in width, centered on the water mains, unless otherwise allowed by the AUTHORITY.

3. Easements shall recite all details and rights to enter thereon for any purpose appropriate to the inspection, repair, or maintenance of the AUTHORITY system.

4. The AUTHORITY shall have free ingress, egress, and regress on, over, and through the easement at all times and seasons, with reasonable prior notice except in the case of an emergency, in order to inspect, monitor, maintain, reconstruct, enlarge, repair, remove, relocate, or related functions any water mains, manholes, connection fittings, or other appurtenances as the AUTHORITY deems necessary in its sole discretion.

5. No building, fence, lighting fixture, pond, swimming pool, driveway, parking lot, or other permanent structure shall be erected or located within the water easement. No vehicles, campers, trailers, boats, or other large equipment or facilities shall be stored within the easement on a long-term

basis. No trees, shrubbery, or bushes shall be planted within the boundaries of the easement. In the event that the AUTHORITY is not able to access the easement due to any of the foregoing, the AUTHORITY shall have the right, but not the obligation, to remove such obstruction at the owner's expense.

6. Property owners shall not be due compensation from the AUTHORITY for damage to permanent structures, vehicles, or other large equipment, or loss of trees, shrubbery, or bushes resulting from work performed by the AUTHORITY that occurs to such items that are placed within the easement following execution of an easement agreement.

7. Property owners shall not alter the grade nor construct landscaping features within the easement that would impair access by the AUTHORITY.

B. Access Easements:

1. Access easements may be required to allow the AUTHORITY to access their facilities, and the AUTHORITY may require the inclusion of these easements on a case-by-case basis, where reasonable and deemed necessary.

2. Widths of easements are also to be determined on a case-by-case basis.

3. Easements shall recite all details and rights to enter thereon.

END OF SECTION

SECTION 2 – CONSTRUCTION SUBMITTALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures.

B. Action on construction submittals.

C. Construction progress schedules.

D. Proposed products list.

E. Shop drawings.

F. Manufacturers' instructions.

1.02 SUBMITTAL PROCEDURES

A. For a complete list of items required prior to construction, refer to the "Strasburg Borough Authority Capacity, Design, & Construction Approval Process Policy."

B. When requested by AUTHORITY, submit three copies of complete schedule of all anticipated submittal dates.

C. Transmit each submittal to AUTHORITY in accordance with schedule.

D. Sequentially number the transmittals. Resubmittals to have original number with an alphabetic suffix.

E. Identify Project, subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.

F. Apply Design Consultant's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work. Submittals not containing Design Consultant's stamp shall be returned.

G. Schedule submittals to expedite the Project and deliver to AUTHORITY. Coordinate submission of related items.

H. Identify variations from Drawings and Product or system limitations which may be detrimental to successful performance of the completed Work.

I. Revise and resubmit submittals as required, clearly identify all changes made since previous submittal.

J. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.03 ACTION ON CONSTRUCTION SUBMITTALS

A. AUTHORITY's Action: Where action and return is required or requested, AUTHORITY will review each submittal, mark with the action taken and return within a reasonable time period. Where submittal must be held for coordination, Design Consultant will be so advised by AUTHORITY.

B. Submittals returned with "REVIEWED" action indicates that the information submitted was found to be in conformance with the design concept and in compliance with the requirements of the Drawings. DEVELOPER may proceed with performance of the work covered by the submittal.

C. Submittals returned with "REVIEWED AS NOTED" action indicates that the information submitted was found to be in conformance with the design concept and in compliance with the requirements of the Drawings, provided the noted clarifications or corrections are completed. Submission of a corrected submittal indicating the changes noted by AUTHORITY is not required. DEVELOPER may proceed with performance of the work covered by the submittal.

D. Submittals returned with "REVISE AND RESUBMIT" action indicate that: (1) information submitted is at least partially not in conformance with these Requirements, (2) information submitted is at least partially not in compliance with the Requirements, (3) submittal is incomplete and does not include all items required by the individual specification Sections, or (4) certifications or computations required by the individual specification Sections have not been included in the submittal. Submittal will be returned to Design Consultant noting the reasons for noncompliance. DEVELOPER shall not proceed with the performance of the work covered by submittal until corrected information is submitted and approved.

E. Submittals returned with "NOT APPROVED" action indicates that AUTHORITY interprets the information submitted to be not in conformance with the design concept or not in compliance with these Requirements. Performance of the work shall not proceed until submittal is revised, resubmitted and reviewed.

1.04 CONSTRUCTION PROGRESS SCHEDULES

A. If required by AUTHORITY, submit one copy of initial progress schedule to AUTHORITY for review and comment. Submit revisions when requested by the AUTHORITY, to reflect changes to the initially submitted schedule.

1.05 PROPOSED PRODUCTS LIST

A. If requested by AUTHORITY, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product. Submit number of copies DEVELOPER requires, one copy to be retained by AUTHORITY, and an electronic copy for review by the AUTHORITY ENGINEER.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.06 SHOP DRAWINGS

A. Submit the number of opaque reproductions which DEVELOPER requires, one copy which will be retained by AUTHORITY, and an electronic copy for review by the AUTHORITY ENGINEER. Each shop drawing must be marked with the name of the project and numbered consecutively.

B. All work which is related to shop drawing approval shall not be initiated until approved shop drawings have been received from AUTHORITY.

C. All work initiated by DEVELOPER prior to receipt of approved shop drawings shall be at the sole risk of DEVELOPER. Any and all rework, modifications or reinstallations necessitated by changes in the Work due to changes required by subsequently approved shop drawings will be done by DEVELOPER.

1.07 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Drawings.

END OF SECTION

SECTION 3 – TRENCHING, BACKFILLING AND COMPACTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Excavating trenches for utilities.

B. Backfilling and compaction.

1.02 RELATED WORK

A. Section 4 – Boring and Jacking.

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T 99, Standard Method of Test for Moisture-Density Relations of Soils Using a 5.5-lb. Rammer and a 12-inch Drop, most recent edition.

2. AASHTO T 191, Standard Method of Test for Density of Soil In-Place by the Sand Cone Method, most recent edition.

B. American Society for Testing and Materials:

1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort, most recent edition.

2. ASTM D2167 – Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method, most recent edition.

3. ASTM D2321 – Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe, most recent edition.

4. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth), most recent edition.

C. Occupational Safety and Health Administration:

1. OSHA 29 CFR, Part 1926, Subpart P, Construction Standards for Excavation

D. Commonwealth of Pennsylvania Department of Transportation (PennDOT)

1. Publication 408 – Specifications

a. PDT Section 703 Aggregates.

E. State Code: Commonwealth of Pennsylvania, Pennsylvania Code, Title 67. Transportation, Department of Transportation, Chapter 459, Occupancy of highways by Utilities, as supplemented or revised (Penn DOT Chapter 459).

F. State Publication: Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Transportation, Department of Transportation, Chapter 203, Work Zone Traffic Control (Penn DOT Chapter 203).

G. Strasburg Borough

1. Roadway Requirements

2. Blasting Requirements

H. Strasburg Township

1. Roadway Requirements

2. Blasting Requirements

1.04 DEFINITION

A. Definitions:

1. Subgrade: Trench bottom prepared as specified to receive pipe bedding, concrete cradle or concrete encasement of the bottom of excavations prepared to receive pipeline structures.

2. Utility: Any buried pipe, duct, conduit, or cable

3. Final Restoration Elevation: Elevation of bottom of final restoration operation such as bottom of topsoil depth or paving Subgrade.

1.05 REGULATORY REQUIREMENTS

1. Work performed within State Highway rights-of-way shall be completed according to Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Department of Transportation, Chapter 459, Occupancy of Highways by Utilities and if applicable, the PennDOT Highway Occupancy Permit

secured by DEVELOPER. Work within the State Highway rights-of-ways shall be subject to inspection by representatives of PennDOT.

2. Work performed within Borough rights-of-way shall be completed according to Strasburg Borough's requirements.

1.06 PROJECT CONDITIONS

A. Removal of Obstructions:

1. Remove, realign, or change the direction of above or below ground utilities and their appurtenant supports, if such is required in the opinion of AUTHORITY. Perform such work unless such work is done by the owner of the obstruction. However, uncover and sustain the obstruction at own expense prior to the final disposition of obstruction. Additional precautions concerning obstructions are as follows:

a. Do not interfere with persons, firms, corporations, or utilities employing protective measures, removing, changing, or replacing their property or structures, but allow said persons, firms, corporations or utilities to take such measures as they may consider necessary or advisable under the circumstances.

b. Break through and reconstruct, if necessary, the invert or arch of a sewer, culvert or conduit that may be encountered if the said structure is in such a position, in the judgment of AUTHORITY, as not to require its removal, realignment or complete reconstruction.

B. Environmental Requirements:

1. Do not perform trenching, backfilling or compacting when weather conditions or the condition of materials are such, in the opinion of AUTHORITY, that work cannot be performed satisfactorily.

2. Do not use frozen materials as backfill or wet materials containing moisture in excess of the amount necessary for satisfactory compaction.

3. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.

4. Plan work to provide adequate protection during storms with provisions available for preventing flood damage. Protect installed piping and other work against damage from uplift due to high ground water levels.

5. Accommodation of Drainage: Keep gutters, sewers, drains, and ditches open for surface drainage. No damming or ponding or water in gutters or other waterways will be permitted, except through approved pipes or properly constructed troughs. When so required, provide pipes or troughs of such sizes and lengths as required, and place the same as required. Perform grading in the vicinity of trenches so that the ground surface is properly pitched to prevent water running into the trenches.

6. Pumping: Keep excavations free from standing water. Build dams and other devices necessary for this purpose and provide and operate pumps of sufficient capacity for dewatering the excavations. Provide for the disposal of the water removed from excavations in such manner as not to cause injury to the public health, to public or private property, to the work of others, to the portion of the work completed or in progress or produce an Impediment to the use of streets, roads, and highways.

7. When it is necessary to haul soft or wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clear away spillage of materials caused by hauling on roadways.

8. Provide effective dust control by sprinkling water, use of calcium chloride or other method approved by AUTHORITY. Employ dust control when, where and in a manner required by AUTHORITY.

9. Do not dispose of water in trenches by draining through completed portions of the work.

C. Protection: Assume the risks attending and presence or proximity of overhead or underground public utility and private lines, pipes, conduits and support work for same, existing structures and property of whatever nature. Damages and expenses for direct or indirect injury to such structures or to any person or property by reason of them or by reason of injury to them; whether such structures are or are not shown on the Drawings, rests solely with DEVELOPER.

1. Outside Rights-of-Way: Take necessary precautions to protect trees, shrubs, lawns, and such landscaping from damage. Complete restoration work for damaged areas.

2. Pipe Supports: Adequately support underground pipes or conduits exposed as a result of excavations. Provide adequate support along their entire exposed length. Install such supports in such manner that backfilling may be performed without dislodging such pipes or conduits. Place and carefully compact Aggregate Backfill around the supports and leave such supports in place as a guard against breakage due to backfill settlement.

3. Temporary Protective Construction:

   a. Temporary Fence Barricade: Erect and maintain substantial temporary fences surrounding excavation to prevent unauthorized persons from entering such areas.

   b. Barricades: Furnish and erect substantial barricades at crossings of trenches, or along trenches, to protect the traveling public.

   c. Cover open excavation when work therein is suspended or left unattended, including the end of a workday. For such covers, use materials of sufficient strength and weight to prevent their removal by unauthorized persons.

   d. Remove temporary protective construction at the completion of work.

D. Structure Supports: Where passing buildings or any structure which by their construction or position might bring a great pressure upon the trenches, the right reserved by AUTHORITY to require that such buildings or structures be underpinned or supported and protected, or special sheeting be driven or that short lengths of trench be opened at one time. Failure of AUTHORITY to recommend said protection shall not relieve DEVELOPER of his responsibility to protect structures near the construction.

E. Accommodation of Traffic: Do not obstruct streets, roads, and highways unless Strasburg Borough authorized in writing the complete closing of the street, road, or highway. Employ such measures as may be necessary, including flag persons, to keep the street, road, or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three feet wide and free from obstructions. No to obstruct fire hydrants.

F. Explosive and Blasting:

1. Blasting will be permitted only in areas permitted by Strasburg Borough or Strasburg Township and where the proximity of structures, underground facilities or public safety does not preclude the use of explosives. Blasting must comply with Borough or Township regulations.

2. 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 and any other applicable federal, state, or local codes that may have jurisdiction.

3. All blasts shall be properly matted and securely covered. DEVELOPER shall be solely responsible for injury to persons or property located within or beyond the area or scope of the project that may result from use of explosives.

4. Blasting work shall be supervised by personnel licensed and experienced in this type of work.

5. Explosives shall be stored in state-approved magazine off the job site and shall be delivered to the site in vehicles clearly marked to indicate cargo.

6. Blasting within State Highway and railroad rights-of-way is not permitted unless authorized by PennDOT or the railroad. DEVELOPER shall be responsible for securing required permits.

7. Notify utilities having structures or other installations above or below ground in proximity to the trenching work prior to use of explosives. Such notice must be given sufficiently in advance to enable the utilities to take such steps as they may deem necessary to protect their property from injury. Such notice shall not relieve DEVELOPER of responsibility of damage resulting from his use of explosives. The right is reserved to direct that rock within five (5) feet of pipe, conduit or other structures encountered in the trench be removed by methods other than blasting.

8. Cease blasting operations when street paving adjacent to trench is damaged. Repair damaged street paving. Submit to AUTHORITY methods to be used in subsequent blasting. Do not proceed with blasting without written approval of AUTHORITY on methods to be used in subsequent blasting.

G. Removal of Rock by Means Other Than Blasting: Where removal of rock by means other than blasting is required, in accordance with the requirements of State and local laws, rules and regulations, and AUTHORITY requirements, remove by the use of mechanical surface impact equipment, or by drilling and hydraulic rock splitting equipment, or by other methods.

H. Responsibility for Condition of Excavation: Condition and results of excavation are solely the responsibility of DEVELOPER. Remove slides and cave-ins at whatever time and under whatever circumstance they occur.

I. Excess Materials: No right of property in materials is granted to DEVELOPER for materials excavated on lands not owned by DEVELOPER. This provision does not relieve DEVELOPER of his responsibility to remove and dispose of surplus excavated materials.

J. Borrow Material: When the required quantity of backfill material exceeds the quantity of suitable on site material, provide borrow material. If borrow material is needed, notify AUTHORITY sufficiently in advance to permit AUTHORITY to verify such need and to view the proposed borrow pit to determine the material suitability. Borrow excavation will be subject to AUTHORITY approval whose written consent shall be obtained prior to its use. DEVELOPER shall be responsible for all sampling and testing required by AUTHORITY to determine suitability.

K. Change of Trench Location or Depth: AUTHORITY reserves the right to change the location of a trench from that indicated on the Drawings due to the presence of an obstruction, or for other causes.

L. Advance Trenching: Where existing utilities or other suspected underground obstructions as indicated on the Drawings are within close proximity of proposed pipelines, uncover and verify the exact location of utilities and other underground obstructions far enough in advance of pipe laying to allow any changes in pipe alignment or grade required to bypass the obstructions to avoid removing sections of pipe already installed. If any sections of installed pipe must be removed and reinstalled as a result of not verifying utilities or other underground obstructions far enough in advance, DEVELOPER shall remove and reinstall the pipe.

1.07 FIELD MEASUREMENTS

A. Verify that survey benchmark, control point, and intended elevations for the Work are shown on the Drawing.

PART 2 – PRODUCTS

2.01 FILL MATERIAL

A. Earth Backfill: On site excavated soil or soil-rock mixed materials free of topsoil, vegetation, lumber, metal, and refuse; and free of rock or similar hard objects larger than six inches in greatest dimensions. Rock to soil ratio shall not exceed one part rock to three parts soil.

B. Aggregate Backfill: PennDOT 2A Modified Aggregate conforming to PennDOT Publication 408, Section 703.

C. Pipe Bedding and initial Backfill:

1. Pipe Bedding: AASHTO No. 8 Coarse Aggregate conforming to PennDOT Publication 408, Section 703.2.

2. Initial Backfill: AASHTO No. 8 Coarse Aggregate conforming to PennDOT Publication 408, Section 703.2.

3. Concrete Cradle and Encasement: PennDOT Publication 408, Section 704, Type A, a 28-day minimum mix design compressive strength of 3,300 psi.

4. Clay Dike: Clay containing no more than 15% (by volume) stone no larger than two (2) inches in diameter.

D. Unsuitable Bearing Replacement: AASHTO No. 3 Coarse Aggregate conforming to PennDOT Publication 408, Section 703.2

E. Underground Warning Tape: Required for all pipe.

1. Printed polyethylene tape, three inches minimum width, color coded, one-inch minimum lettering, printed with name of utility burled below, and suitable for installation in all soil types.

2. Magnetic.

3. Provide for:

a. Water line/service – blue

PART 3 – EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

C. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities which are to remain.

3.02 EXCAVATING

A. Perform sheeting and shoring according to OSHA Standards.

B. Perform soil erosion and sedimentation control work according to Erosion and Sedimentation Control Plan approved by Lancaster County Soil Conservation Office (where applicable).

C. General:

1. Excavation shall be performed to the lines and grades indicated on the Drawings or directed by AUTHORITY.

2. Perform excavation and backfilling using machinery except where hand excavation and backfilling is required or is necessary to protect existing structures, utilities, or other private or public properties.

3. Begin excavation in trenches for sewer lines at the control point having the lower invert and proceed upward.

4. Saw cut existing pavement. Remove pavement according to Strasburg Borough requirements.

5. Remove rock to Subgrade at least twenty-five (25) feet in advance of pipe laying.

6. Do not interfere with 45 degree bearing splay of foundations.

D. Subgrade Preparation:

1. Do not excavate below depths indicated or specified except where unsuitable material is encountered at Subgrade.

2. Remove unsuitable material found below Subgrade to a depth determined by AUTHORITY and backfill with suitable material or as directed by AUTHORITY to required Subgrade.

3. Remove rocks or other hard matter protruding through trench bottom at Subgrade which could damage pipe or impede consistent backfilling or compaction. Backfill with AASHTO No. 8 Coarse Aggregate to required Subgrade. Compact in four (4) inch lifts.

4. Remove rock below Subgrade if shattered due to excessive drilling impact or splitting operations and in the opinion of AUTHORITY it is unfit for foundations. Backfill to Subgrade with Concrete or other material acceptable to AUTHORITY.

E. Excavated Material Storage:

1. Separate and stockpile in designated area, excavated materials suitable for use as backfill. Remove from the site, excess materials, and excavated materials not suitable for backfill.

2. In no case shall excavated materials be stockpiled outside of the construction easements or the permanent right-of-way if construction easements are not in place.

3. In streets, roads, and highways or in any other locations where working space is limited, remove the excavated materials from the first 100 feet of any opening, when required by AUTHORITY, as soon as such is excavated; store and return same for backfilling when required. In no case will DEVELOPER be allowed to cast excavated material beyond the curb or right-of-way lines on sidewalks or lawns.

4. At all times keep excavated materials at least five (5) feet back from edge of trench to facilitate access.

F. Trench Width:

1. From Subgrade elevation to an elevation at least twelve (12) inches above the top of the outside barrel of the pipe, excavate trench banks to vertical lines and not less than the minimum or more than the maximum widths specified in Table A. If sheeting is required, the Table A dimensions apply to the inside face of sheeting.

Table A

Minimum Trench Width (outside diameter of pipe at the barrel plus)	Maximum Trench Width (outside diameter of pipe at the barrel plus)
12 inches	16 inches

2. Refer to PennDOT requirements for trench width within the PennDOT rights-of-way.

3. From a point twelve (12) inches above at the top of the outside barrel of the pipe, maintain trench banks as follows:

a. Vertical as possible for trenches in paved or unpaved roadways, with a maximum of forty (40) inches.

b. In open areas, trenches may be sloped at angles required to make trench stand; however, in no case shall angle exceed one-half horizontal to one vertical.

c. Top of trench shall not exceed limits of right-of-way or construction easement if such is in place.

d. Maintain trenches such that there is no conflict with State or OSHA regulations.

G. Length of Open Trench:

1. Complete trench excavation at least twenty-five (25) feet but not more than one hundred (100) feet in advance of pipe laying and keep trenches free from obstructions, except that at the end of a workday or at the discontinuance of work, the pipe laying may be completed to within five (5) feet of the end of the open trench.

2. DEVELOPER shall limit all trench openings to a distance commensurate with all rules of safety.

3. If the work is stopped either totally or partially, DEVELOPER shall refill the trench and temporarily repave over the same. The trench shall not be opened until he is ready to proceed with the construction of the pipeline.

4. AUTHORITY reserves the right to request trench refilling over completed pipe if in AUTHORITY's judgment such action is necessary.

3.03 PIPE BEDDING

A. Place Pipe Bedding and Initial Backfill as specified herein unless indicated otherwise on the Drawing. Place material in trench for full width. Place on each side of pipe and fittings simultaneously.

B. Pipe Bedding: Carefully place on undisturbed Subgrade or compacted Subgrade as approved by AUTHORITY, Pipe Bedding material from six (6) inches below outside of pipe barrel to pipe springline. Work Pipe Bedding material by hand under pipe haunching to provide adequate side support. Place in three (3) inch layers (uncompacted).

C. Initial Backfill: From pipe springline to twelve (12) inches above outside of pipe barrel carefully place initial Backfill in four (4) inch layers (uncompacted). Place carefully so as not to disturb pipe.

3.04 BACKFILL

A. Backfill trenches to contours and elevations indicated on the Drawing.

B. Maintain optimum moisture content of fill materials to attain required compaction density.

C. Do not use frozen backfill materials or place backfill on frozen subgrades or trench subgrades.

D. Perform backfilling by methods which will result in thorough compaction of backfill material.

E. Backfill to Final Restoration Elevation: Backfill from one (1) foot above the top of pipe to Finished Restoration Elevation using backfill materials specified below. Consolidate backfill materials evenly from center to side of trench to prevent arching.

1. Within the Right-Of-Way Limits of Existing State Highways: Backfill material as specified below unless stated otherwise in the approved PennDOT Highway Occupancy Permit.

    a. Paved Areas: Aggregate Backfill compacted in four (4) inch layers to the bottom of the temporary or permanent paving.

    b. Unpaved Shoulders: Aggregate Backfill compacted in four (4) inch layers to existing grade.

    c. Unpaved Areas: Aggregate Backfill compacted in four (4) inch layers to bottom of topsoil. Replace topsoil to approximate depth of existing as final refill operation and crown to such height as required by AUTHORITY. Maintain crowned surface to the satisfaction of AUTHORITY, during the warranty period.

2. Existing and Proposed Borough Roadways and Private Driveways: Aggregate backfill compacted in four (4) inch layers to bottom of temporary or permanent paving.

3. Unpaved Shoulders of Proposed and existing Borough Streets: Backfill compacted in six (6) inch layers to a point six (6) inches below the adjacent existing surface. Refill the remaining six (6) inches with compacted Aggregate Backfill.

4. Unimproved Streets: Aggregate Backfill compacted in eight (8) inch layers to within six (6) inches of existing grade. Refill the remaining six (6) inches with compacted PennDOT 2A Aggregate.

5. Stone Driveways: Backfill compacted in eight (8) inch layers to within six (6) inches of existing grade. Refill the remaining six (6) inches with compacted PennDOT 2A Aggregate.

F. If there is a deficiency of backfill material, provide borrow material as required.

3.05 COMPACTION

A. Solidly tamp each layer of bedding material to compact to a density of 90% Solidly tamp each layer of backfill around the pipeline and above pipeline using proper tamping tools made specifically for this purpose. Compact each layer to the densities specified using ASTM D698 Standard Proctor Test Methods determined at maximum density at optimum moisture content as determined by AASHTO T 99.

1. Within the Right-of-Way limits of existing State Highways and Borough Roadways.

a. Paved Areas: 100%

b. Unpaved Areas: 90% (Up to bottom elevation of final restoration material)

2. Other Areas

a. Paved Areas: 95%

b. Stone Driveways: 95%

c. Lawns, Fields: 90% (Up to bottom elevation of final restoration material)

B. Do not use rolling equipment or heavy tampers to consulate backfill until at least two (2) feet of backfill is placed over the top of the pipe.

C. The use of HYDRA-HAMMER for compacting backfill in trenches is prohibited.

D. The use of puddling or jetting for compacting backfill in trenches is prohibited.

E. Compaction Tests: During the course of backfilling and compacting, AUTHORITY may at various locations and depths of trenches request that DEVELOPER make field tests to verify that specified compactions are being achieved. Perform field density tests according to AASHTO T 191.

F. If compaction tests indicate that Work does not meet specified requirements, remove Work, replace, compact and retest.

3.06 STREAM CROSSINGS

A. Excavate trenches in stream crossings to the depth shown on the Drawing or otherwise require by AUTHORITY.

B. Material excavated may be used as backfill unless specifically prohibited by any governing agency having jurisdiction.

C. Make all necessary provisions for cofferdaming, dewatering and removal of excess excavated material.

D. Maintain the flow in the stream at all times.

E. 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.

F. Install concrete encasement to a minimum of ten (10) feet back from the top edges of the stream banks.

G. Construct stream crossing according to permit issued for the crossing.

3.07 CLEAN-UP AND MAINTENANCE

A. General: During construction, the 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. 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.

B. Remove surplus excavated materials, rubbish, and other construction debris from the site after backfilling is completed.

C. Construction site shall be left clean at end of each working day to satisfaction of AUTHORITY.

END OF SECTION

SECTION 4 – BORING AND JACKING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Construction of bored or jacked crossings.

1.02 RELATED WORK

A. Section 5 – Pipe and Fittings

1.03 REFERENCES

A. American Society for Testing and Materials:

1. ASTM A53, Pipe, Street, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

2. ASTM A 153; Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. Commonwealth of Pennsylvania Department of Transportation (PennDOT)

1. Publication 408 – Specifications

a. PDT Section 703 Aggregates.

C. State Code: Commonwealth of Pennsylvania, Pennsylvania Code, Title 67. Transportation, Department of Transportation, Chapter 459, Occupancy of Highways by Utilities, as supplemented or revised (PennDOT Chapter 459).

D. State Publication: Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Transportation, Department of Transportation, Chapter 203, Work Zone Traffic Control (PennDOT Chapter 203).

1.04 REGULATORY AGENCY REQUIREMENTS

A. DEVELOPER shall be responsible for complying with requirements of owner of crossing or right-of-way or entity having jurisdiction. Work shall not commence until the proper notice to proceed has been issued by said owner or entity.

B. DEVELOPER shall be responsible for making application and obtaining all permits required to complete work from owner of crossing or right-of-way or entity having jurisdiction. DEVELOPER shall contact AUTHORITY for additional requirements if permit is required to be in the AUTHORITYS name.

C. Work performed within PennDOT right-of-ways shall comply with Pennsylvania Code, Title 67, Chapter 459 – Occupancy of Highways by Utilities and PennDOT Publication 408.

D. Work performed within Amtrak rights-of-way shall comply with applicable Amtrak requirements for pipeline installations.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport, handle and store materials and Products specified herein in a manner recommended by the respective manufacturers of such to prevent damage and defects.

1.06 PROJECT CONDITIONS

A. DEVELOPER shall keep boring pits dewatered at all times. When water is known or expected to be encountered, pumps of sufficient capacity to handle the flow shall be maintained at the site. When dewatering, close observation shall be maintained to detect any settlement or displacement of roadway embankment.

PART 2 – PRODUCTS

2.01 STEEL CASING PIPE

A. Unless required otherwise by owner of crossing or right-of-way or by entity having jurisdiction, the following specifications shall be adhered to:

B. Steel Pipe: ASTM A 53, or ASTM A 139, Grade B

1. 35,000 psi minimum yield strength

2. Full circumference welded joints

3. Asphalt coated

4. Minimum Wall Thickness: .375 inch

5. The steel casing pipe diameter shall be at least six (6) inches larger than the outside diameter of the pipe bell.

2.02 CARRIER PIPE AND FITTINGS

A. As specified in Section 5 – Pipe and Fittings unless required otherwise by owner of crossing or right-of-way or by entity having jurisdiction.

2.03 MISCELLANEOUS MATERIALS

A. Casing Spacers: Use casing spacers to center and support carrier pipe inside casing pipe. Provide spacers by Cascade Waterworks Mfg. Co. Model CCS.

1. Shell: 2-piece bolt on style, stainless steel, 14-gauge minimum thickness.

2. Liner: Shell shall be lined with a ribbed PVC extrusion with retaining section that overlaps the edge of the shell and prevents slippage.

3. Runners: Ultra high molecular weight (UHMW) polymer and shall be attached to risers. Runners shall have low coefficient of friction, high resistance to abrasion and sliding wear and low deflection under compression.

4. Hardware: 304 stainless steel.

B. End Seals: Provide end seals to wrap around casing and carrier pipes following installation to provide barrier to backfill and seepage. Seals shall be fabricated of 1/8" thick minimum synthetic rubber. Secure end seals to casing using 304 stainless steel straps with worm mechanism for tightening. End seals shall be by Cascade Waterworks Mfg. Co. Model CCES.

C. Grout (Sand/Cement)

1. Portland Cement: ASTM C 150 Type II.

2. Sand: ASTM C 33, fine aggregate.

3. Water: Portable.

4. Grout Quality: Mixture of one part Portland Cement, three parts fine aggregate and water.

D. Sand: ASTM C 33, fine aggregate.

PART 3 – EXECUTION

3.01 PREPARATION

A. Trenching: Excavate approach cased crossings, pits and trenches using methods specified in Section 3 – Trenching, Backfilling and Compaction.

B. Brace and Shore trenches to comply with OSHA requirements.

3.02 BORING

A. Push the pipe into the fill with a boring auger rotating within the pipe to remove the soil. When augers, or similar devices are used for pipe emplacement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe. The auger and cutting head arrangements shall be removable from within the pipe in the event an obstruction is encountered.

B. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than one-half inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material.

C. The use of water or other liquids to facilitate casing emplacement and soil removal is prohibited.

D. Any method which employs simultaneous boring and jacking or drilling and jacking for pipes over eight (8) inches in diameter which does not have the above approved arrangement will not be permitted. For pipes eight (8) inches and less in diameter, auguring or boring without this arrangement may be considered for use only as approved by AUTHORITY.

3.03 JACKING

A. Jacking shall be conducted without hand mining ahead of the pipe and without the use of any type of boring, auguring, or drilling equipment.

B. Bracing and backstops shall be so designed and jacks of sufficient rating used to that the jacking can be progressed without stoppage except for adding lengths of pipe.

C. Accurately place guide timbers on line and grade.

D. The vertical face of the excavation shall be supported as necessary to prevent sloughing.

E. Use poling boards and bulkheads as required if subgrade conditions in the heading are unstable.

F. Jacking and excavation within the pipe shall proceed simultaneously with the ground being cut no more than two (2) inches above subgrade at the bottom.

G. The use of water or other liquids to facilitate casing placement and spoil removal is prohibited.

H. If voids develop or if jacked hole diameter is more than one (1) inch greater than the outside diameter of the encasing conduit place grout to fill voids in manner approved by the regulatory agencies.

I. Check conduit alignment in a manner and at times required by AUTHORITY. Check alignment and grade at least once per shift as the work progresses.

J. Completely bulkhead heading at interruptions in jacking operation.

K. Completely weld joints around the circumference between sections of steel pipe encasing.

3.04 INSTALLATION AND TESTING OF CARRIER PIPE

A. Install carrier pipe one pipe length at a time. Push carrier pipe through steel casing pipe using casing spacers.

B. Assemble pipe joints with retainer glands or restrained joint before pushing.

C. Test carrier pipe as specified in Section 4 – Pipe and Fittings.

3.05 CLOSING CASING PIPE

A. After carrier pipe has been installed inside casing pipe and successfully tested, fill casing pipe with sand meeting PennDOT Form 408, Section 703, Specification for Type A Fine Aggregate.

B. After filling with sand, close ends of casing pipe and end seals per manufacturer's recommendations.

END OF SECTION

SECTION 5 – PIPE AND FITTINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Water system pipe, fittings, and related appurtenances.

1.02 RELATED SECTIONS

A. Section 3 – Trenching, Backfilling and Compaction

B. Section 4 – Boring and Jacking

C. Section 6 – Manholes

D. Section 7 – Disinfection of Water Facilities

E. Section 8 – Cast-In-Place Concrete

1.03 REFERENCES

A. American National Standards Institute

1. ANSI A 21.10, Cast-Iron and Ductile-Iron Fittings, 2 through 48 inches, for Water and Other Liquids.

2. ANSI A 21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.

3. ANSI A 21.50, Thickness Design of Ductile-Iron Pipe.

4. ANSI A 21.51, Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

B. American Society for Testing and Materials

1. ASTM A 307, Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Strength.

2. ASTM B 88, Standard Specification for Seamless Copper Water Tube

3. ASTM B 763, Standard Specification for Copper Alloy Sand Castings for Valve Applications

4. ASTM D 1784, Rigid Poly, (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

5. ASTM D 1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80 and 120.

6. ASTM D 2467, Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

7. ASTM D 2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

8. ASTM F 477, Elastromeric Seals (Gaskets) for Joining Plastic Pipe.

C. American Water Works Association

1. AWWA C104, Cement-Mortar Lining for Ductile Iron Pipe and Fittings.

2. AWWA C110, Ductile-Iron and Gray-Iron Fittings.

3. AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

4. AWWA C150, Thickness Design of Ductile-Iron Pipe.

5. AWWA C151, Ductile-Iron Pipe Centrifugally Cast.

6. AWWA C153, Ductile-Iron Compact Fittings, 3 inch through 24 inch and 54 inch through 64 inch.

7. AWWA C600, Installation of Ductile Iron Mains and their Appurtenances.

8. AWWA C800, Underground Service Line Valves and Fittings

9. AWWA C901, Polyethylene Pressure Pipe and Tubing, ¾ inch through 3 inch for Water Service

1.04 SUBMITTALS

A. Make submissions required by Section 2 – Construction Submittals.

1.05 QUALITY ASSURANCE

A. Design Criteria:

1. Use only one type and class of pipe in any continuous line of sewer between structures, unless otherwise indicated on the Drawings.

2. Use pipe and fittings designed to withstand imposed trench loadings and conditions at the various locations.

B. Laboratory Tests:

1. The AUTHORITY reserves the right to require that laboratory tests also be conducted on materials that are shop tested. Furnish without compensation, labor, materials, and equipment necessary for collecting, packaging, and identifying representative samples of materials to be tested and the shipping of such samples to the Testing Laboratory.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport, handle and store pipe materials and other Products specified herein in a manner recommended by the respective manufacturers to prevent damage and defects.

1.07 SITE CONDITIONS

A. Environmental Requirements:

1. Keep trenches dewatered until pipe joints have been made and concrete cradle and encasement, if any, have cured.

2. Under no circumstances lay pipe in water or on bedding containing frost.

3. Do not lay pipe when weather conditions are unsuitable, as determined by AUTHORITY, for pipe laying work.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

A. Size:

1. All pipe diameters referenced or noted shall be inside diameters.

2. All water mains shall have a minimum diameter of 8 inches. Size shall be based on hydraulic design requirements.

B. Ductile Iron, Cement-Lined (DICL) Class 52 Water Piping (for dedicated water mains):

1. Manufacturers:

   a. McWane

   b. U.S. Pipe

2. Pipe: ANSI/AWWA C151/A21.51.

3. Wall Thickness Class: AWWA C150, Class 52 for buried pipe and Class 53 for flanged pipe.

4. Fittings: Ductile iron, ANSI/AWWA C153/A21.53 and ANSI/AWWA C110/A21.10. Mechanical joints shall conform to ANSI/AWWA C111/A21.11. Working pressure rated at 350 psi.

5. Joints:

   a. Burled Joints

      1. Push-on: ANSI/AWWA C111/A21.11.

      2. Mechanical: ANSI/AWWA C111/A21.11.

   b. Exposed/Interior Joints

      1. Flanged: ANSI A21.15 with ANSI B16.21 1/16-inch-thick cloth insertion rubber face gaskets. ANSI B18.2 nuts and bolts.

6. Pipe Lining: Ductile Iron pipe and fittings shall be coated inside in accordance with the following:

   a. Water Pipe and Fittings: Lining shall be double coated cement mortar with a minimum thickness of 0.125 inches and seal coated per ANSI/AWWA C104/A21.4.

7. Pipe and Fittings Coating: ANSI/AWWA C151/A21.51, factory coated inside and out with bituminous paint, minimum 1 mil dry thickness.

2.02 WATER SERVICE LINES AND APPURTENANCES

A. Polyethylene Pipe (PE):

1. Manufacturer:

   a. Cresline CE Blue

   b. JM Eagle

   c. EJ Prescott

2. AWWA C901, SDR 9, copper tube size made of PE 4710 type resin conforming to ASTM D 2737, NSF certified.

3. Pressure Rating: 200 psi minimum.

4. Fittings: Compression type equivalent to Mueller Insta-tite or 110 Series or Ford Pack-Joint.

   a. Stainless steel inserts to be used in the compression fitting to prevent crimping.

B. Copper Pipe:

1. ASTM B88, Type K copper tubing.

2. Fittings: ANSI B16.26 compression type equivalent to Mueller Insta-Tite or 110 Series or Ford Pack-Joints.

C. Corporation Stops

1. Manufacturers

   a. Ford Meter Box Co., Model No. F 1000

   b. Mueller Company, H15008

2. AWWA C800, 100 psig working pressure, ball or ground key type, bronze body, double stem o-rings, AWWA threaded inlet connections, compression style or insta-tite outlet connections suitable for pipe or tubing used.

D. Curb Stops:

1. Manufacturers

a. Ford Meter Box Co., B44-333, B44-444, or B11-777

b. Mueller Company, B25209

2. AWWA C800, 300 psig working pressure, ball or curb type valve, bronze body and tee heard, double-stem o-rings, compression style inlet and outlet connections suitable for pipe or tubing used.

C. Curb Boxes:

1. Manufacturers

a. Bingham & Taylor, Series I2B9 or Series I4B

b. Tyler, Series 6500

2. Cast iron construction, adjustable, two (2) piece screw type, 2 ½ inch or 4 ¼ inch shaft with inlaid cover and bolt down lid marked "WATER". Length of box and base shall be as required for the actual field conditions encountered. Interior and exterior of boxes shall be hot bituminous coated.

D. Service Saddles:

1. Service saddles to be used for connections to plastic mains. Connections to cast iron and ductile iron mains shall be made via direct taps.

2. Manufacturers

a. Ford Meter Box Company, Style 202B

b. Mueller Company, DR2S

3. Double strap type suitable for use on new or existing water main material, self-sealing gaskets rated for minimum 250 psig working pressure, type 304 stainless steel or ASTM A 536 ductile iron saddle with type 304 stainless steel.

E. Meter Pits:

1. ¾ inch Service Line

a. For ¾ inch service lines, the meter pit shall be a bottomless, single meter plastic pit setter meter box model PFCBHH as manufactured by Ford.

b. Suitable subgrade shall be prepared, including a minimum of 12-inches of clean 2B modified stone. The bottom of the meter pit shall be open to the stone bedding or shall have holes drilled for water to drain to the stone bedding.

c. The meter box shall be constructed of rigid PVC material and include the following:

1. Insulation pads – Ford Meter Box CCID-15
2. Depth – 48 inches minimum
3. Meter Size – 5/8"x3/4”
4. Meter Inlet – Angle ball valve
5. Meter Outlet – Angle dual check valve
6. Lid: Lids shall be the 15.25” Flat with Latch Lock model as manufactured by NICOR, Inc. Any alternatives may be considered provided they meet all of the following requirements and are presented and approved at an Authority meeting:

a. Locking Mechanism: The lid will be fastened to the meter pit frame via the use of a polymer worm gear latching assembly. The assembly will consist of a standard 27/32” silicon bronze pentagon bolt mounted through the top of the lid and then through a molded polymer worm gear and held in place with a stainless-steel washer and stainless steel screw.
b. Temperature Range: The meter pit lids must be able to maintain all their physical properties in an operating range of -40 degrees to 190 degrees Fehrenheit.
c. Plastic UV Characteristics: Material must be UV stable and capable of retaining its H20 strength for the expected life of the product. The expected life of the product shall be at least 25 years. Documentation shall be included with the bid that verifies the UV stability, expected lifetime, and strength through accelerated testing.
d. Water Absorption: The plastic material must not absorb water as determined by test standard ASTM D 570- 98 Water Absorption-24 Hour Method testing.

e. Load Rating: All meter pit lids must be H20 rated. Certificates of testing from a third-party testing firm must be included.
f. Physical Characteristics: Plastic meter pit lids must be light weight, stiff, and impact resistant, with recessed lid able to accept Sensus Radio reading devices.
g. Lids are to be made with High pressure injection molding process using No-Break Virgin polymer, Hydrozone HD Polyolefin resin.
h. Label: The meter pit lid must be embossed with the words "Water" or "Water Meter"; the letters being 1.75".
i. Non-slip: The meter pit lids must be designed to minimize the risk of slips and falls.
j. Lids are to be guaranteed for a period of five (5) years against defects in workmanship and materials.
k. Documentation showing the manufacturing process including detailed engineering drawings shall be included with the bid response. The purpose of this requirement is to ensure a consistent product which easily fits within the meter boxes.
l. Documentation demonstrating an active Quality Assurance/Quality Control process is in place must be provided. This program shall include routine, random product sampling. This documentation must also include certificates of compliance with the ASTM standards listed.
m. A sample for fit test shall be provided.

2. 1 inch Service Line

a. For 1 inch service lines, the meter pit shall be a bottomless, single meter plastic pit setter meter box model PFCBHH as manufactured by Ford.

b. Suitable subgrade shall be prepared, including a minimum of 12-inches of clean 2B modified stone. The bottom of the meter pit shall be open to the stone bedding or shall have holes drilled for water to drain to the stone bedding.

c. The meter box shall be constructed of rigid PVC material and include the following:

1. Insulation pads – Ford Meter Box CCID-18
2. Depth – 48 inches minimum
3. Meter Size – 1"

4. Meter Inlet – Angle ball valve
5. Meter Outlet – Angle dual check valve
6. Lid: Lids shall be the 18.75" Flat with Latch Lock model as manufactured by NICOR, Inc. Any alternatives may be considered provided they meet all of the following requirements and are presented and approved at an Authority meeting:

    a. Locking Mechanism: The lid will be fastened to the meter pit frame via the use of a polymer worm gear latching assembly. The assembly will consist of a standard 27/32" silicon bronze pentagon bolt mounted through the top of the lid and then through a molded polymer worm gear and held in place with a stainless-steel washer and stainless steel screw.
    b. Temperature Range: The meter pit lids must be able to maintain all their physical properties in an operating range of -40 degrees to 190 degrees Fehrenheit.
    c. Plastic UV Characteristics: Material must be UV stable and capable of retaining its H20 strength for the expected life of the product. The expected life of the product shall be at least 25 years. Documentation shall be included with the bid that verifies the UV stability, expected lifetime, and strength through accelerated testing.
    d. Water Absorption: The plastic material must not absorb water as determined by test standard ASTM D 570- 98 Water Absorption-24 Hour Method testing.
    e. Load Rating: All meter pit lids must be H20 rated. Certificates of testing from a third-party testing firm must be included.
    f. Physical Characteristics: Plastic meter pit lids must be light weight, stiff, and impact resistant, with recessed lid able to accept Sensus Radio reading devices.
    g. Lids are to be made with High pressure injection molding process using No-Break Virgin polymer, Hydrozone HD Polyolefin resin.
    h. Label: The meter pit lid must be embossed with the words "Water" or "Water Meter"; the letters being 1.75".
    i. Non-slip: The meter pit lids must be designed to minimize the risk of slips and falls.
    j. Lids are to be guaranteed for a period of five (5) years against defects in workmanship and materials.
    k. Documentation showing the manufacturing process including detailed engineering drawings shall be included with the bid response. The purpose of this

requirement is to ensure a consistent product which easily fits within the meter boxes.

l. Documentation demonstrating an active Quality Assurance/Quality Control process is in place must be provided. This program shall include routine, random product sampling. This documentation must also include certificates of compliance with the ASTM standards listed.

m. A sample for fit test shall be provided.

3. 1 ½ and 2 inch Service Lines

a. For 1 ½ and 2 inch service lines, the meter pit shall be a bottomless, single meter plastic pit setter meter box model PMBHH as manufactured by Ford.

b. Suitable subgrade shall be prepared, including a minimum of 12-inches of clean 2B modified stone. The bottom of the meter pit shall be open to the stone bedding or shall have holes drilled for water to drain to the stone bedding.

c. The meter box shall be constructed of rigid PVC material with appropriate brackets for the meter, valving and service line and include the following:

1. Insulation pads – Ford Meter Box CCID-18
2. Depth – 48 inches minimum
3. Meter Size – Match service size
4. Meter Inlet – Angle ball valve
5. Meter Outlet – Angle dual check valve
6. Lid: Lids shall be the 18.75” Flat with Latch Lock model as manufactured by NICOR, Inc. Any alternatives may be considered provided they meet all of the following requirements and are presented and approved at an Authority meeting:

a. Locking Mechanism: The lid will be fastened to the meter pit frame via the use of a polymer worm gear latching assembly. The assembly will consist of a standard 27/32” silicon bronze pentagon bolt mounted through the top of the lid and then through a molded polymer worm gear and held in place with a stainless-steel washer and stainless steel screw.

b. Temperature Range: The meter pit lids must be able to maintain all their physical properties in an operating range of -40 degrees to 190 degrees Fehrenheit.

c. Plastic UV Characteristics: Material must be UV stable and capable of retaining its H20 strength for the expected life of the product. The expected life of the product shall be at least 25 years. Documentation shall be included with the bid that verifies the UV stability, expected lifetime, and strength through accelerated testing.
d. Water Absorption: The plastic material must not absorb water as determined by test standard ASTM D 570- 98 Water Absorption-24 Hour Method testing.
e. Load Rating: All meter pit lids must be H20 rated. Certificates of testing from a third-party testing firm must be included.
f. Physical Characteristics: Plastic meter pit lids must be light weight, stiff, and impact resistant, with recessed lid able to accept Sensus Radio reading devices.
g. Lids are to be made with High pressure injection molding process using No-Break Virgin polymer, Hydrozone HD Polyolefin resin.
h. Label: The meter pit lid must be embossed with the words “Water” or “Water Meter”; the letters being 1.75”.
i. Non-slip: The meter pit lids must be designed to minimize the risk of slips and falls.
j. Lids are to be guaranteed for a period of five (5) years against defects in workmanship and materials.
k. Documentation showing the manufacturing process including detailed engineering drawings shall be included with the bid response. The purpose of this requirement is to ensure a consistent product which easily fits within the meter boxes.
l. Documentation demonstrating an active Quality Assurance/Quality Control process is in place must be provided. This program shall include routine, random product sampling. This documentation must also include certificates of compliance with the ASTM standards listed.
m. A sample for fit test shall be provided.

2.03 VALVES AND APPURTENANCES

A. Gate Valves

1. Manufacturers

   a. American Flow Control, Series 2500

   b. Mueller

2. General: AWWA C 509 resilient seat wedge type designed for 150 psi operating pressure.

   a. Buried: Non-rising stem

   b. Interior: Outside stem and yoke

3. Valve Body: ASTM A 126, Class B cast iron.

4. Resilient Wedge: ASTM A 536 ductile iron crated with nitrite rubber.

5. Stem: ASTM B 763 bronze with two (2) upper and one (1) lower nitrite rubber o-ring seals.

6. End Connections:

   a. Buried service: mechanical joint.

   b. Interior: ANSI 125/150 lb. flanged.

7. Provide square operating nut and valve box for buried service.

8. Interior and Exterior Coating: AWWA C 550 fusion bonded epoxy coating, 8 mils minimum.

B. Air Release Valves:

1. Manufacturer: Crispin, Model PL 10.

2. Use valves of appropriate size at high points vent air which may accumulate. Valve shall be designed for 150 psig working pressure.

3. Construction: Cast iron body and cover, stainless steel floats and parts.

C. Pressure Reducing Valves:

1. Manufacturer: Cla-Val, Model 90-01

D. Valve Boxes

1. Manufacturers

a. Tyler Pipe, 6850 series

b. Bingham & Taylor, I5B series, screw type.

2. All valves buried in the ground shall be provided with cast iron valve boxes of the Two Piece or Buffalo Type. The valve boxes shall have an adjustable two section screw-type telescoping column and a separate base. The valve box column shall have an inside diameter of 5¼ inches. Valve boxes shall be furnished with a cover. Mark covers to read "SEWER", "WATER", or "FIRE" as appropriate. The valve boxes shall be hot coated inside and out with a tar or asphalt compound. For deep installations, provide screw-type extensions as required, designed for use with the valve box furnished. Set top of stem between 1-2 feet below grade.

2.04 THRUST RESTRAINT

A. DEVELOPER has option of either of the means specified below. Length of restraint specified by AUTHORITY.

1. Concrete Thrust Blocks and Tie Rods: Details as shown on drawings. Concrete shall be as specified in Section 8 – Cast-In-Place Concrete, 3,000 psi compressive strength (at 28 days). Tie rods shall be constructed of suitable metal. Metal harness of tie rods shall be galvanized or otherwise rust proofed and shall be painted with bituminous coating after installation.

2. Megalug Retainer Glands: Mechanical joint restraint consisting of follower gland which when actuated imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. ASTM A 536-84 ductile iron follower gland of dimensions such that it can be used with AWWA C153 mechanical joints. Restraining devices shall be of ductile iron, heat treated to a minimum hardness of 370 BHN. Twist-off nuts shall be used to insure proper actuating of the restraint device. Restraint device shall have a 250 psi minimum working pressure with 2:1 minimum safety factor. Megalug retainer gland equivalent to EBAA Iron, Inc.

B. The following method of thrust restraint is acceptable by special exception only. DEVELOPER shall request the ability to use this item, and the AUTHORITY shall provide approval prior to use.

1. FIELD LOK 350 Restrained Gasket: Push-on joint restraint consisting of a gasket with vulcanized stainless steel locking segments which impart a wedging action against the pipe, increasing its resistance as the pressure increases. NSF 61-approved EPDM rubber compound shall be selected. The restraint shall be a boltless, integral restraining system and shall be rated for 350 psi in accordance with ANSI/AWWA C111/A21.11. Restrained gasket shall be FIELD LOK 350 by US Pipe or equal.

2.07 FIRE HYDRANTS

A. Manufacturers

1. American Flow Control, Traffic Model B-62-B.

B. General: AWWA C502, compression type (opening against the pressure/closing with pressure), traffic type with breakable safety flange and stem couplings.

C. Construction: Cast iron or ductile iron body, cast iron base, bronze operating nut (open left), street operating rod, bronze hose and steamer nozzles with cast iron caps secured to barrel, and bronze drain system.

D. Rated Working Pressure: 200 psig

E. Inlet Connection: 6-inch, mechanical joint unless noted otherwise on Drawings.

F. Nozzle Sizes:

1. Hose: Two (2) 2-1/2 inch.

2. Steamer: One (1) 4-1/2 inch.

G. Color:

1. Body: Red

H. Threads: Threads shall be in accordance with National Standard Threads.

2.08 PIPING SPECIALTIES AND APPURTENANCES

A. Tapping Sleeve and Valve Assemblies

1. Manufacturers

a. Mueller Company

b. American Flow Control

c. U.S. Pipe and Foundry Company

2. Tapping Sleeve

a. General: ASTM A 126, Grade B ductile from (4”-12”) or ASTM A 526 ductile iron (14” and larger), mechanical joint end connection with ANSI/AWWA C111/A21.11 nuts and bolts. Outlet end connection shall be ANSI 125/150 lb. flanged for mating to tapping valve.

b. Exterior Coating: Military Spec. MIL C-450 C asphaltic varnish or equal.

3. Tapping Valves

a. General: AWWA C 509 resilient seat wedge type gate valve as specified herein in this Section under Gate Valves except valve shall be modified for passage and clearance of tapping machine cutlers.

b. Mating Flange: Flange shall have a raised male face to ensure true alignment of valve and tapping machine.

c. Outlet End Connection: Mechanical joint with ANSI/AWWA C111/A21.11 nuts and bolts for buried service.

B. Steel Pipe Couplings

1. Manufacturers

a. Smith-Blair, Style 411

b. Dresser, Style 38

2. Coupling shall consist of a sleeve, two (2) follower rings, two (2) gaskets and a sufficient number of bolts and nuts.

   a. Sleeve: ASTM A53 or ASTM A512 or carbon steel.

   b. Followers: ASTM A47 malleable iron.

   c. Gasket: Grade 30 rubber.

   d. Bolts: AWWA C111/ANSI A21.11.

C. Flanged Adapters

1. Manufacturers

   a. EBAA Iron, MEGAFLANGE, Series 2100

   b. Romac Alpha FC

2. General: Use to connect plain end pipe to flanged equipment. Coupling shall consist of iron body, a follower ring, a gasket and o-ring, and a sufficient number of bolts and nuts.

   a. Body: ASTM A 536 ductile iron. ANSI 150 lb. flange drilling bolt circle, bolt size and spacing.

   b. Follower: ASTM A536 ductile iron.

   c. Bolts: AWWA C111/ANSI A21.11.

   d. Gasket: Grade 30 rubber

   e. O-Ring: Grade 60 rubber.

D. Repair Sleeve

1. Manufacturer: Mueller Company Model H-785

E. Casing Pipe (for bored crossings)

1. Casing Pipe: ASTM A53 seamless steel, full circumference welded joints and of DIAMETER AS SHOWN ON Drawings unless required otherwise by governing agency having authoritative jurisdiction.

2. Casing Spacers: Use casing spacers to center and support carrier pipe inside casing pipe. Provide spacers by Cascade Waterworks Mfg. Co. Model CCS or equal.

   a. Shell: 2-piece bolt on style, stainless steel, 14-gauge minimum thickness.

   b. Liner: Shell shall be lined with a ribbed PVC extrusion with retaining section that overlaps the edge of the shell and prevents slippage.

   c. Runners: Ultra high molecular weight (UHMW) polymer and shall be attached to risers. Runners shall have low coefficient of friction, high resistance to abrasion and sliding wear and low deflection under compression.

   d. Hardware: T 304 stainless steel.

3. End Seals: Provide end seals to wrap around casing and carrier pipes following installation to provide barrier to backfill and seepage. Seals shall be fabricated of 1/8" thick minimum synthetic rubber. Secure end seals to casing using 304 stainless steel straps with worm mechanism for tightening. End seals shall be by Cascade Waterworks Mfg. Co. Model CCES.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Carefully examine each section of pipe and each pipe fitting before laying in conformance with the inspection requirements of the appropriate referenced standard.

B. Remove rejected pipe from the Project.

3.02 PREPARATION

A. Clean piping interior and mating surfaces of bell, spigot, and gasket before laying. Maintain clean until completed work is accepted.

B. Touch-up chipped, cracked, or abraded surfaces and finished joints with two coats of the particular coating material.

C. Perform trenching for sewer pipe and place pipe bedding as specified in Section 2 – Trenching, Backfilling and Compacting.

D. Dig bell holes sufficiently large to permit proper joint making and to ensure pipe is firmly bedded full length of its barrel.

E. Excavate trenches in rock at least twenty-five (25) feet in advance of pipe laying. Protect pipe ends if blasting is allowed.

3.03 LAYING PIPE

A. General Requirements:

1. Lay pipe proceeding upgrade true to line and grades given. Lay bell and spigot pipe with bell end upgrade.

2. Bed pipe using materials specified in Section 2 – Trenching, Backfilling and Compaction. Gravity sewer pipe bedding must conform to AASHTO-99 to a density of 90% proctor.

3. Exercise care to ensure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs along inside bottom half of pipeline.

4. Center spigot end in bell or socket end of previously laid pipe, shove tight and secure.

5. No wedging or blocking permitted in laying pipe unless by written permission of AUTHORITY.

6. Before joints are made, bed each section of pipe full length of barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place.

7. Walking or working on completed pipeline, except as necessary in tamping and backfilling, not permitted until trench is backfilled one-foot deep over top of pipes.

8. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.

9. Take up and replace with new, such in-place pipe sections found to be defective.

10. Take necessary precautions to prevent newly laid pipe from floating as a result water accumulation in the trench; or the collapse of the pipeline from any cause. Restore or replace pipe as necessary.

11. At the close of each day's work, and at such other times when pipe is not being laid, protect open end of pipe with a tight fitting stopper.

12. Cut pipe using only equipment specifically designed for that purpose such as an abrasive wheel, rotary wheel cutter, a guillotine pipe saw or a milling wheel saw. The use of chisels or hand saws will not be permitted. Grind smooth cut ends and rough edges. Bevel slightly, cut end for push-on connections.

13. Where cutting of pipe is necessary, minimum laying length shall be five (5) feet.

B. Specific Requirements:

1. Install ductile iron pipe, and fittings, and assemble joints according to AWWA C600.

2. Install PVC pipe and fittings and assemble joints according to ASTM D2855.

C. Meter Pits:

1. All service lines will require the use of a meter pit and continuous piping of the same material as utilized for the service line leading from the main.

D. Joints

1. Make pipe and fitting joints according to pipe manufacturer's specifications and to specifications previously specified for pipe.

2. Make joints watertight. Immediately repair detected leaks and defects. Methods of repair subject to AUTHORITY'S approval.

E. Alignment and Grade:

1. Lay and maintain all pipe at the required lines and grades as shown on the Drawings. Place fittings and valves at the required locations with joints centered, spigots forced home, and all valve stems plumb. Do not deviate from the required line and grade, except with the approval of AUTHORITY.

2. Deflect pipe joints where indicated on the drawings. Deflections shall not exceed pipe manufacturer's recommended maximum allowable deflection.

3. Do not change grade or alignment without AUTHORITY'S approval.

3.04 THRUST RESTRAINTS

A. General: Provide thrust restraint at all plugs, caps, tees, and bends (both horizontal and vertical) on pipelines 4 inches and larger.

B. Concrete Reaction Backing: Place concrete reaction backing between undisturbed solid ground and the fitting to be anchored. The backing unless otherwise shown or directed, shall be located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.

C. Install megalug retainer gland according to manufacturer's instructions.

D. If permitted, install restrained gasket according to manufacturer's instructions.

E. Temporary Thrust Restraint: Provide temporary thrust restraint at temporary caps or plugs. Submit details of temporary restraint to AUTHORITY for approval.

3.05 EMERGENCY REPAIRS

A. CONTRACTOR shall be responsible for utilizing great care and superior Judgment when working on and around AUTHORITY'S system(s). CONTRACTOR shall provide emergency repair service (at no cost to AUTHORITY) when a main break or leak results from CONTRACTOR'S actions. Emergency repair could include isolation of the affected main, excavation, clamping, possible disinfection, site restoration and other actions necessary to restore satisfactory service to the customers. CONTRACTOR shall notify AUTHORITY immediately when incidents and/or accidents occur that adversely affect service to AUTHORITY'S customers. AUTHORITY shall provide guidance towards resolving such situations, including approval of the emergency work and approval of any emergency main appurtenances, including but not limited to, repair saddles and clamps.

3.06 FIELD QUALITY CONTROL:

A. General Requirements: Conduct tests specified herein so that each pipeline installed in the Project is tested to AUTHORITY'S satisfaction.

1. Provide tools, materials (including water), apparatus and instruments necessary for pipeline testing. AUTHORITY will require payment for water used. Procedures for water usage must be approved by AUTHORITY in writing.

2. Conduct tests in the presence of and to the satisfaction of AUTHORITY.

3.07 PRESSURE LINE TESTING

A. Alignment Test for Pressure Lines:

1. Prior to backfilling of pressure lines, the joint alignment shall be inspected to assure the maximum deflection present in each joint does not exceed the manufacturer's recommendations.

2. Assure lines which are a portion of a pump discharge system shall be inspected to assure the line is installed at a constant or increasing grade so as to eliminate the possibility for air accumulation at an intermediate high point.

3. Any and all defects shall be corrected by DEVELOPER to the satisfaction of AUTHORITY prior to backfilling. This shall be completed before the work shall proceed and before acceptance.

B. Leakage Test Requirements (applicable to Water Mains):

1. This test will be made by plugging a section of the main (as determined by the Engineer) and all branch fittings to withstand internal pressure.

2. The Contractor shall slowly fill each valved section of main with water and apply the test pressure, based on the elevation of the lowest point of the line or section under test, corrected to the elevation of the test gauge by means of a pump connected to the pipe in a manner satisfactory to the Engineer.

3. Expel air completely from the pipe and valves before applying the specified test pressure. If permanent air vents are not located within the section being tested, install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all air has been expelled, close the corporation cocks and apply the test pressure. At the conclusion of the test, remove the corporation cocks and plug the openings, or leave in place at the discretion of the Engineer.

4. The main shall be hydrostatically tested at a pressure 1.5 times the normal working pressure with a minimum pressure of 150 PSI. The test pressure shall be held for a period of at least two (2) hours during which time the test pressure shall not vary more than 5 PSI.

5. The Contractor shall conduct a leakage test concurrently with the Hydrostatic Pressure Test. Leakage shall be defined as the quantity of water that must be supplied into the newly constructed force main, or any valved section thereof, to maintain the pressure within 5 PSI of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

Acceptance shall be determined on the basis of allowable leakage as specified below.

ALLOWABLE LEAKAGE PER 1,000 FEET OF MAIN (GPH)

Avg. Test Pressure PSI	Nominal Pipe Diameter - Inches							
	4	6	8	10	12	14	16	20
250		0.71	0.95	1.19	1.42	1.66	1.90	2.37
225		0.68	0.90	1.13	1.35	1.58	1.80	2.25
200		0.64	0.85	1.06	1.28	1.48	1.70	2.12
175		0.60	0.80	0.99	1.19	1.39	1.59	1.98
150		0.56	0.74	0.92	1.10	1.29	1.47	1.84

C. Time for Making Test:

1. Where any section of a main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five days have elapsed after the concrete reaction backing was installed. If high early strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least two days have elapsed.

2. AUTHORITY shall be present during the operating of valves required to fill mains for pressure and leakage test.

3. DEVELOPER shall advise AUTHORITY of any pressure test and leakage test at least 48 hours in advance. No testing will be authorized unless air temperature is 35E or higher.

4. The pressure and leakage tests shall be witnessed by AUTHORITY.

5. DEVELOPER shall furnish laboratory calibrated test gauges and measuring devices for the leakage test.

6. The section under test shall be brought back to test pressure at one-half hour intervals during the testing. AUTHORITY will record both the makeup water amount and pressure at each one-half hour repressurization.

3.08 ACCEPTANCE: Observation of successful testing of sewers, force mains or water mains by AUTHORITY does not constitute acceptance of the system or any portion thereof. Upon completion of any determined portion of a total system, and successful testing thereof, the AUTHORITY, at its sole discretion, may consider acceptance or beneficial use of the facilities.

END OF SECTION

SECTION 6 – DISINFECTION OF WATER FACILITIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Disinfection procedures of water mains and related facilities.

1.02 QUALITY ASSURANCE

A. Bacteriological Tests

1. AWWA Standard C651-14.

a. Number of Samples Required: Two samples, taken a minimum of 24 hours apart. Samples to be taken by the AUTHORITY.

B. Reference Standards:

1. American Water Works Association:

a. AWWA B300, Hypochlorites.

b. AWWA B301, Liquid Chlorine.

c. AWWA C651, Disinfecting Water Mains.

d. AWWA Manual M12, Simplified Procedure for Water Examination.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. AUTHORITY staff shall transport, handle and store disinfection products as specified herein in the manner recommended by the respective manufacturers to prevent contamination and deterioration of products.

B. When handling disinfection products, due caution is advised. Utilize procedures in the manner recommended by the manufacturer.

1.04 JOB CONDITIONS

A. Environmental Requirements:

1. Testing and disinfection of water mains will not be performed if the air temperature is expected to fall below 35ºF or as directed by AUTHORITY.

2. Keep interior of pipe clean. Close open end of pipe with a watertight plug anytime pipelaying is not in progress.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Hypochlorites: AWWA Standard B300.

B. Liquid Chlorine: AWWA Standard B301.

PART 3 – EXECUTION

3.01 CHLORINATION, FLUSHING, AND DECHLORINATION

A. Chlorination and disinfection of water-distribution piping shall be in conformance with ANSI/AWWA C651-14. Only the Tablet/Granule and the Continuous Feed methods shall be acceptable.

B. Flushing: AUTHORITY shall be notified at least 72 hours prior to any desired flushing. AUTHORITY shall complete all flushing as required in these testing procedures and where necessary to conform to typical water quality requirements. Contractor/Developer shall be charged for AUTHORITY staff time to flush. Potable water shall be used for disinfection, hydrostatic pressure testing, and flushing. Drainage shall take place away from the construction or work area. Adequate drainage must be provided during flushing. If applicable, the valve(s) isolating the main from existing system shall be locked out and tagged out to prevent unintentional release of the elevated chlorine residual water used for disinfection. Valves and hydrants shall only be operated by AUTHORITY staff.

C. Dechlorination: When dichlorination is required, it is recommended that any high-velocity flushing be completed prior to disinfection. Dechlorination equipment may not be capable of handling high flows with high levels of chlorine.

D. Tablet Method:

1. Place calcium hypochlorite granules or tablets in the water main during installation and then filling the main with potable water to create a chlorine solution. This method may be used only if the pipes and appurtenances are kept clean and dry during construction. This method shall NOT be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with calcium hypochlorite.

2. Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at

500-ft intervals. The quantity of the granules at each location shall be as shown in Table 1 below.

Table 1 Weight of calcium hypochlorite granules to be placed at beginning of main and at each 500-ft (150-m) interval

Pipe Diameter (*d*)		Calcium Hypochlorite Granules	
in.	*(mm)*	*oz*	*(g)*
4	(100)	1.7	(48)
6	(150)	3.8	(108)
8	(200)	6.7	(190)
10	(250)	10.5	(298)
12	(300)	15.1	(428)
14 and larger	(350 and larger)	$D^2 \times 15.1$	$D^2 \times 428$

Where D is the inside pipe diameter, in feet $D = d/12$

3. Calcium hypochlorite tablets (5-grams) shall be placed in the upstream end of each section of pipe to be disinfected, including branch lines. Also, at least one tablet shall be placed in each hydrant branch and in other appurtenances. The number of 5-g tablets required for each pipe section shall be 0.0012 d^2L rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 2 below shows the number of tablets required for commonly used sizes of pipe. Calcium hypochlorite tablets shall be attached by an adhesive meeting the requirements of NSF/ANSI 61. There shall be adhesive only on the broadside of the tablet attached to the surface of the pipe. Attach tablets inside and at the top of the main. If the tablets are attached before the pipe section is placed in the trench, their positions shall be marked on the pipe exterior to indicate that the pipe has been installed with tablets at the top.

Table 2 Number of 5-g calcium hypochlorite tablets required for dose of 25 mg/L*

Pipe Diameter		Length of Pipe Section, *ft (m)*				
		13 (4.0) or less	18 (5.5)	20 (6.1)	30 (9.1)	40 (12.2)
in.	*(mm)*	Number of 5-g Calcium Hypochlorite Tablets				
4	(100)	1	1	1	1	1
6	(150)	1	1	1	2	2
8	(200)	1	2	2	3	4
10	(250)	2	3	3	4	5
12	(300)	3	4	4	6	7
16	(400)	4	6	7	10	13

*Based on 3.25-g available chlorine per tablet

4. When installation has been completed, the main shall be filled with water such that the full pipe velocity is no greater than 1ft/sec. Fill rate must be carefully controlled to ensure tablets do not come loose from pipe. Precautions shall be taken to ensure that air pockets are eliminated.

5. The chlorinated water shall remain in place for at least 24 hours. If the water temperature is less than 41 degrees Fahrenheit, the water shall remain in the pipe for at least 48 hours. A detectable free chlorine residual (greater than 0.2 mg/L) shall be found at each sampling point after the 24- or 48- hour period.

E. Continuous-Feed Method of Chlorination

1. The continuous-feed method consists of completely filling the main with potable water, removing air pockets, then flushing the completed main to remove particulates, and refilling the main with potable water that has been chlorinated to 25mg/L. After a 24-hour holding period in the main there shall be a free chlorine residual of not less than 10mg/L.

2. Before the main is chlorinated, it shall be filled with potable water to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall be greater than or equal to 3.0ft/sec. Table 3 below shows the rates of flow required to produce a velocity of 3ft/sec in commonly used pipes.

Table 3 Required flow and openings (either taps or hydrants) to flush pipelines at 3.0 ft/sec (0.91 m/sec) (40 psi [276 kPa] residual pressure in water main)*

Pipe Diameter		Flow Required to Produce 3.0 ft/sec (approx.) Velocity in Main		Size of Tap Used, *in. (mm)*			Number of Hydrant Outlets	
				1 (25)	1½ (38)	2 (51)		
in.	*(mm)*	*gpm*	*(L/sec)*	Number of Taps Required on Pipe†			2½-in. (64-mm)	4½-in. (114 mm)
4	(100)	120	(7.4)	1	—	—	1	1
6	(150)	260	(16.7)	—	1	—	1	1
8	(200)	470	(29.7)	—	2	—	1	1
10	(250)	730	(46.3)	—	3	2	1	1
12	(300)	1,060	(66.7)	—	—	3	2	1
16	(400)	1,880	(118.6)	—	—	5	2	1

*With a 40-psi (276-kPa) pressure in the main with the hydrant flowing to atmosphere, a 2½-in. (64-mm) hydrant outlet will discharge approximately 1,000 gpm (63.1 L/sec); and a 4½-in. (114-mm) hydrant outlet will discharge approximately 2,500 gpm (160 L/sec).

†Number of taps on pipe based on 3.0-ft/sec discharge through 5 ft (1.5 m) of galvanized iron (GI) pipe with one 90° elbow.

3. To chlorinate the main, water shall be supplied through a backflow preventing device. Main shall be filled at a constant, measured rated into the newly installed main. The main shall undergo hydrostatic testing prior to disinfection.

4. At a point not more than 10ft downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will not have less than 25mg/L free chlorine. Table 4 below provides the amount of chlorine required for each 100 ft of pipe for various pipe diameters. Solutions with a minimum 1 percent chlorine concentration may be prepared with sodium hypochlorite or calcium hypochlorite. The latter solution required 1 lb of calcium hypochlorite in 8 gal of water.

Table 4 Chlorine required to produce an initial 25-mg/L concentration in 100 ft (30.5 m) of pipe by diameter

Pipe Diameter		100% Chlorine		1% Chlorine Solution	
in.	*(mm)*	*lb*	*(g)*	*gal*	*(L)*
4	(100)	0.013	(5.9)	0.16	(0.6)
6	(150)	0.030	(13.6)	0.36	(1.4)
8	(200)	0.054	(24.5)	0.65	(2.5)
10	(250)	0.085	(38.6)	1.02	(3.9)
12	(300)	0.120	(54.4)	1.44	(5.4)
16	(400)	0.217	(98.4)	2.60	(9.8)

5. Chlorine application shall not cease until the entire main is filled with chlorinated water. The chlorinated water shall be retained in the main for a least 24 hours, during which time valves and hydrants in treated section shall be operated to ensure disinfection of the appurtenances. At the end of this 24-hr period, the treated water in all portions of the main shall have a residual of at least 10mg/L.

F. Bacteriological Testing

1. After hydrostatic testing and chlorination have been completed, purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired.

2. Flushing shall occur until the residual fee chlorine level is less than 4.0mg/L and greater than 0.2 mg/L. AUTHORITY shall be notified at least 72 hours prior to desired flushing.

3. Bacteriological samples shall be taken by the AUTHORITY in accordance with AWWA C651. AUTHORITY shall submit water samples in appropriate bottles. A sample shall mean a representative

amount of water in a laboratory approved container that is analyzed for both the presence of total coliform and the presence of e.coli. The presence of either constituent shall be considered a failed sample. Two consecutive passing samples are required, in accordance with PA DEP requirements. Samples shall be taken at least 24 hours apart. Contractor shall be responsible for repeating the chlorination process and repeating the flushing process until two consecutive passed samples are achieved. The AUTHORITY shall be notified at least 48 hours prior to desired sampling.

4. Disinfection, flushing, and bacteriological processes shall be repeated until all new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired all pass bacteriological testing in accordance with PA DEP requirements.

5. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 7 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place concrete work for:

1. Pipe thrust restraint.

2. Restoration of disturbed/damaged concrete curbs and sidewalks.

3. Miscellaneous concrete specified in other Sections.

1.02 REFERENCES

A. American Concrete Institute (ACI)

1. 301 – Specifications for Structural Concrete for Buildings

2. 305- Guide to Hot Weather Concreting

3. 306 – Guide to Cold Weather Concreting

4. 318 – Building Code Requirements for Structural Concrete

5. 347 – Guide to Formwork for Concrete

B. American Society for Testing and Materials (ASTM)

1. A615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

2. C31 – Making and Curing Concrete Test Specimens in the Field

3. C39 – Compressive Strength of Cylindrical Concrete Specimens

4. C94 – Ready-Mixed Concrete

5. C143 – Slump of Portland Cement Concrete

6. C173 – Air Content of Freshly Mixed Concrete by the Volume Method

C. Pennsylvania Department of Transportation (PennDOT) Publication 408, latest edition

1. Section 704 – Cement Concrete

2. Section 711 – Concrete Curing Material and Admixtures

3. Section 1001 – Cement Concrete Structures

104. PROJECT REQUIREMENTS

A. DEVELOPER shall be responsible for replacing or restoring all concrete damaged or disturbed in performing work of the Project to match original conditions in addition to those requirements specified herein this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete: Class A cement concrete as specified in PennDOT Publication 408, Section 704.1 (b), 3300 psi minimum compressive strength at 28 days.

B. Concrete Admixtures: Curing Materials and Admixtures: As specified in PennDOT Publication 408, Section 711.

C. Liquid Membrane-Forming Curing Compound: As specified in PennDOT Publication 408, Section 711.

D. Reinforcing Bars: 60 ksi yield grade, ASTM A615, deformed billet steel bars.

E. Curb and Sidewalk Restoration Materials: Materials shall comply with Strasburg Borough Specifications.

F. Epoxy Bonding Compound: Use product equivalent to Sika Chemical Sikadur 32 Hi-Mod.

G. Form coatings: Provide commercial formulation form-coating compounds that will not bond with, nor affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify that excavation is completed to required depth, and that subgrade has been properly compacted.

3.02 PREPARATION

A. Accurately place and adequately support embedded items and joint materials in pour.

B. Prepare existing hardened concrete to bond to new concrete.

1. Roughen and clean existing concrete surface of foreign matter.

2. Apply Epoxy Bonding Compound over existing prepared concrete according to manufacturer's instructions.

C. Sprinkle sufficient water over subgrade to prevent water loss from concrete.

3.03 FORMING

A. Construct forms according to ACI 347 to required dimensions, plumb and straight.

1. Securely brace and shore forms to prevent displacement, bowing and pillowing, and to safely support imposed concrete load.

2. Fabricate forms for easy removal without harming or prying against concrete surfaces.

B. Provide openings in concrete formwork of the correct size and in the proper location to accommodate piping and other construction work items. Accurately place and securely support items to be built into forms.

C. Where soil conditions will permit excavation to accurate sizes without bracing, and where cave-ins can be prevented during the concrete pour, earth forms may be used. Earth forms shall be wetted, but not muddy before concrete is placed.

3.04 REINFORCING

A. Place reinforcing steel accurately and securely brace against displacement using reinforcing accessories according to ACI 318.

B. Splice bars according to ACI 318.

3.05 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Notify AUTHORITY minimum 24 hours prior to commending concrete pour.

C. Ensure that reinforcement, formed expansion and construction joints and embedded items are not disturbed during concrete placement.

D. Place concrete continuously between predetermined expansion, control, and construction joints.

E. Do not interrupt successive placement; do not permit cold joints to occur.

F. Consolidate concrete by vibration, spading, rodding or other manual methods.

G. Perform concrete work in cold and hot weather according to ACI 306 and ACI 305, respectively.

3.06 FINISHING

A. Finish concrete to match original conditions or as directed by AUTHORITY.

3.07 CURING

A. Cure concrete with Liquid Membrane-Forming Curing Compound. Apply curing compound in accordance with PennDOT Publication 408, Section 1001.3.

3.08 CURB AND SIDEWALK RESTORATION

A. Restore curbs and sidewalks damaged by construction to conform to Strasburg Borough Specifications.

B. Saw cut and reconstruct sidewalks to the first expansion joint on either side of the damaged section.

C. Saw cut and reconstruct curbs to a minimum of one (1) foot beyond each side of damaged section. Match original lines and grades.

END OF SECTION

ELA group, inc.
ENGINEERS + LANDSCAPE ARCHITECTS
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LITITZ, PA 17543
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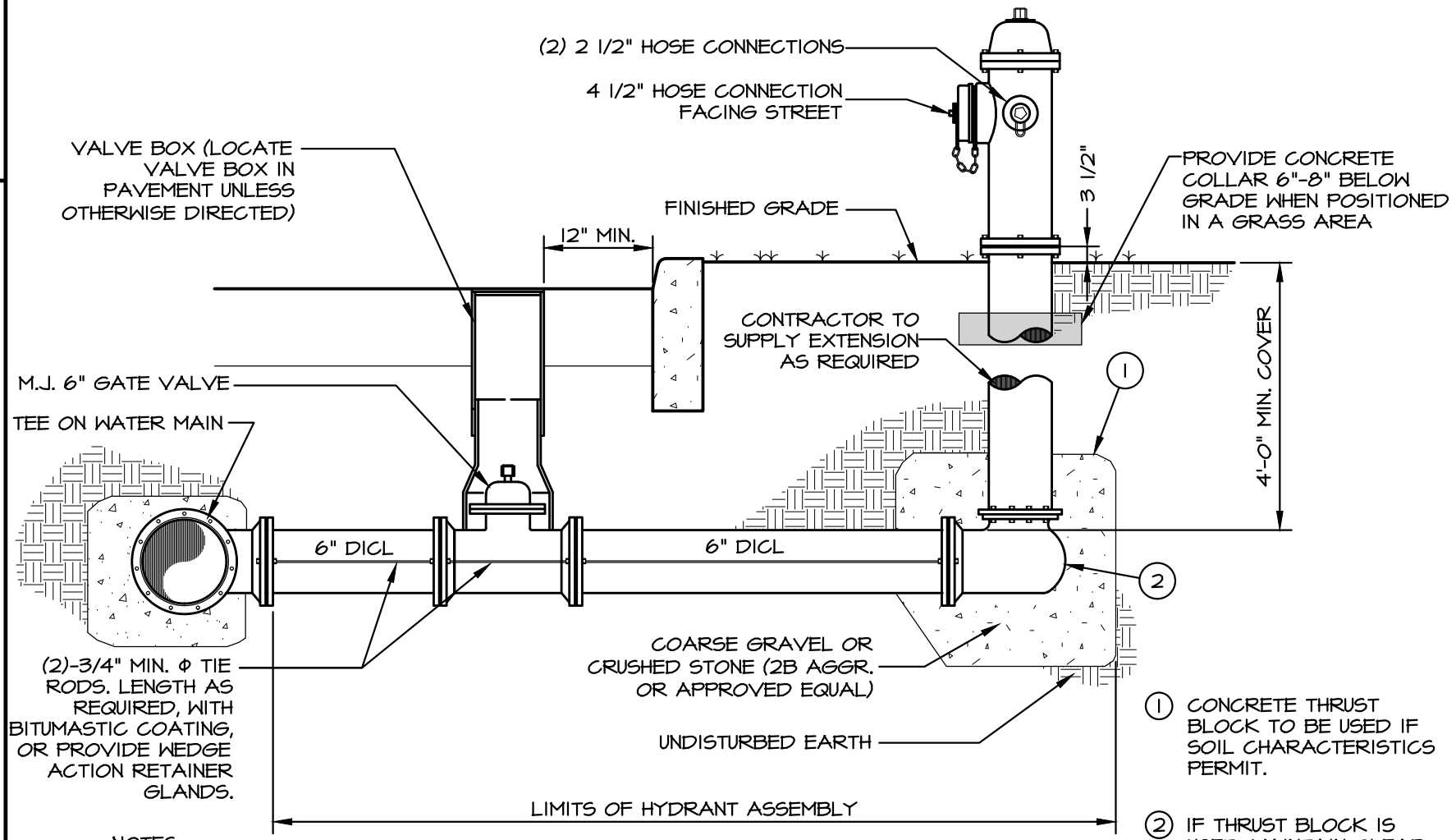
FIRE HYDRANT ASSEMBLY DETAIL

STRASBURG BOROUGH AUTHORITY STANDARD DETAIL



1. CONCRETE THRUST BLOCK TO BE USED IF SOIL CHARACTERISTICS PERMIT.

2. IF THRUST BLOCK IS USED, MAINTAIN CLEAR DRAIN, WRAP IN POLYETHYLENE PRIOR TO PLACING CONCRETE.

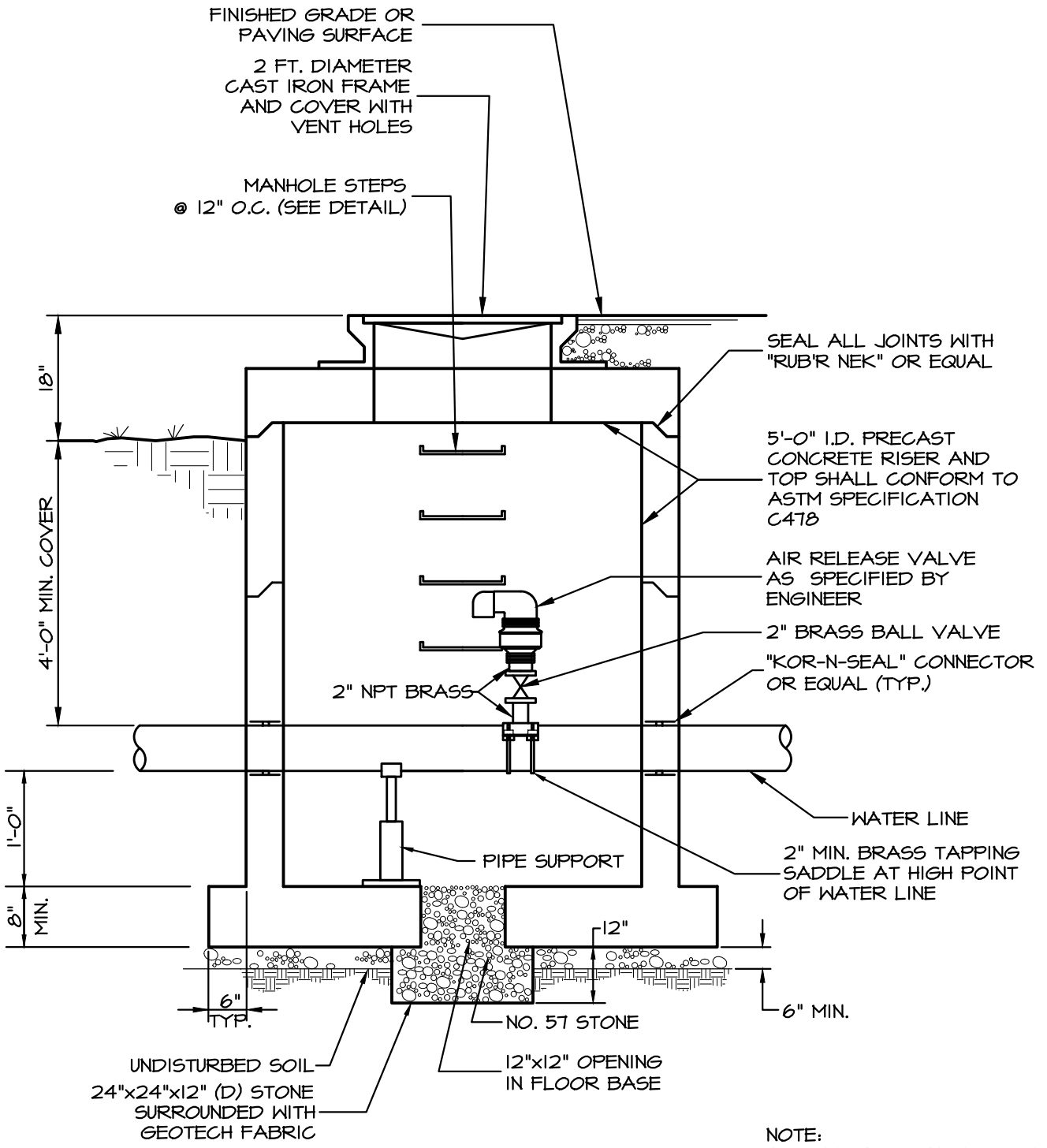
NOTES:

1. HYDRANT TO BE AMERICAN FLOW CONTROL 5-1/4" TRAFFIC MODEL B-62-B, OPEN LEFT. HOSE: TWO (2) 2.5-INCH. STEAMER ONE (1) 4.5-INCH. BODY COLOR TO BE RED.
2. GATE VALVE TO BE AMERICAN FLOW CONTROL SERIES 500 OR MUELLER, NON-RISING STEM, OPEN LEFT.
3. RESTRAINED JOINTS TO BE MEGA-LUG OR EQUAL.
4. AWWA C 550 FUSION BONDED EPOXY COATING INTERIOR AND EXTERIOR, MIN 8 MIL DFT.
5. VALVE BOX TO BE TYLER PIPE, 6850 SERIES OR BINGHAM & TAYLOR, 15B SERIES, SCREW TYPE.

FIRE HYDRANT ASSEMBLY-VERTICAL CURB

NO SCALE

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022
DRAWING:	W-1



NOTE:
AIR RELEASE VALVE TO BE CRISPIN MODEL PL10.

(2" AND LESS) AIR RELEASE VALVE MANHOLE

NO SCALE

AIR RELEASE VALVE AND MANHOLE DETAIL

STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

EA group, inc.
ENGINEERS + LANDSCAPE ARCHITECTS
743 S. BROAD ST.
LITITZ, PA 17543
(717) 626-7271
elagroup.com

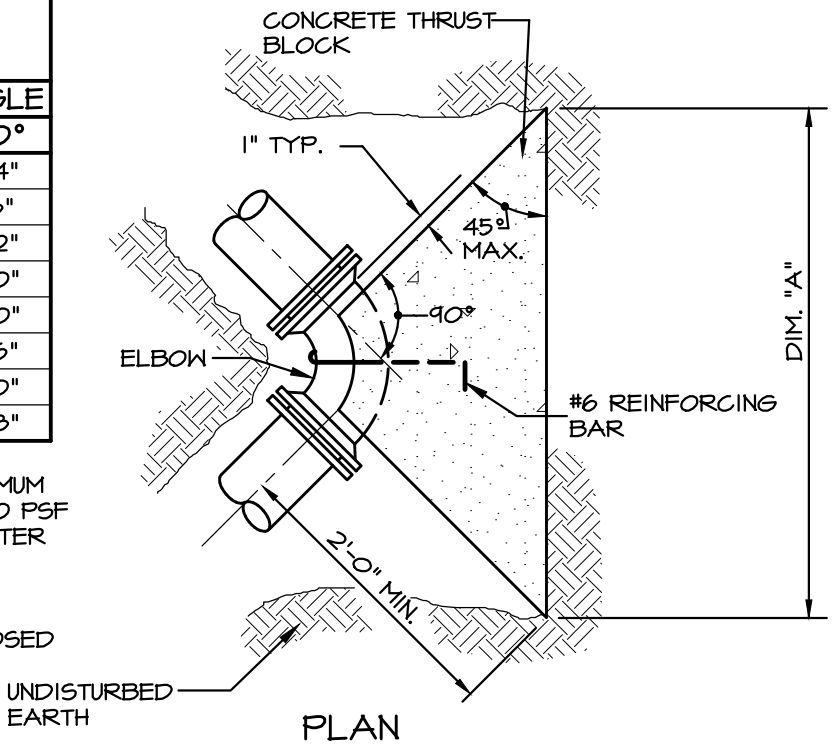
SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-2

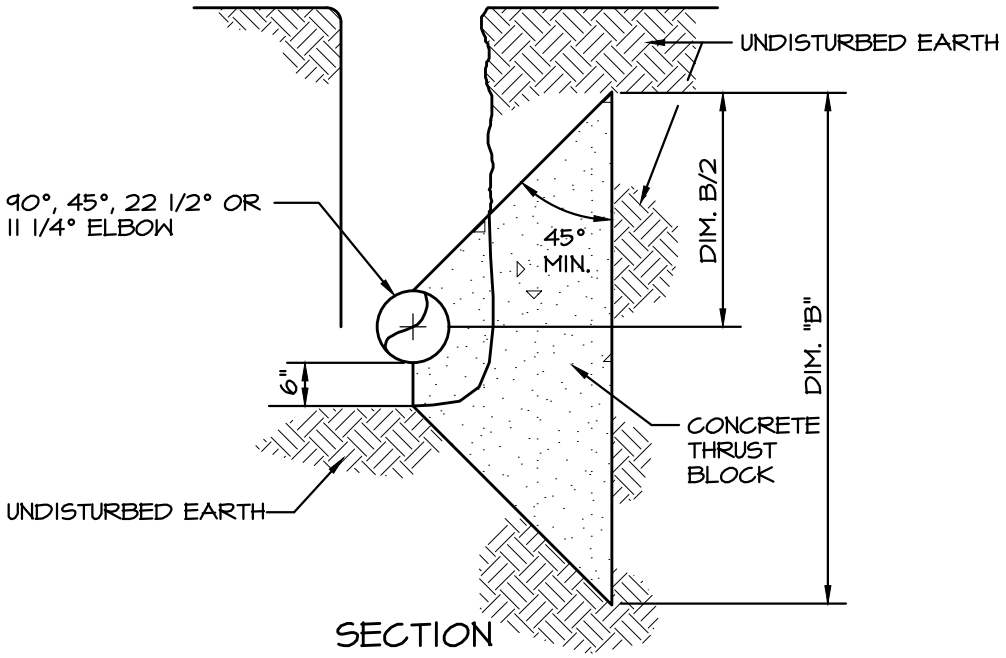
THRUST BLOCK DIMENSION SCHEDULE - ELBOWS(*) (DUCTILE IRON PIPE)					
PIPE DIAM.	DIM.	ELBOW DEFLECTION ANGLE			
		11 1/4°	22 1/2°	45°	90°
4"	A	12"	18"	24"	24"
	B	12"	12"	12"	18"
6"	A	18"	24"	30"	42"
	B	12"	18"	24"	30"
8"	A	24"	24"	42"	60"
	B	12"	24"	30"	36"
12"	A	30"	42"	54"	90"
	B	24"	30"	36"	48"

(*) THRUST BLOCK DESIGN BASED ON THE MINIMUM SOIL HORIZONTAL BEARING STRENGTH OF 3000 PSF AND 150 PSI WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED THRUST BLOCK SIZES.



PLAN



SECTION

HORIZONTAL AND VERTICAL UP RESTRAINT THRUST BLOCKING DETAIL - ELBOWS

NO SCALE

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HORIZONTAL AND VERTICAL UP RESTRAINT THRUST BLOCKING DETAIL-ELBOWS
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

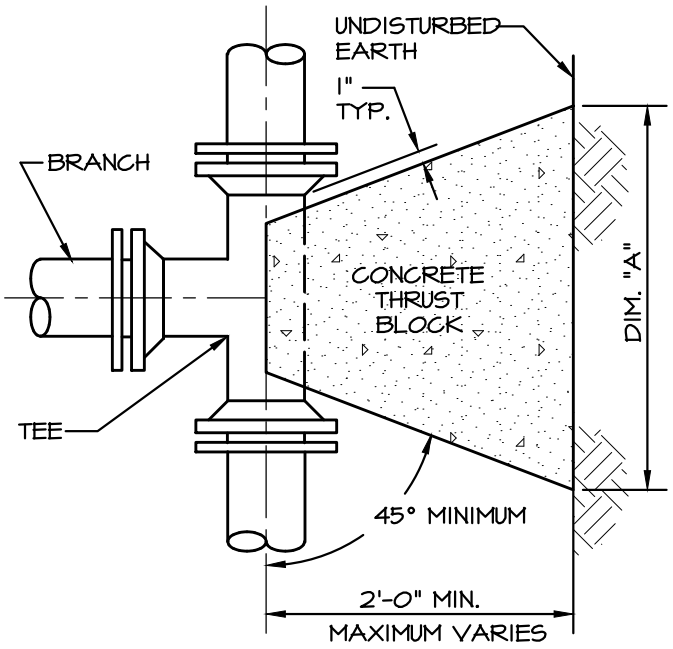
SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-3

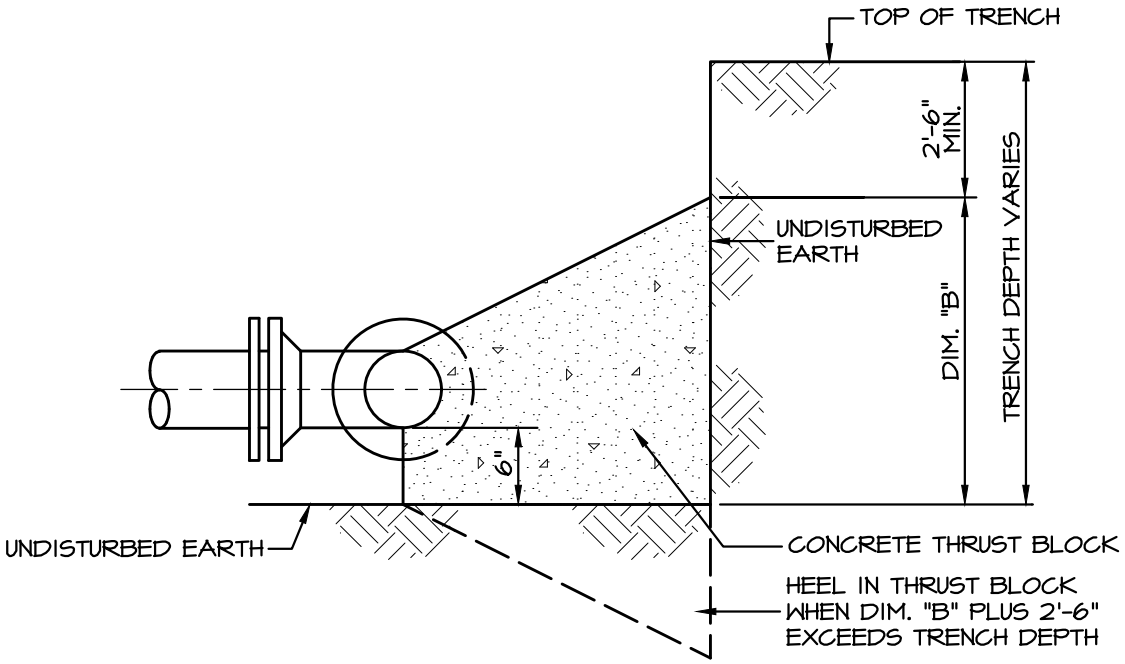
THRUST BLOCK DIMENSION SCHEDULE - ELBOWS(*) (DUCTILE IRON PIPE)				
DIM.	BRANCH SIZE			
	4"	6"	8"	12"
A	36"	42"	60"	96"
B	18"	24"	30"	42"

(*) THRUST BLOCK DESIGN BASED ON THE MINIMUM SOIL HORIZONTAL BEARING STRENGTH OF 3000 PSF AND 150 PSI WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED THRUST BLOCK SIZES.



PLAN



SECTION

HORIZONTAL RESTRAINT THRUST BLOCKING DETAIL - TEES

NO SCALE

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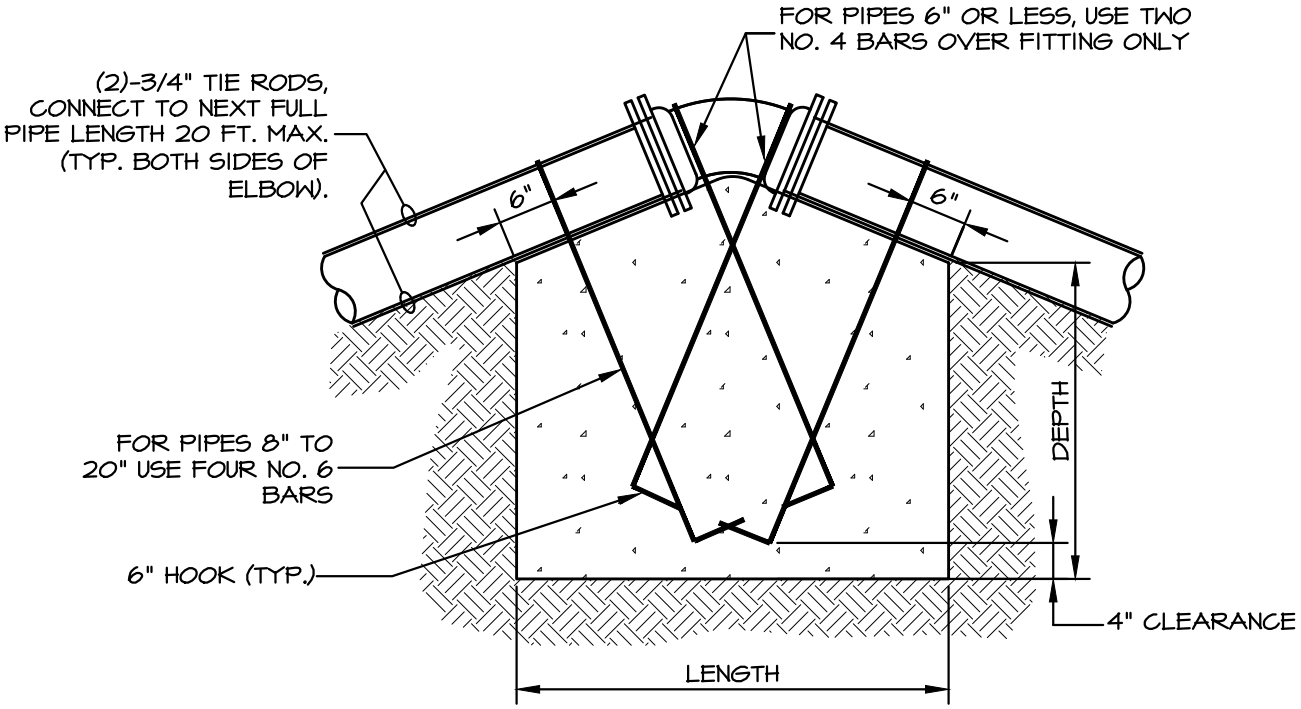
HORIZONTAL RESTRAINT THRUST BLOCKING DETAILS-TEES
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-4

PIPE SIZES	DIMENSIONS OF CONCRETE BLOCKING								
	LENGTH			WIDTH			DEPTH		
	11 1/4°	22 1/2°	45°	11 1/4°	22 1/2°	45°	11 1/4°	22 1/2°	45°
4" AND SMALLER	2'	4'	4'	1.5'	3'	3'	1'	2'	3'
6" AND 8"	3'	4'	6'	3'	3'	3'	2'	3'	4'
10" AND 12"	4.5'	6'	8'	3'	3'	4'	3'	4.5'	5'
14" AND 16"	6'	8'	11'	3.5'	3.5'	5'	2.5'	5'	5'
18" AND 20"	7'	9'	13'	4'	5'	5.5'	4'	5'	6'



NOTES:

1. DIMENSIONS OF CONCRETE BLOCKS VERIFIED USING AWWA M41 DUCTILE IRON PIPE AND FITTINGS. ASSUMPTIONS USED FOR CALCULATIONS WERE A WORKING PRESSURE OF 200 PSI AND A SAFETY FACTOR OF 1.5.
2. IF THE OWNER AGREES, TIE RODS MAY BE ELIMINATED PROVIDED ALL JOINTS ARE MECHANICAL JOINT TYPE WITH JOINT RESTRAINT. (MEGALUG BY EBAA IRON SERIES 1100 OR APPROVED EQUAL).
3. NO COUPLING OR JOINTS SHALL BE COVERED WITH CONCRETE .
4. REINFORCING BAR STRAPS TO BE SHAPED TO PIPE CURVATURE.
5. ALL EXPOSED STEEL TO BE PAINTED WITH TWO COATS ASPHALTIC PAINT.
6. CONCRETE BEARING SURFACES SHALL BE UNDISTURBED SOIL.

TYPICAL THRUST BLOCKING FOR VERTICAL UPWARD THRUSTS

NO SCALE

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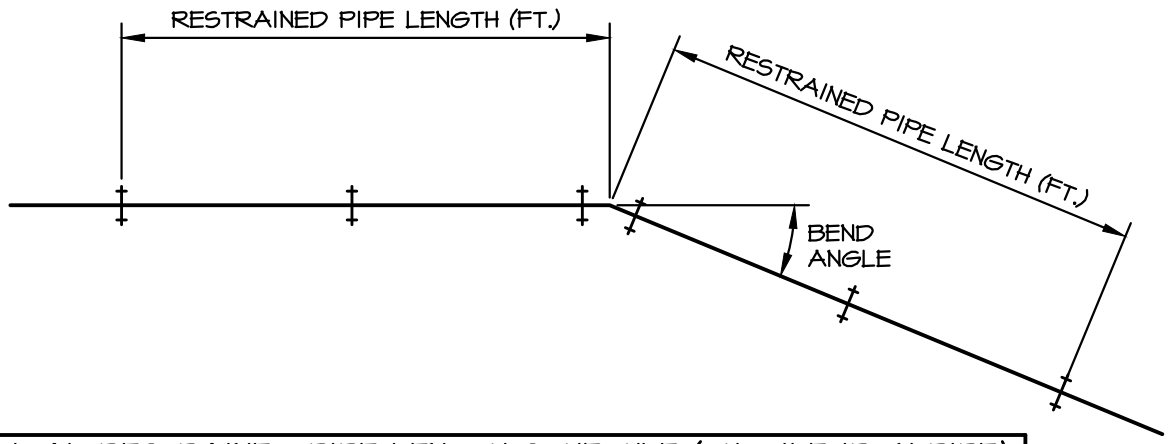
TYPICAL THRUST BLOCKING FOR VERTICAL UPWARD THRUSTS
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-5



VERTICAL RESTRAINED PIPE LENGTH SCHEDULE (DUCTILE IRON PIPE)			
PIPE DIAMETER	VERTICAL ELBOW DEFLECTION ANGLE		
	45°	22 1/2°	11 1/4°
4"	20'	10'	5'
6"	27'	13'	7'
8"	36'	17'	9'
10"	42'	21'	10'
12"	49'	24'	12'
16"	62'	30'	15'

HORIZONTAL RESTRAINED PIPE LENGTH SCHEDULE (DUCTILE IRON PIPE)						
PIPE DIAMETER	HORIZONTAL ELBOW DEFLECTION ANGLE				TEE BRANCH	DEAD END
	90°	45°	22 1/2°	11 1/4°		
4"	21'	9'	5'	2'	47	47
6"	28'	12'	6'	3	66	66
8"	37'	15'	8'	4	85	85
10"	43'	18'	9'	5'	101	101
12"	50'	21'	10'	5'	118	118
16"	62'	26'	13'	7'	150	150

NOTES:

1. HORIZONTAL AND VERTICAL RESTRAINED PIPE LENGTH SCHEDULE CALCULATED USING EBBA IRON - RESTRAINT LENGTH CALCULATOR 6.3. ASSUMPTIONS USED FOR CALCULATIONS WERE GP SOIL TYPE, 2.0 TO 1.0 SAFETY FACTOR, TRENCH TYPE 5, 2 FEET OF BURY DEPTH AND TEST PRESSURE OF 150 PSI. CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY ALL CALCULATION ASSUMPTIONS AND MAKE THE FINAL RESTRAINED LENGTH SELECTION.
2. FOR PIPE SIZES GREATER THAN 16", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED RESTRAINED PIPE LENGTHS.
3. ADD 12% TO LENGTH IF PIPE IS POLYETHYLENE ENCASED.
4. WHERE RESTRAINED LENGTHS FROM ADJACENT FITTINGS OVERLAP, SUBMIT CALCULATIONS FOR RESTRAINED LENGTHS.

RESTRAINED PIPE LENGTH SCHEDULE

NO SCALE

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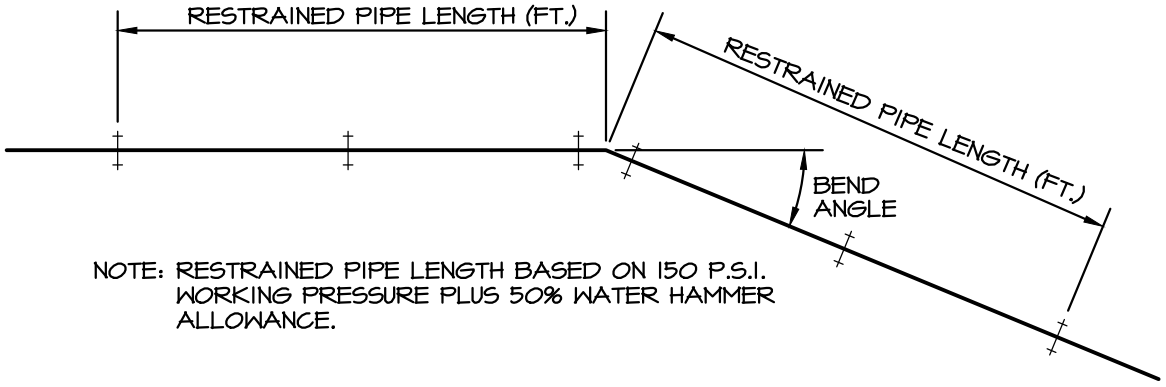
RESTRAINED PIPE LENGTH SCHEDULE
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-6



NOTE: RESTRAINED PIPE LENGTH BASED ON 150 P.S.I. WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

HORIZONTAL RESTRAINED PIPE LENGTH SCHEDULE (DUCTILE IRON PIPE)				
PIPE DIAMETER	HORIZONTAL ELBOW DEFLECTION ANGLE			
	90°	45°	22 1/2°	11 1/4°
3" THRU 4"	19'	8'	4'	2'
6"	27'	11'	7'	3'
8"	35'	14'	8'	4'
10"	42'	17'	8'	5'
12"	49'	20'	10'	5'

*ADD 12% TO LENGTH IF PIPE IS POLYETHYLENE ENCASED

VERTICAL RESTRAINED PIPE LENGTH SCHEDULE (DUCTILE IRON PIPE)			
PIPE DIAMETER	VERTICAL ELBOW DEFLECTION ANGLE		
	45°	22 1/2°	11 1/4°
3" THRU 4"	20'	10'	5'
6"	28'	14'	7'
8"	37'	18'	9'
10"	44'	21'	11'
12"	52'	25'	12'

*ADD 12% TO LENGTH IF PIPE IS POLYETHYLENE ENCASED

NOTE: FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED RESTRAINED PIPE LENGTHS.

DUCTILE IRON RESTRAINED PIPE LENGTH SCHEDULE

NO SCALE

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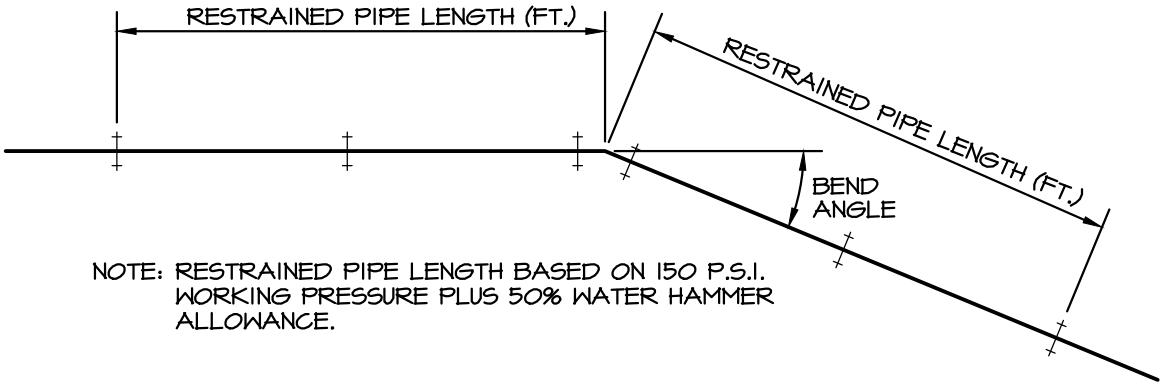
DUCTILE IRON RESTRAINED PIPE LENGTH SCHEDULE
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-7



NOTE: RESTRAINED PIPE LENGTH BASED ON 150 P.S.I. WORKING PRESSURE PLUS 50% WATER HAMMER ALLOWANCE.

HORIZONTAL RESTRAINED PIPE LENGTH SCHEDULE (PVC PIPE)				
PIPE DIAMETER	HORIZONTAL ELBOW DEFLECTION ANGLE			
	90°	45°	22 1/2°	11 1/4°
1 1/2" THRU 4"	27'	11'	6'	3'
6"	38'	15'	10'	4'
8"	49'	20'	11'	6'
10"	59'	24'	12'	7'
12"	69'	28'	14'	8'

VERTICAL RESTRAINED PIPE LENGTH SCHEDULE (PVC PIPE)			
PIPE DIAMETER	VERTICAL ELBOW DEFLECTION ANGLE		
	45°	22 1/2°	11 1/4°
1 1/2" THRU 4"	28'	14'	7'
6"	39'	20'	10'
8"	52'	25'	13'
10"	62'	29'	15'
12"	73'	35'	17'

NOTE: FOR PIPE SIZES GREATER THAN 12", SUBMIT ENGINEERING CALCULATIONS TO VERIFY PROPOSED RESTRAINED PIPE LENGTHS.

PVC RESTRAINED PIPE LENGTH SCHEDULE

NO SCALE

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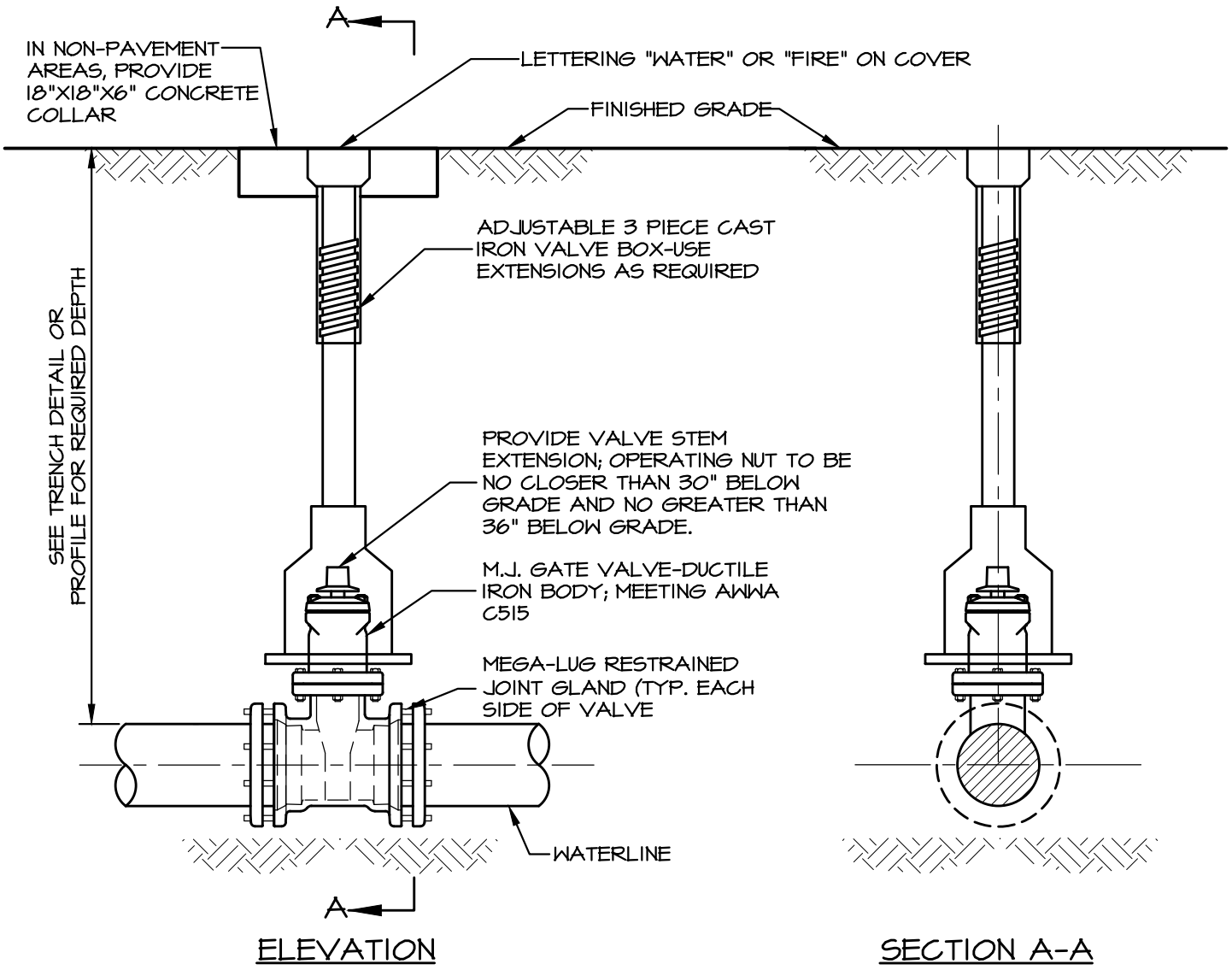
PVC RESTRAINED PIPE LENGTH SCHEDULE
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-8



NOTES:

1. IF EXTENSIONS ARE NECESSARY CONTRACTOR SHALL SET "PLUMB" AND ALIGN PROPERLY FOR ACCESS TO OPERATING NUT.
2. VALVES SHALL BE OPEN LEFT AND RIGHT CLOSE UNLESS OTHERWISE SPECIFIED.
3. GATE VALVES SHALL BE USED ON WATERLINES 12 INCHES AND SMALLER.
4. GATE VALVE TO BE AMERICAN FLOW CONTROL SERIES 500 OR MUELLER, NON-RISING STEM, OPEN LEFT.
5. RESTRAINED JOINTS TO BE MEGA-LUG OR EQUAL.
6. AWWA C 550 FUSION BONDED EPOXY COATING INTERIOR AND EXTERIOR, MIN 8 MIL DFT.
7. VALVE BOX TO BE TYLER PIPE, 6850 SERIES OR BINGHAM & TAYLOR, 15B SERIES, SCREW TYPE.

GATE VALVE AND VALVE BOX

NO SCALE

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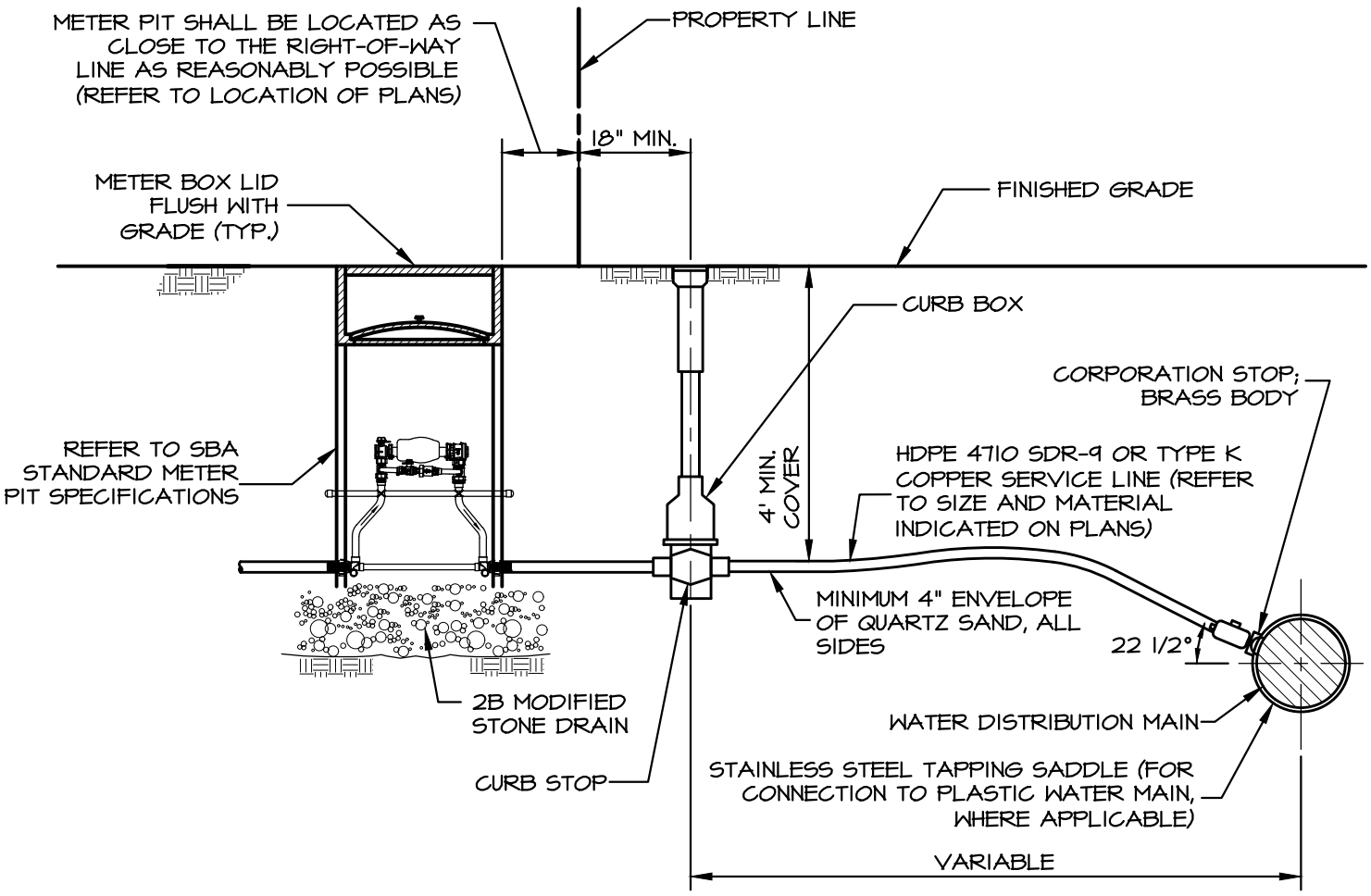
GATE VALVE AND VALVE BOX
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-9



NOTES:

1. WHEN USING POLYETHYLENE SERVICE TUBING, STAINLESS STEEL INSERTS SHALL BE USED.
2. ALL MATERIALS SHALL CONFORM TO NSF 61/ANSI 61; ANNEX F; ANNEX G; AND NSF/ANSI 372.
3. CURB BOX LID SHALL BE FLUSH WITH GRADE AND CURB BOX SHALL BE CENTERED OVER CURB STOP VALVE.
4. SERVICE LINE TO BE HDPE SDR-9 (CRESLINE CE BLUE, JM EAGLE, OR EJ PRESCOTT) OR TYPE K COPPER TUBING.
5. CURB STOP TO BE FORD METER BOX CO. B44-333, B44-444, OR B11-777, OR MUELLER COMPANY B25209.
6. CURB BOX TO BE BINGHAM & TAYLOR, SERIES 12B9 OR SERIES 14B, OR TYLER SERIES 6500.
7. CORPORATION STOP TO BE FORD METER BOX CO, MODEL F 1000 OR MUELLER COMPANY, H15008.

WATER SERVICE CONNECTION WITH METER (3/4", 1", 1 1/2" AND 2")

NO SCALE

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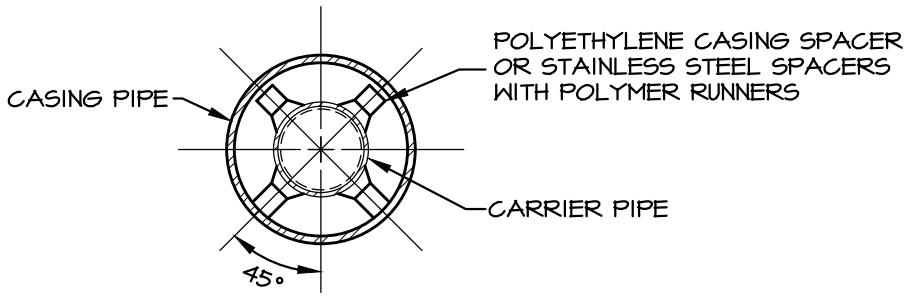
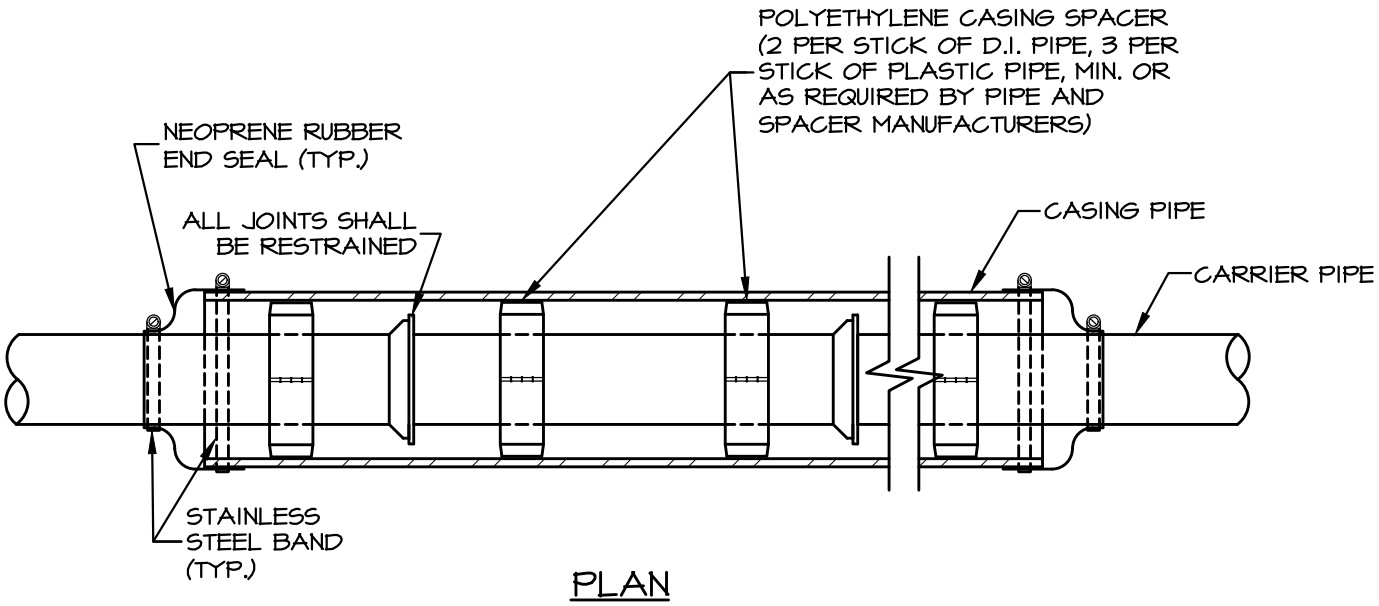
WATER SERVICE CONNECTION WITH METER (3/4", 1", 1 1/2" AND 2")
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	FEBRUARY 2024

DRAWING: W-10



SECTION



PLAN

CASING CRADLE

NO SCALE

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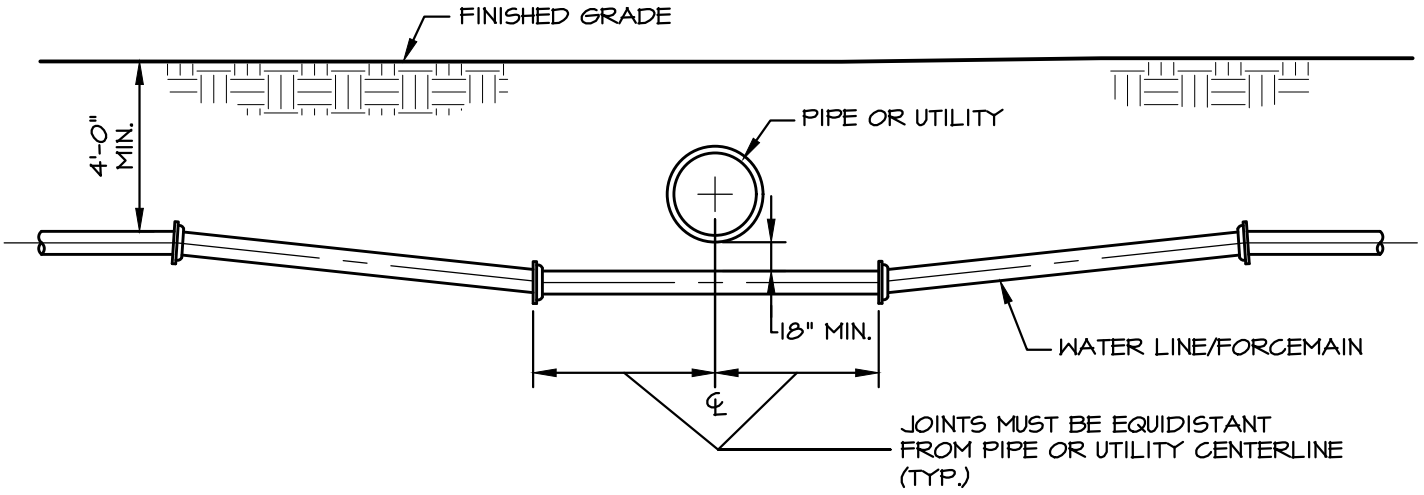
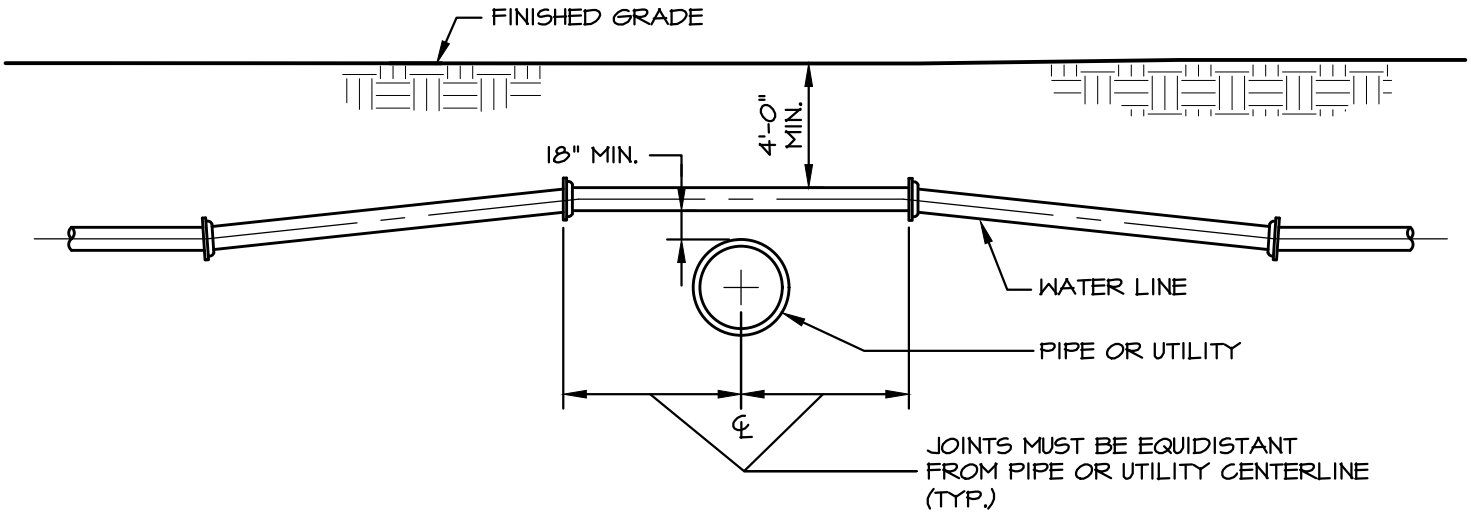
CASING CRADLE
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-11





NOTES:

1. CONTRACTORS MUST INSTALL PIPE OR UTILITY CROSSINGS USING DEFLECTING JOINTS IN A MANNER THAT DOES NOT CREATE LOCALIZED SAGS OR HIGH POINTS THAT WOULD CAUSE THE ACCUMULATION OF AIR AND REQUIRE ADDITIONAL AIR RELEASE VALVES.
2. PIPE JOINT DEFLECTIONS TO BE IN ACCORDANCE WITH AWWA STANDARDS, SECTION C600.
3. ONLY FULL STICKS OF PIPE SHALL BE UTILIZED FOR THIS METHOD OF CROSSING PIPES OR UTILITIES.
4. THE UTILITY OWNER MAY, AT THEIR DISCRETION AND IN CONSULTATION WITH THE AUTHORITY, REQUIRE CONCRETE ENCASEMENT OF EITHER THE UTILITY OR WATER LINE/FORCEMAIN.

WATER LINE CROSSING PIPE OR UTILITY USING DEFLECTING JOINTS

NO SCALE

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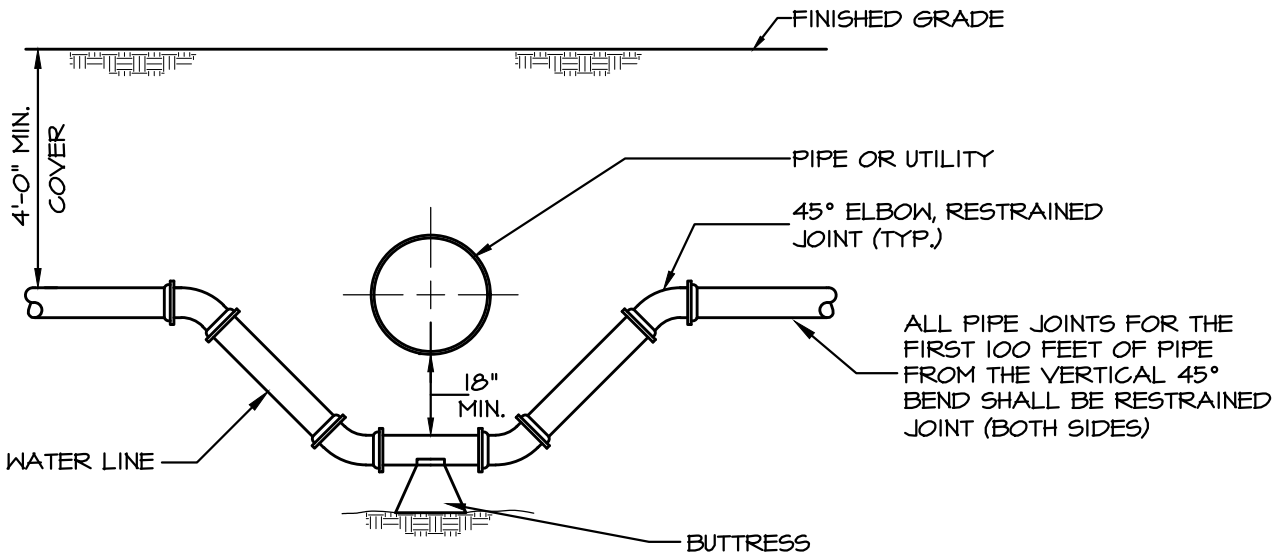
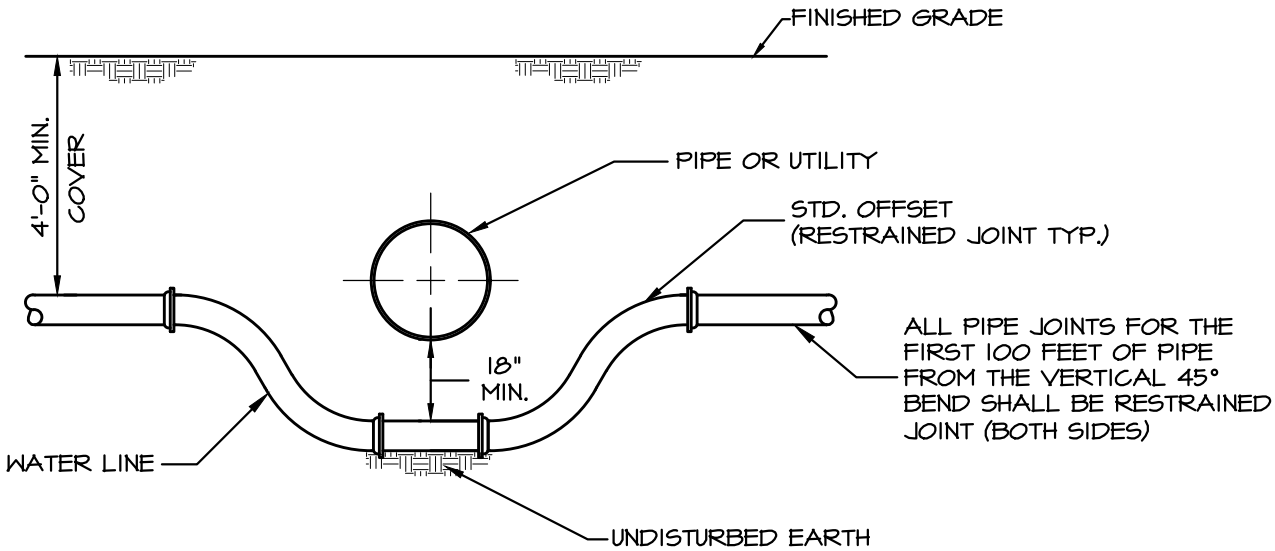
WATER LINE CROSSING PIPE OR UTILITY USING DEFLECTING JOINTS
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-12



USING ELBOWS



USING STD. OFFSETS

*NOTE: THIS DETAIL APPLIES TO CROSSINGS OF ALL EXISTING PIPES

WATER LINE CROSSING PIPE OR UTILITY USING FITTINGS WITH BUTTRESS

NO SCALE

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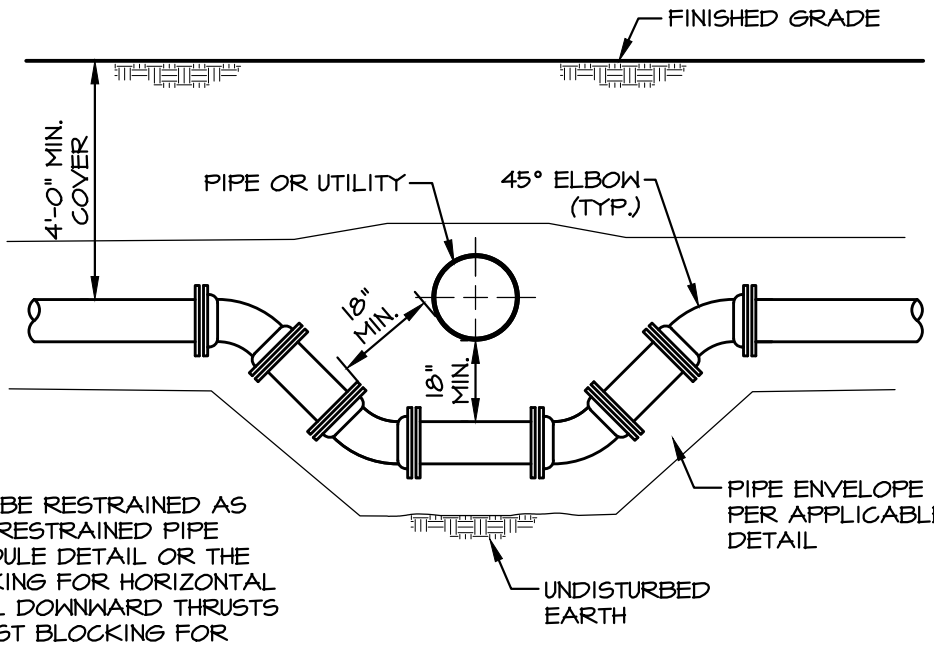
WATER LINE CROSSING PIPE OR UTILITY USING FITTINGS WITH BUTTRESS
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

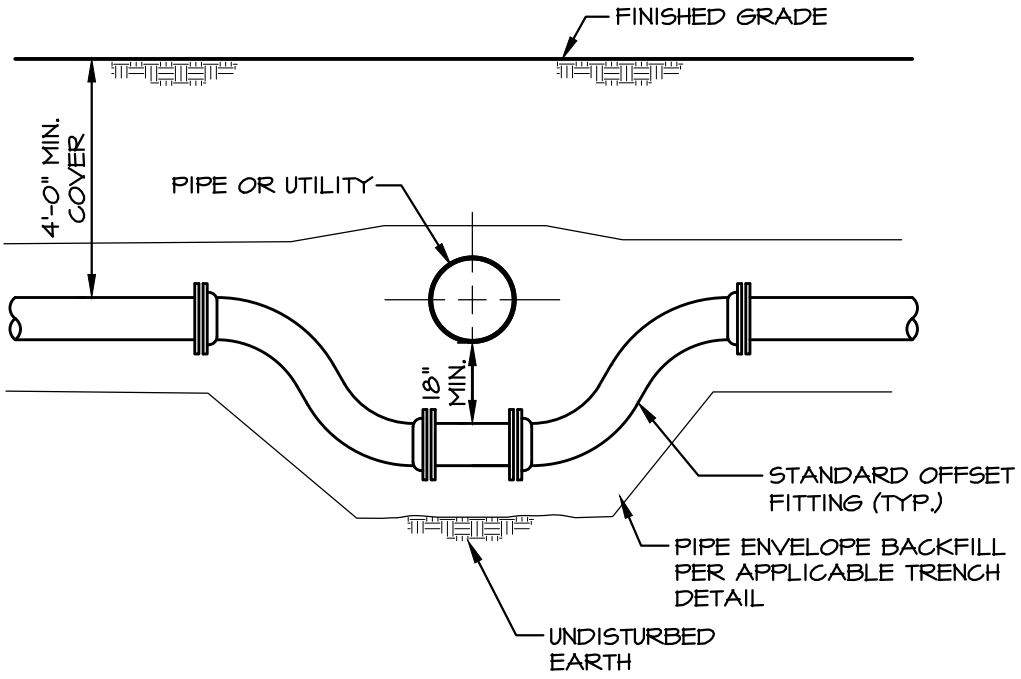
DRAWING: W-13



NOTES:

1. BENDS SHALL BE RESTRAINED AS SHOW ON THE RESTRAINED PIPE LENGTH SCHEDULE DETAIL OR THE THRUST BLOCKING FOR HORIZONTAL AND VERTICAL DOWNWARD THRUSTS AND THE THRUST BLOCKING FOR VERTICAL UPWARD THRUSTS DETAILS.
2. REGARDLESS OF THE THRUST RESTRAINT USED, THE FOUR BENDS OR TWO OFFSETS SHOWN ON THIS DETAIL SHALL BE RESTRAINED JOINT.

USING ELBOWS



USING STANDARD OFFSETS

WATER LINE CROSSING PIPE OR UTILITY USING FITTINGS

NO SCALE

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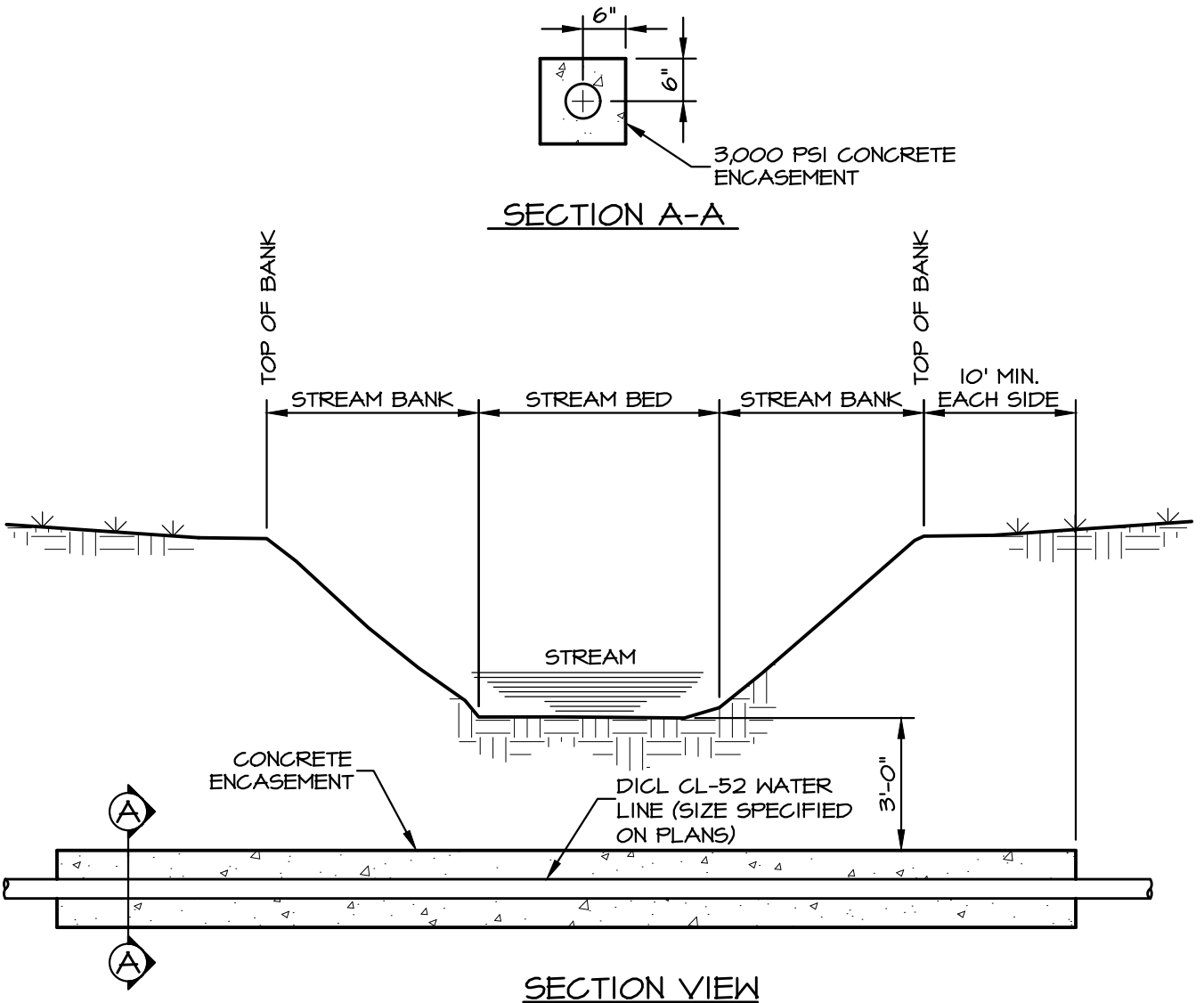
WATER LINE CROSSING PIPE OR UTILITY USING FITTINGS
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-14



SECTION VIEW

NOTES:

1. ALL NECESSARY CHAPTER 102 AND 105 PERMITS SHALL BE ACQUIRED PRIOR TO INSTALLATION. CONTRACTOR SHALL IMPLEMENT ALL BEST MANAGEMENT PRACTICES AS SET FORTH WITHIN SAID PERMITS.
2. CONTRACTOR SHALL CONDUCT AN ONSITE MEETING WITH THE WATER AUTHORITY PRIOR TO ORDERING MATERIALS FOR THE STREAM CROSSING.
3. ANY CHANGES TO THE DESIGN OR LAYOUT OF THE STREAM CROSSING SHALL BE APPROVED BY THE WATER AUTHORITY PRIOR TO INSTALLATION.
4. ALL HORIZONTAL AND VERTICAL BENDS SHALL HAVE ADEQUATE CONCRETE THRUST BLOCKING OR RODDED PIPE RESTRAINT.

STREAM CROSSING DETAIL

NO SCALE

ELA group, inc.
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LITITZ, PA 17543
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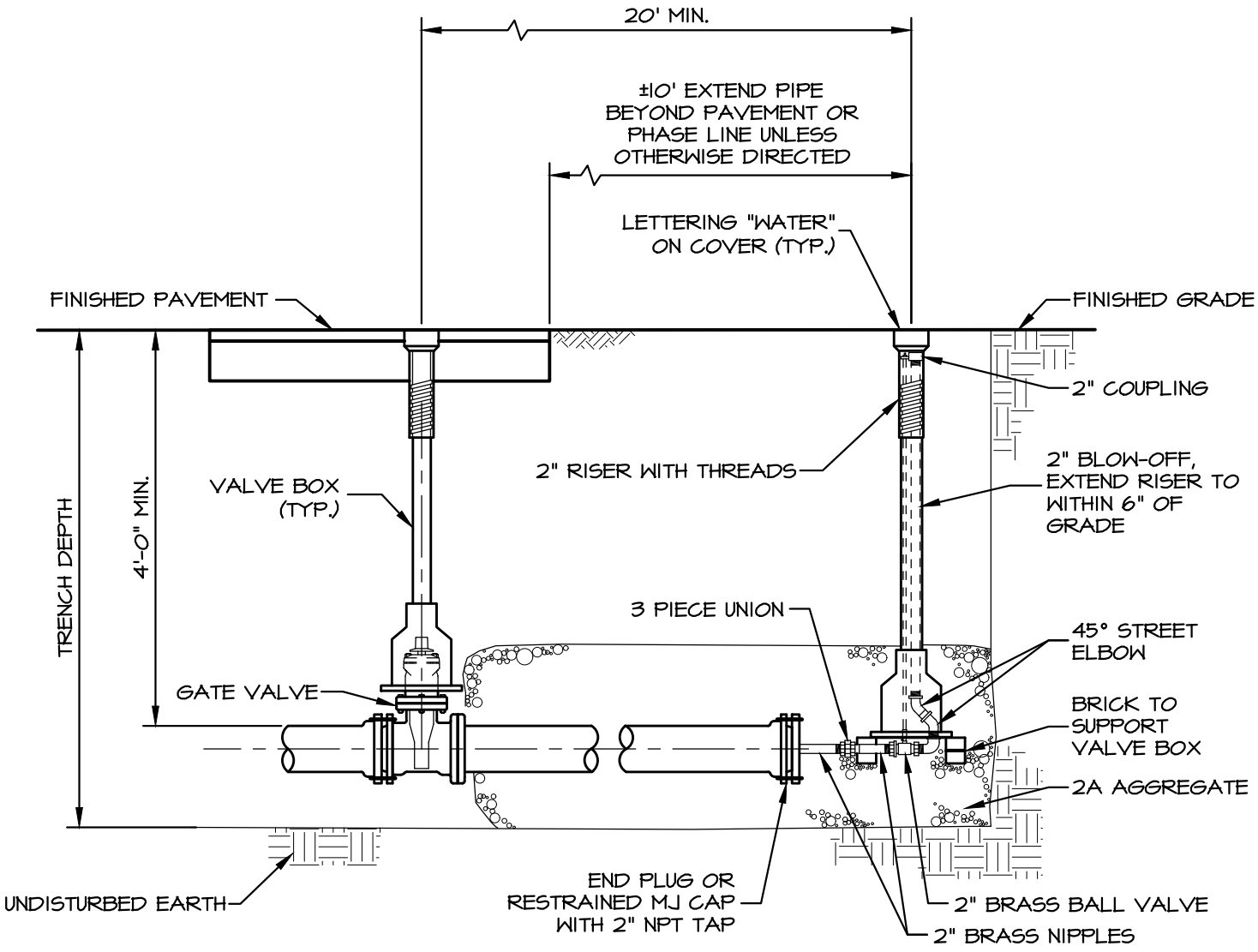
STREAM CROSSING DETAIL
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-15



NOTE:

ALL JOINTS ARE MECHANICAL JOINT PIPE WITH JOINT RESTRAINT OR PUSH ON PIPE WITH FIELD LOCK GASKETS.

CAP AND BLOW-OFF

NO SCALE

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CAP AND BLOW-OFF
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-16

RESERVED FOR FUTURE USE

743 S. BROAD ST.
LITITZ, PA 17543
(717) 626-7271
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STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	FEBRUARY 2024

DRAWING:
W-17

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STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	FEBRUARY 2024

DRAWING:
W-17A

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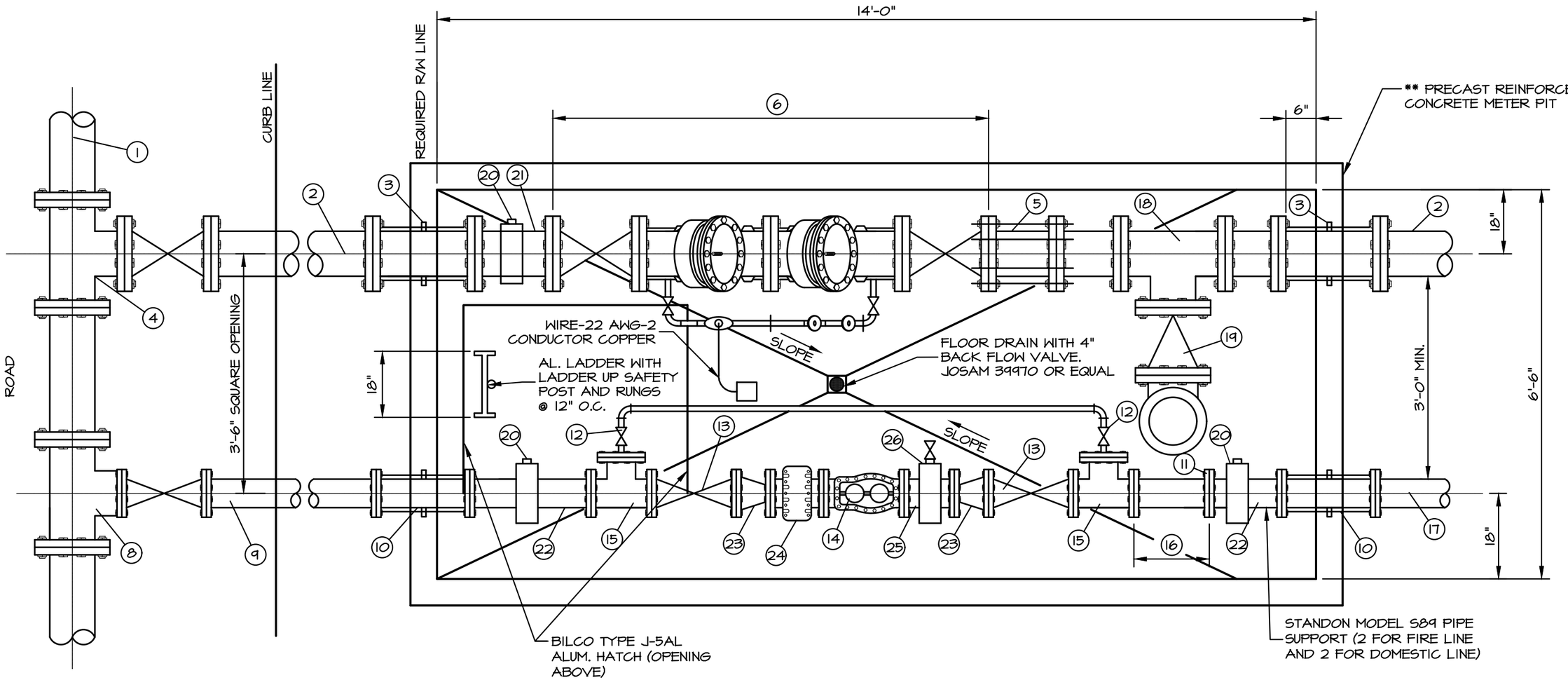
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	FEBRUARY 2024

DRAWING:
W-18



PLAN VIEW

METER PIT (4" DOMESTIC AND 6" FIRE)

NO SCALE

NOTE: SEE DETAIL W-19A FOR CHART

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METER PIT (4" DOMESTIC AND 6" FIRE)
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-19

PIPING SCHEDULE		
ITEM	SIZE	DESCRIPTION
1	8"	EXISTING WATER MAIN
2	6"	FIRE LINE (CLASS 52 - C.L.D.I.)
3	6"	RODDED THRU WALL OR OMNI SLEEVE WITH MEG-A-LUG JOINT RESTRAINT (CL 53 OR CL 54)
4	6" X 6"	TAPPING SLEEVE W/ GATE VALVE
5	6" X 6"	FLANGE ADAPTER
6	6"	WATTS 709 DCDA DOUBLE CHECK DETECTOR ASSEMBLY OR EQUAL/BYPASS ROCKWELL ECR-TRPL TYPE WATER METER (5/8" X 3/4")
7	N/A	ROCKWELL (SENSUS) ECR-6 WHEEL, 10 DIGIT ID, GALLON WITH TRPL AND 25' TWO WIRE.
8	6" X 4"	TAPPING SLEEVE W/ GATE VALVE
9	4"	DOMESTIC LINE (CLASS 52 - C.L.D.I.)
10	4"	RODDED THRU WALL OR OMNI SLEEVE WITH MEG-A-LUG JOINT RESTRAINT (CL 53 OR CL 54)
11	4"	FLANGE
12	2"	LOCKING BALL VALVE - APOLLO 75-100-41 OR EQUAL
13	4"	GATE VALVE
14	3"	NEPTUNE HIGH PERFORMANCE COMPOUND METER (OR APPROVED EQUAL BY THE CITY OF LANCASTER)
15	4" X 2"	TEE
16	N/A	4" SPOOL PIECE (IN PLACE OF BACKFLOW PREVENTOR). RPZ BACKFLOW PREVENTOR TO BE LOCATED INSIDE BUILDING (SEE FLOOR PLAN DETAIL)
17	4"	DOMESTIC LINE (PVC SDR-21)
18	6" X 4"	TEE
19	4"	WAFER CHECK VALVE
20	2"	SERVICE SADDLE AND PLUG FOR FLUSHING
21	6"	SPOOL PIECE (CLASS 52 - C.L.D.I.)
22	4"	SPOOL PIECE (CLASS 52 - C.L.D.I.)
23	4" X 3"	REDUCER (BUSHING)
24	3"	STRAINER
25	3"	SPOOL PIECE
26	3"	SERVICE SADDLE WITH 2" BRASS NIPPLE AND VALVE

METER PIT (4" DOMESTIC AND 6" FIRE)

NO SCALE

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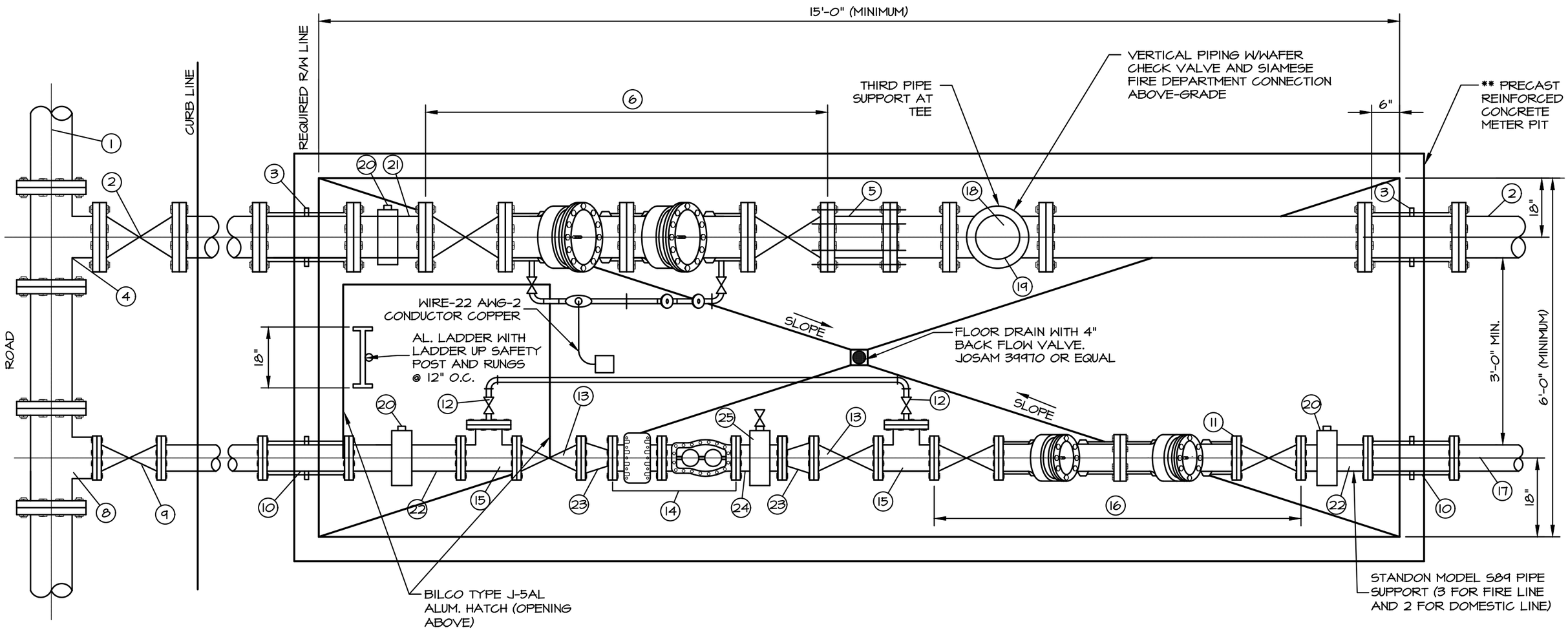
METER PIT (4" DOMESTIC AND 6" FIRE)

STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-19A



PLAN VIEW

METER PIT (4" DOMESTIC AND 6" FIRE WITH FIRE DEPARTMENT CONNECTION)

NOTE: SEE DETAIL W-19C FOR CHART

NO SCALE

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METER PIT (4" DOMESTIC AND 6" FIRE WITH FIRE DEPARTMENT CONNECTION)
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	NOVEMBER 2022

DRAWING: W-19B

PIPING SCHEDULE		
ITEM	SIZE	DESCRIPTION
1	8"	EXISTING WATER MAIN
2	6"	FIRE LINE (CLASS 52 - C.L.D.I.)
3	6"	RODDED THRU WALL OR OMNI SLEEVE WITH MEG-A-LUG JOINT RESTRAINT (CL 53 OR CL 54)
4	8" X 6"	TAPPING SLEEVE W/ GATE VALVE
5	6" X 6"	FLANGE ADAPTER
6	6"	WATTS 709 DCDA DOUBLE CHECK DETECTOR ASSEMBLY OR EQUAL/BYPASS ROCKWELL ECR-TRPL TYPE WATER METER (5/8" X 3/4")
7	N/A	ROCKWELL (SENSUS) ECR-6 WHEEL, 10 DIGIT ID, GALLON WITH TRPL AND 25' TWO WIRE.
8	8" X 4"	TAPPING SLEEVE W/ GATE VALVE
9	4"	DOMESTIC LINE (CLASS 52 - C.L.D.I.)
10	4"	RODDED THRU WALL OR OMNI SLEEVE WITH MEG-A-LUG JOINT RESTRAINT (CL 53 OR CL 54)
11	4"	FLANGE
12	2"	LOCKING BALL VALVE - APOLLO 75-100-41 OR EQUAL
13	4"	GATE VALVE (OS&Y WITH HANDWHEEL)
14	3"	SENSUS OMNI C2 WATER METER WITH STRAINER
15	4" X 2"	TEE
16	4"	WATTS LF709 DOUBLE CHECK VALVE ASSEMBLY
17	4"	DOMESTIC LINE (PVC C900 DR-18)
18	6" X 4"	TEE
19	4"	WAFER CHECK VALVE
20	2"	SERVICE SADDLE AND PLUG FOR FLUSHING
21	6"	FLANGED SPOOL PIECE (DICL CL-53)
22	4"	FLANGED SPOOL PIECE (DICL CL-53)
23	4" X 3"	CONCENTRIC REDUCER
24	3"	FLANGED SPOOL PIECE (DICL CL-53)
25	3"	SERVICE SADDLE WITH 2" BRASS NIPPLE AND VALVE

METER PIT (4" DOMESTIC AND 6" FIRE WITH FIRE DEPARTMENT CONNECTION)

NO SCALE

METER PIT (4" DOMESTIC AND 6" FIRE WITH FIRE DEPARTMENT CONNECTION)

STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

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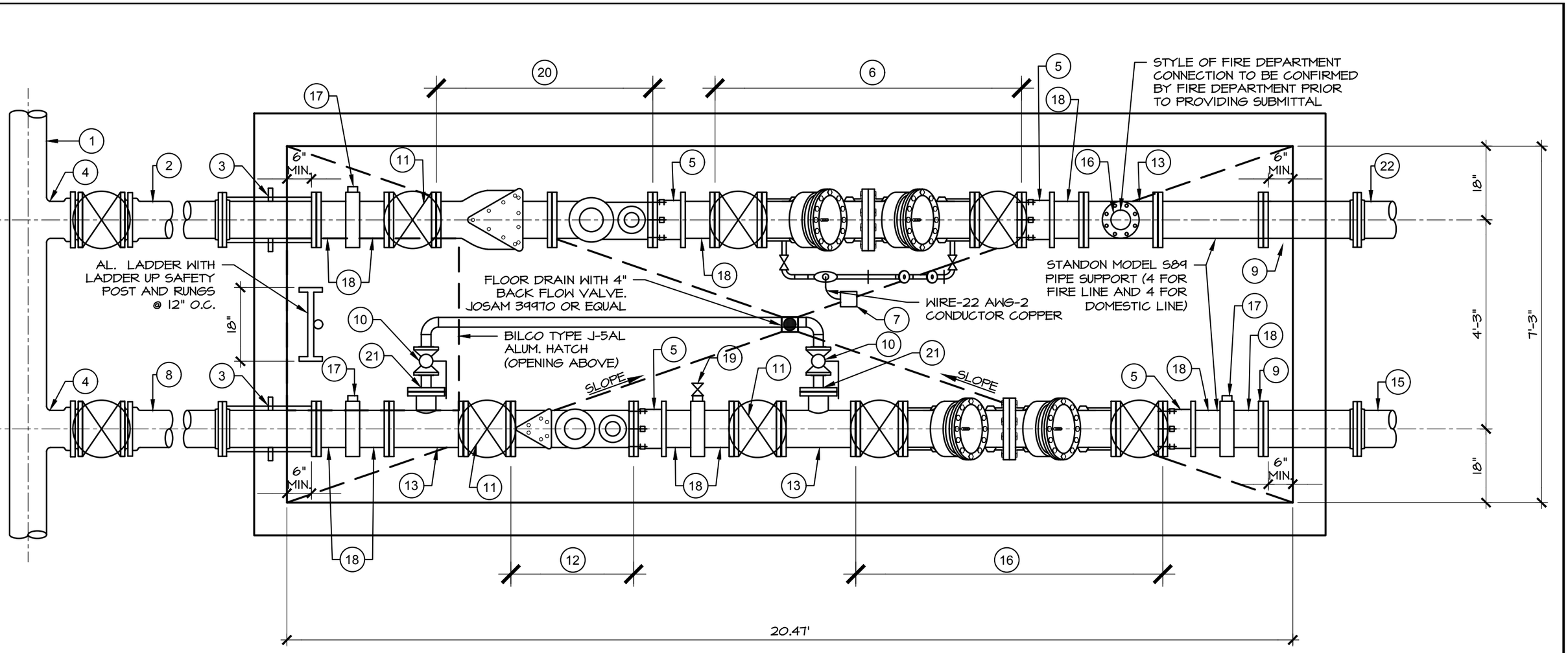
SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	NOVEMBER 2022

DRAWING: W-19C



METER PIT (8" DOMESTIC AND FIRE WITH FIRE DEPARTMENT CONNECTION)

NO SCALE

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METER PIT (8" DOMESTIC AND FIRE WITH FIRE DEPARTMENT CONNECTION)
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	DECEMBER 2023

DRAWING: W-19D

ITEM NO.	DESCRIPTION	SIZE/ DIMENSION
1	EXISTING WATER MAIN	8"
2	FIRE LINE (CLASS 52 - C.L.D.I.)	8"
3	RODDED THRU WALL OR OMNI SLEEVE WITH MEG-A-LUG JOINT RESTRAINT (CL 53 OR CL 54)	8"
4	TAPPING SLEEVE W/ GATE VALVE	8"
5	FLANGE ADAPTER	8"
6	WATTS 709 DCDA DOUBLE CHECK DETECTOR ASSEMBLY OR EQUAL/BYPASS ROACKWELL ECR-TRPL TYPE WATER METER (5/8" X 3/4")	8"
7	ROCKWELL (SENSUS) ECR-6 WHEEL, 10 DIGIT ID, GALLON WITH TRPL AND 25' TWO WIRE	N/A
8	DOMESTIC LINE (CLASS 52 - C.L.D.I.)	8"
9	FLANGE	8"
10	LOCKING BALL VALVE - APOLLO 75-100-41 OR EQUAL	2"
11	GATE VALVE (OS&Y WITH HANDWHEEL)	8"
12	SENSUS OMNI C2 WATER METER WITH STRAINER	8"
13	TEE	8"X4"
14	WATTS LF709 DOUBLE CHECK VALVE ASSEMBLY	8"
15	DOMESTIC LINE (MATERIAL PER PLAN)	PER PLAN
16	VERTICAL PIPING WITH TYCO SWING CHECK VALVE AND GROOVED FLANGED ADAPTERS	4"
17	SERVICE SADDLE AND PLUG FOR FLUSHING	2"
18	FLANGED SPOOL PIECE (DICL CL 53)	8"
19	SERVICE SADDLE WITH 2" BRASS NIPPLE AND VALVE	8"
20	SENSUS OMNI F2 METER	8"
21	FLANGED CAP WITH 2" NPT THREADS	8"X2"
22	FIRE LINE (MATERIAL PER PLAN)	PER PLAN

METER PIT (8" DOMESTIC AND FIRE WITH FIRE DEPARTMENT CONNECTION)

STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

ELA group, inc.
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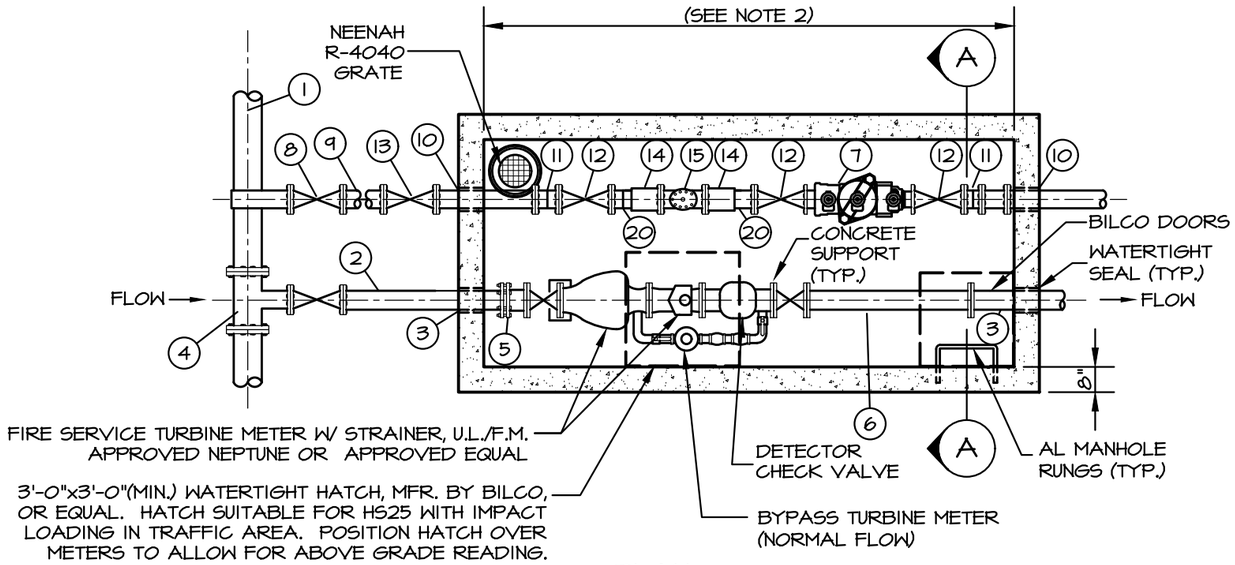
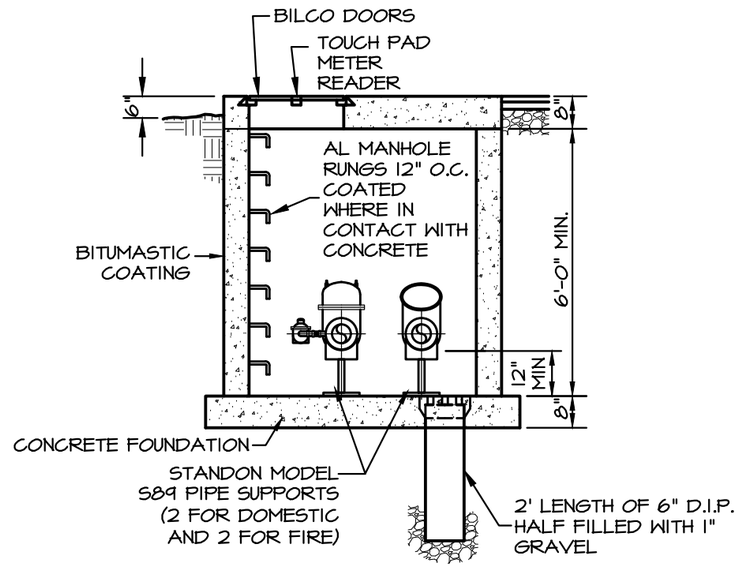
SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	DECEMBER 2023

DRAWING: W-19E



PLAN



SECTION A-A

PIPING SCHEDULE

ITEM	SIZE	DESCRIPTION
1	8"	PROPOSED WATER MAIN
2	6"	FIRE LINE (CLASS 52-C.L.D.I.)
3	6"	RODDED THRU WALL OR OMNI SLEEVE WITH MEG-A-LUG JOINT RESTRAINT (CL 53 OR CL 54)
4	6" X 8"	TEE
5	6" X 6"	FLANGE ADAPTER
6	N/A	SPOOL PIECE. NOTE: BACKFLOW PREVENTER LOCATED IN BUILDING. SEE MECHANICAL PLANS FOR DETAILS
7	2"	BACKFLOW PREVENTOR OR
8	2"	BRASS CORPORATION STOP
9	2"	DOMESTIC LINE (TYPE K COPPER TUBING)
10	2"	PVC SLEEVE (CAULKED IN PLACE)
11	2"	FLARED MALE PIPING ADAPTER
12	2"	GATE OR BALL VALVE
13	2"	CURB STOP WITH VALVE BOX
14	1.5"	METER COUPLING SCREWED INTO VALVE
15	1.5"	SENSUS METER TO BE PROVIDED BY THE STRASBURG BOROUGH AUTHORITY AND INSTALLED BY DEVELOPER
20	2" X 1.5"	REDUCER (BUSHING)

NOTES:

1. DETECTOR CHECK AND PIPING SHALL BE THE SAME NOMINAL SIZE.
2. THE MINIMUM DIMENSIONS OF THE METER PIT SHALL BE DETERMINED BY LENGTH OF INSTALLED METER AND TO SATISFY METER MFGR.'S STRAIGHT PIPE REQUIREMENTS.
3. METER VAULT TO BE LOCATED OUTSIDE OF ROADWAYS OR TRAFFIC AREAS, UNLESS OTHERWISE APPROVED BY THE AUTHORITY.
4. ALL PIPING, VALVES, FITTINGS, ETC., TO BE FURNISHED AND INSTALLED BY CONSUMER, ASIDE FROM METER, WHICH SHALL BE PROVIDED BY THE AUTHORITY AND INSTALLED BY THE DEVELOPER.
5. PRESSURE REDUCING VALVE REQUIRED WHEN DISTRIBUTION SYSTEM OPERATING PRESSURES ARE GREATER THAN 80 PSI.
6. ALL NON-RESIDENTIAL INSTALLATIONS SHALL BE APPROVED INDIVIDUALLY BY THE AUTHORITY.
7. ALL JOINTS SEALED WATERTIGHT (TYP.).

METER PIT (2" DOMESTIC AND 8" FIRE)

NO SCALE

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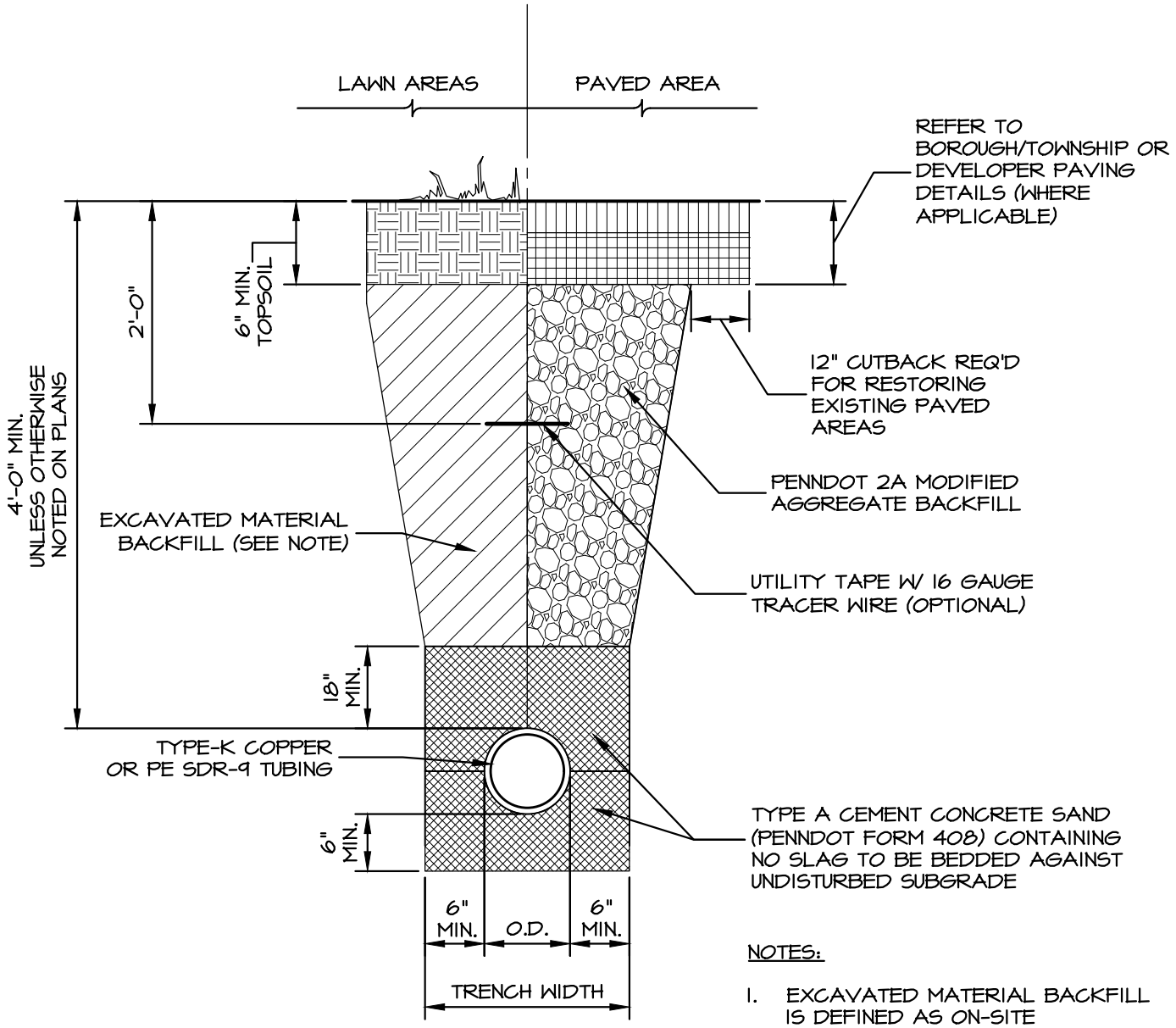
METER PIT (2" DOMESTIC AND 8" FIRE)
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-20



NOTES:

1. EXCAVATED MATERIAL BACKFILL IS DEFINED AS ON-SITE EXCAVATED SOIL OR SOIL-ROCK MIXTURE FREE OF STONES, ORGANIC MATERIAL AND OTHER DEBRIS GREATER THAN 6" IN DIAMETER.
2. DETAIL SHALL APPLY TO WATER PIPES 2" OR LESS IN NOMINAL DIAMETER.

SMALL DIAMETER WATER LINE TRENCH

NO SCALE

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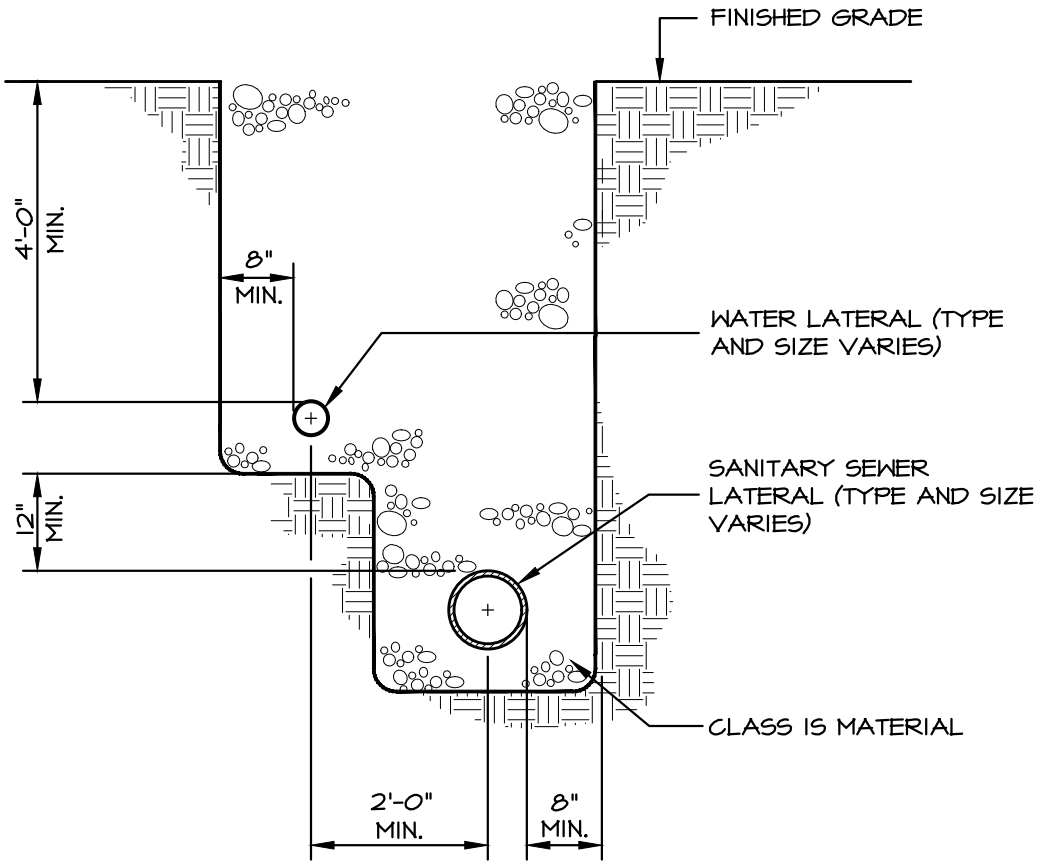
SMALL DIAMETER WATER LINE TRENCH
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-21



NOTE:

1. FOR FINAL RESTORATION, SEE APPROPRIATE DETAIL

COMBINATION SERVICE LATERAL TRENCH

NO SCALE

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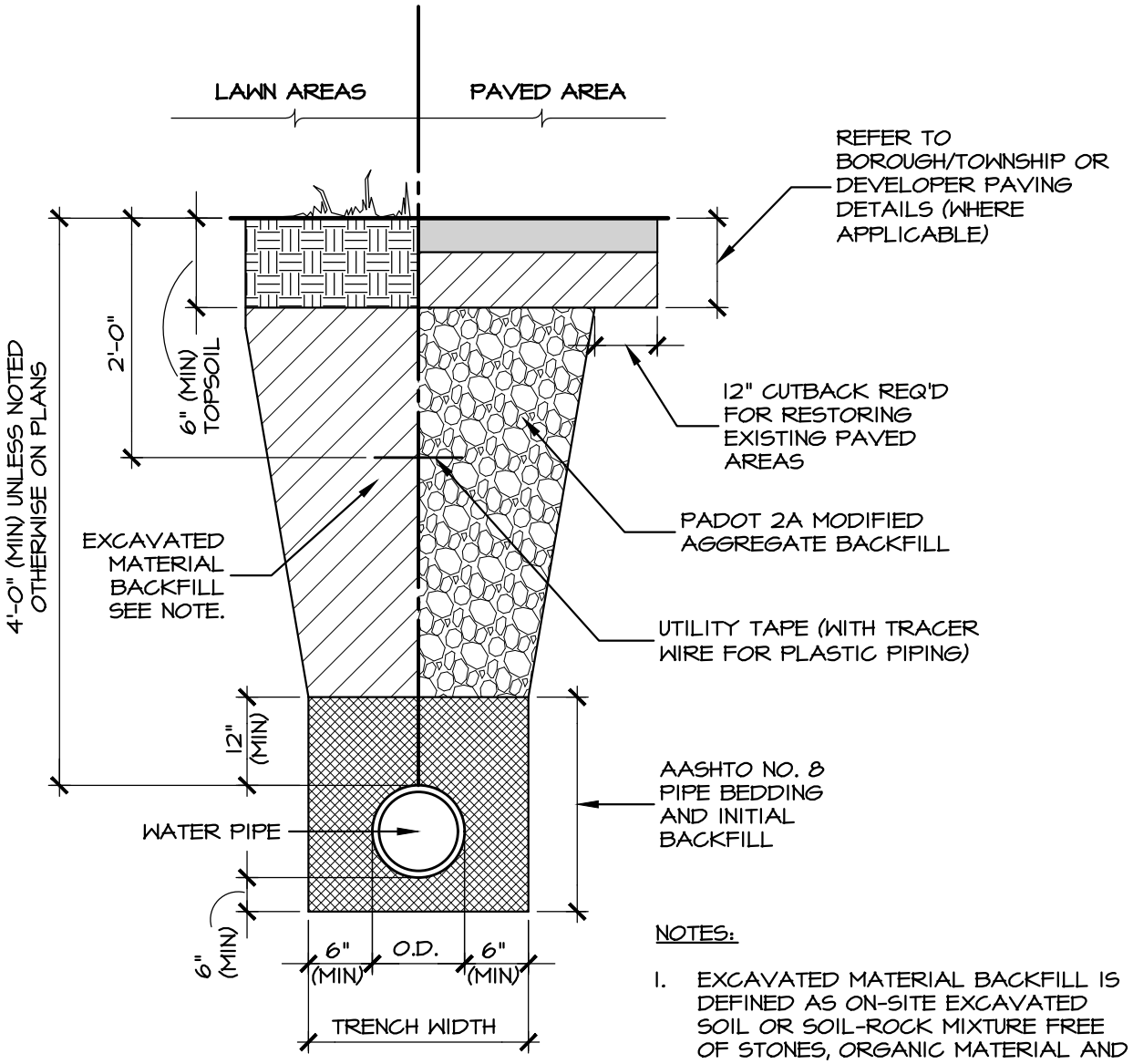
COMBINATION SERVICE LATERAL TRENCH
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-22



NOTES:

1. EXCAVATED MATERIAL BACKFILL IS DEFINED AS ON-SITE EXCAVATED SOIL OR SOIL-ROCK MIXTURE FREE OF STONES, ORGANIC MATERIAL AND OTHER DEBRIS GREATER THAN 6" IN DIAMETER.
2. DETAIL IS APPLICABLE TO WATER PIPES GREATER THAN 2" IN NOMINAL DIAMETER.

LARGE DIAMETER WATER PIPE INSTALLATION

NO SCALE

EA group, inc.
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LARGE DIAMETER WATER PIPE INSTALLATION
STRASBURG BOROUGH AUTHORITY STANDARD DETAIL

SCALE:	NO SCALE
DRAWN BY:	TMO
DATE:	JANUARY 2022

DRAWING: W-23