CITY OF PLYMOUTH, INDIANA

CONSTRUCTION STANDARDS

FOR THE

DESIGN AND DETAILS

OF

WATER PROJECTS

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CITY OF PLYMOUTH, INDIANA

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SECTION 1

INTRODUCTION

SECTION 1

INTRODUCTION

1.01 General

The instructions and directives included in this manual cover the design and construction of water facilities. The City of Plymouth is responsible for these and issues this manual as a guideline. The purpose of these Standards is to establish minimum criteria for design, materials, and workmanship.

All water lines and facilities shall be designed and constructed in full accordance with these Standards, Indiana Department of Environmental Management (IDEM), and Ten States Standards for Water Works, latest edition. The jurisdiction of the Standards includes the entire water distribution system and its appurtenances.

It shall be the Developer's/Contractor's responsibility to comply with all requirements of the City or other authority having jurisdiction on work if such authority imposes greater requirements. Furthermore, the developer shall be responsible for procuring all necessary permits and licenses, pay all charges and fees for acquiring and recording all easements, and giving all notices necessary and incidental to the work.

Addenda and/or revisions to these Standards may be issued periodically and will be distributed and made available to the public and developer's/contractor's at the City Office. Users shall be responsible to keep apprised of any changes and revisions to these Standards.

Any conflicts between these Standards and any applicable State laws shall be superseded by such law. If any conflict arises between these Standards and applicable City Ordinances, the Ordinance shall prevail. These Standards are approved and adopted by the City of Plymouth Board of Public Works and Safety.

SECTION 2

DEFINITIONS AND TERMS

SECTION 2
DEFINITIONS AND TERMS

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SECTION 2

DEFINITIONS AND TERMS

2.01 Definitions and Terms

Whenever in these Standards or in any documents the following term, abbreviations, or definitions are used, the intent and meaning shall be interpreted as follows:

A. Abbreviations

ASTM …..... American Society of Testing and Materials
AASHTO……. American Association of State Highway and Transportation Officials
AWWA …….. American Water Works Association
ANSI ……. American National Standards Institute
ASME ……. American Society of Mechanical Engineers
ACI ..…… American Concrete Institute
NEMA ……. National Electrical Manufactures Association
INDOT …….. Indiana Department of Transportation
IDEM ……. Indiana Department of Environmental Management
OSHA …….. Federal Occupational Safety and Health Act

B. Definitions

1. **Acceptance:** The formal written acceptance by the City of an entire project which has been completed in all respects in accordance with the approved Plans, Specifications, and these Standards including any previously approved modifications thereof.

2. **Backfill:** Earth and/or other material used to replace material removed from trenches during construction which is above the pipe bedding.

3. **Bedding:** That portion of the trench backfill which encases the water pipe to a minimum depth above and below the bell/barrel of the pipe, as provided in the section of these Standards. For the purpose of properly supporting the pipe.

4. **Building Service:** The conduit for transporting water from the water main into the building.

5. **City:** The City of Plymouth, Indiana and their representatives.

6. **City Engineer:** Authorized Agent by the City of Plymouth.

7. **Contractor:** Any Contractor who meets the City requirements and is licensed to enter into contracts for and to perform the work.

8. **County:** The county of Marshall, State of Indiana.

9. **City Representative:** The authorized agent of the City of Plymouth assigned to make detailed observations of any or all portions of the work.

10. **Developer:** Any individual, partnership, firm, corporation, or other entity who, as property owner, is initiating the work.

11. **Director:** Director of the Planning Department or his/her authorized representative.

12. **Easement:** Easements are areas along the line of all water lines which are outside of dedicated easements or rights-of-way, and are recorded and dedicated to the City granting rights along the water line. Easements shall be exclusively for water lines and no private utilities shall be constructed or encroach upon the easement except with the express written approval of the City.

13. **Engineer:** The Engineer for the Developer/Contractor.

14. **Inspector:** A direct or indirect employee of the City assigned to make detailed inspection of any or all portions of the work and materials. The inspector has full authority to reject materials and/or any portion of the work not supplied and installed in accordance with these Standards.

15. **Other Specifications and Materials:** Wherever in these Standards other specifications or regulations are mentioned, it shall be understood that the materials and methods mentioned therewith shall conform to all requirements of the latest revision of the specifications so mentioned.

16. **Permits:** Clearance to perform specific work under specific conditions at specific locations. The Developer or his duly authorized representative shall furnish to the City all necessary plans and documents required by the City to make application for permits.

17. **Plans:** Construction plans, including system maps, water main plans, and profiles, cross sections, utility plans, detailed drawings, etc., or reproductions thereof, approved or to be approved by the City and/or City Engineer which show location, character, dimensions, and details of the work to be done.

18. **Record Drawing (As-Built):** Plans certified, signed and dated by a professional engineer registered in the State of Indiana, indicating that the Plans have been reviewed and revised, if necessary, to accurately show all as-built construction and installation details including, but not limited to, key elevations, locations and distances.

19. **Right-of-Way:** All land or interest therein which by deed, conveyance, agreement, easement, dedication, or process of law is reserved for or dedicated to the use of general public, within which the City shall have the right to install and maintain water mains and appurtenances.

20. **Standard Drawings:** The drawings of structures, pipes, components, details or devices commonly used and referred to on the Plans and in these Standards.

21. **Standards:** The Standard Specifications design and construction of public streets and alleys, water facilities within the City of Plymouth as contained herein and all subsequent additions, deletions, or revisions.

22. **Ten State Standards:** Recommended Standards for Water Works, latest edition, developed by the Committee of the Great Lakes – Upper Mississippi River Board of State Public Health and Environmental Managers.

23. **Uniform Plumbing Code:** The Uniform Plumbing Code adopted by the current International Association of Plumbing and Mechanical Officials, current edition.

24. **Work:** All the work to be done under the City's permit, in accordance with the approved Plans, Specifications, these Standards, and permit conditions.

SECTION 3

GENERAL RULES AND REQUIREMENTS

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GENERAL RULES AND REQUIREMENTS

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SECTION 3

GENERAL RULES AND REQUIREMENTS

3.01 General

This Section provides the general rules and policies, the construction of facilities as part of the water utility, including permit requirements and inspection. The ordinances for water system governing these Standards are available for inspection at the City Office or at the City's website at www.plymouthin.com.

3.02 Design/Construction Approval for Development

A. Requirements for Construction Permits

It shall be the responsibility of the Owner/Contractor to file the "Notice of Intent" for the construction or modification of any facility as part of the Water Utility from the Indiana Department of Environmental Management (IDEM), Indiana Department of Transportation, or any other applicable regulatory agency.

Street/curb cut permit must be completed with the Plymouth Street department.

A copy of these permits/notifications shall be filed with the City Water Department.

B. Water Main Protection

1. Horizontal and Vertical Separation: Sewers and building services (laterals) shall be laid at least 10 feet (3 m) horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot (3 m) separation, the appropriate reviewing agency may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the sewer or service lateral closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer or service lateral and at an elevation so the bottom of the water main is at least 18 inches (460 mm) above the top of the sewer or service lateral.

   If it is impossible to obtain proper horizontal and vertical separation as described above, both the water main and sewer or service lateral must be constructed of slip-on gasketed joint or mechanical joint pipe complying with public water supply design standards of the agency and be pressure tested to 150 psi (1034 kPa) to assure water tightness before backfilling. The water grade pipe utilized may be SDR-21 PVC, C900 PVC or Ductile iron class 150. Private laterals may utilize PVC SDR-26 pipe.

2. Crossings: Sewers and service laterals crossing water mains shall be laid to provide a minimum vertical distance of 18 inches (460 mm)

between the outside of the water main and the outside of the sewer or lateral. This shall be the case where the water main is either above or below the sewer or lateral. The crossing shall be arranged so that the sewer or lateral joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer or lateral, adequate structural support shall be provided for the sewer or lateral to maintain line and grade.

When it is impossible to obtain proper horizontal and vertical separation as stipulated above, one of the following methods must be specified:

a. The sewer or lateral shall be designed and constructed equal to water pipe, and shall be pressure tested at 150 psi (1034 kPa) to assure water tightness prior to backfilling. The water grade pipe utilized may be SDR-21 PVC, C900 PVC or Ductile iron class 150. Private laterals may utilize PVC SDR-26 pipe.

b. Either the water main or the sewer or lateral line may be encased in a watertight carrier pipe which extends 10 feet (3 m) on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be of materials approved by the regulatory agency for use in water main construction.

C. Demolition of Buildings and Retiring Water Service

Contractor shall contact the City of Plymouth Water Department and make arrangements for removal of all water meters by the City of Plymouth Water Department prior to demolition. Contractor shall excavate and expose the water service, both domestic and fire protection, to the buildings at the locations of the City water shut-off valves (curb stops). Contractor shall neatly cut the water service line at a point 2 – 4 feet on the building side of the shut-off valve (curb stop), cap, and seal and block the line. Contractor shall contact the City of Plymouth Water Department, giving not less than 48 hours' notice of when the City of Plymouth Water Department should be on site to inspect the exposed water service and the sealing procedure utilized prior to backfilling. Failure to have City inspection will result in re-excavating at the contractors expense.

D. Private Water Wells Inside City Limits (Municipal Water Service Area)

1. Any water to be produced from any private water well drilled within the city limits of Plymouth shall be used exclusively for irrigation and/or agricultural purposes only.
2. Each request for private well inside the city limits must be presented to the Utilities Superintendent including the completed "City of Plymouth Water Well Drilling Permit Application/Transfer of Ownership". Application must be completed following guidelines identified in Ordinance No. 2013-2057 AN ORDINANCE ESTABLISHING REGULATIONS REGARDING PRIVATE WATER WELLS.
3. It shall be unlawful to cross connect any private water well in the City to any pipe or line intended to or capable of carrying City municipal water.

E. Technical Review Committee (TRC)

The Owner/Contractor shall submit design drawings for review and approval to the City Engineer. For each project the Owner/Contractor shall request a presentation hearing before the TRC through the City of Plymouth's Clerk / Treasurers' office. During this meeting the TRC may recommend approval of the project or request formal revisions. Revised drawings and specifications shall be resubmitted to the City Engineer for final approval.

F. Posting of Bond

1. The City requires the posting of a performance bond from a company licensed by the State of Indiana to provide such surety. Such bond shall be equal to 100% of the contract amount or an amount established by the City to provide surety for the satisfactory completion of the improvements and shall name the City of Plymouth who can enforce the obligations there under. The duration of the bond shall be through the date of substantial completion of the project. The City of Plymouth shall agree to the date of substantial completion.

2. The City requires the posting of a maintenance bond from a company licensed by the State of Indiana to provide such surety. Such bond shall be equal to 10% of the contract amount or an amount established by the City to provide surety for the satisfactory completion of the improvements and shall name the City of Plymouth who can enforce the obligations there under. The duration of the bond shall be one (1) year beyond the date of substantial completion.

3. The City may, as an alternative to the posting of such bond, accept other appropriate security such as properly conditioned irrevocable letter of credit which meets the same objective as the bonds described in this section, subject to approval of any other department or agency whose interests are protected by the same bonding requirement or cash. The bank issuing the letter of credit must be a bank situated in Indiana and must be an FDIC insured institution. The bank and letter of credit must be agreeable to the City of Plymouth, otherwise this method of guarantee will not be acceptable.

4. If the surety on any bond furnished to the City becomes a party to a supervision, liquidation, rehabilitation action pursuant to I.C. 27-9 et. seq. or its right to do business in the State of Indiana is terminated, it shall be required that, within ten days thereafter, a substitute bond and surety be provided, both of which must be acceptable to the City. Failure to obtain a substitute bond within the stated time frame shall be cause for revocation or suspension of the project approval until such time that the bond is furnished to the City.

G. Pre-Construction Inspection (Contract Projects)

The Owner/Contractor shall conduct a pre-construction, video taped, inspection

of the construction site to serve as a permanent record of pre-construction conditions.

The product shall be high quality audio and video tape. The video portion shall present bright, sharp, clear pictures with accurate colors. The picture shall be free from distortion, tearing, rolls or other picture imperfection. The audio portion shall be proper volume, clarity and free of distortion. The audio commentary shall be precise and concise explanatory notes.

The recordings shall include coverage of all surface features located along the main route. The tape coverage shall include all existing cross streets, driveways, sidewalks, curbs, ditches, shrubbery or other structures located along the route.

H. Construction Inspection

Prior to issuance of the final project approval and commencement of any construction activities pertaining to the installation of any public works project, the Owner/Contractor shall execute an Agreement with the City, which will provide that:

1. The City may utilize its own personnel or contract for construction inspection service to insure that materials and workmanship meets the requirements of the approved plans and specifications.

2. The Owner/Contractor will be responsible for submitting and certifying air pressure and bacteria test results for all water mains as required.

3. The Owner/Contractor will reimburse the City for the cost of such services which shall be determined at the time of execution of the Agreement, and verified by the Owner or his representative throughout construction.

4. No action with regard to the acceptance of the construction and release of the improvement bond pursuant to this section shall be taken until the Owner/Contractor has reimbursed the City in full for the inspection services.

5. All construction of public works facilities intended for dedication to the City shall be observed and certified pursuant to the Agreement.

6. The Owner/Contractor shall furnish the City with three (3) copies of the approved construction plans and specifications at the time the Agreement is executed.

I. Requirements for Project Acceptance and Dedication

Water Works facilities will not be accepted until all documents, as required by the City, are submitted to and approved by the City Engineer and the Board of Works and Safety, including the following:

1. One (1) Year Maintenance Bond;

2. Recorded Covenant and Easement Documents;

3. The completion of a final inspection which confirms that the project has been constructed and tested in accordance with the City's Standards; and

4. As-Built/as-constructed drawings as described in Section 4-14.

3.03 Submittals

A. As-Built Drawings

The contractor shall keep one (1) copy of all project specifications, plans, addenda, modifications, supplemental drawings, shop drawings, and change orders at the project site in good order and annotated to show all changes made during the construction process. In addition, the Contractor shall keep one set of "As-Built Drawings" for the Project. These "As-Built Drawings" shall show all final elevations, all final dimensions and tie downs for buried pipes, valves, fittings, structures, etc., all final dimensions and sizes for pipes and structures, and all other information as necessary to constitute as-built records. These documents shall be kept daily by the Contractor and routinely checked by the City's Representative for completeness and accuracy based on the City Representative's daily records and notes. Upon completion of the project or beneficial occupancy, whichever comes first, these record As-Built Drawings together with any other annotated supplemental plans, drawing, sketches, etc. shall be delivered to the City Representative for their final review and approval. If approved, the documents will be delivered to the Owner within thirty (30) days of completion of the job. If disapproved, they will be returned to the Contractor for corrections, as necessary.

B. Literature

The Contractor shall furnish six (6) sets of equipment manufacturer's operation and maintenance manuals for each item of mechanical and electrical equipment furnished.

C. Manufacturer's Representative

The Contractor shall provide the services of the manufacturer's representative(s) to supervise the start-up and instruct City personnel in the operation and maintenance of equipment. The contractor shall make adjustment of all automatic controls and safety devices, balance and adjust all air and water flow, make proper setting of all valves, and perform all other necessary operations to make the equipment, systems, and facilities fully operable and where required, be oiled and greased with all grease cups, oilers, etc., left filled.

3.04 Safety

Neither the City nor its Engineer is responsible for safety on the job site. All codes, statutes and regulations relating to safety on the job site shall be followed by the Owner, Developer and Contractor. Direction by the Engineer, and inspections by the Engineer, is not designed to assure safety on the job, only that the water facilities are built

according to the standards and the drawings. The Contractor constructing the water facilities shall advise each of its employees that the City and the Engineer are not responsible for safety on the site. All OSHA safety requirements shall be followed. Proof of a Confined Space Entry Program and practices, trenching and shoring program and practices, and any other applicable safety requirements shall be followed.

A. Confined Space Access

For projects which include construction activities within "confined spaces" as defined by Title 29 CFR Part 1926.21(b)(6), the Contractor is hereby advised that he must fully comply with all pertinent requirements as delineated in this regulation and as interpreted by OSHA. The Contractor shall have and maintain all necessary safety and testing equipment at all times during the course of the construction activity.

B. Hazard Communication Standard

Pursuant to the Code of Federal Regulations, 29 CFR Part 1926, as may be amended, all Contractors, Subcontractors and materials suppliers on this Project shall provide access to all persons on the job site at all times, the Material Safety Data Sheets (MSDS) for all hazards of all chemicals per the Federal Regulations. In addition, Contractors, Subcontractors and material suppliers shall provide training to their employees on the MSDS pursuant to the Federal Regulations.

C. Excavation Safety Requirements

It shall be the duty and responsibility of the Contractor and all of its Subcontractors to be familiar and comply with all requirements of Public Law 91-596 29 U.S.C., Sections 651 et. seq., the Occupational Safety and Health Act of 1970 (OSHA) and all amendments thereto and to enforce and comply with all of the provisions of the Act. In addition and as required by Indiana State Law, HB 2071, Section 14. of IC 4-13.6-5-12, the Contractor and all of its Subcontractors shall comply with Subpart P of 29 CFR 1926 dated October 31, 1989 as may be amended.

SECTION 4

GENERAL DESIGN STANDARDS

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GENERAL DESIGN STANDARDS

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SECTION 4

GENERAL DESIGN STANDARDS

4.01 General

The City of Plymouth Utilities Superintendent shall issue final approval for the installation of all water facilities. All facilities shall be designed and installed in accordance with these Standards as well as applicable State and Federal regulations.

4.02 Water Distribution System Design Criteria

A. General

All main extensions shall require a "Notice of Intent" approved by the Indiana Department of Environmental Management (IDEM) to be on file with the City of Plymouth Water Department prior to the water being permenately turned on for domestic use.

All water mains shall be designed and constructed in accordance with IDEM and Ten States Standards for Water Works requirements and be approved by the City of Plymouth Water Department.

All water mains shall be designed to provide fire protection and sized by hydraulic analysis based on flow demands and pressure requirements. The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system shall be approximately 50 psi and not less than 35 psi. System design shall be such that fire flows and facilities are in accordance with the requirements of the State Insurance Services Office.

All designs shall assume a peak hourly flow of no less than 1.0 gpm per residential customer and no less than 10.0 gpm for a minimum dead end flow analysis unless conditions warrant otherwise.

Three (3) sets of shop drawings shall be required to be submitted to the City of Plymouth Water Department on all products such as valves, hydrants, etc.

B. Mains

1. Pipe Capacities and Size: The minimum size of water main for providing fire protection and serving fire hydrants shall be 6-inch diameter. Larger size mains will be required, if necessary, to allow the withdraw of the required fire flow while maintaining the minimum residual pressure specified in Section 5.02(A). Hydraulic calculations shall be prepared by the Developer/Contractor's Engineer and submitted to the City and City Engineer for review and approval. Any departure from minimum requirements shall be justified by hydraulic analysis and future water use, and will only be considered in special circumstances. If

necessary, booster pump systems shall be supplied to maintain minimum pressures at the Developer/Contractor's expense.

2. Depth: The minimum depth for all water lines shall be 5.0 feet (60 inches) from top of the pipe to finished grade and a maximum of 6 feet (72 inches) from top of pipe to finished grade.

3. Dead Ends: In order to provide for additional reliability of service and reduce pressure loss, dead end mains shall be minimized by making appreciate tie-ins (looping) whenever possible. Where dead ends occur, they shall be provided with a fire hydrant if the flow pressure is sufficient or with an approved flushing hydrant or blow-off for flushing purposes as approved by the City and Utilities Superintendent. Flushing devices should be sized to provide flows with a minimum velocity of 2.5 feet per second in the water mains being flushed. No flushing device shall be directly connected to any sewer.

4. Work on Existing Mains: All work around existing water distribution mains, cutting-in to existing water mains, and connections to existing water mains shall be performed by the City of Plymouth Water Department unless specifically approved by the Utilities Superintendent or his assistant.

C. Mechanical Joint Fittings

1. Fittings for buried ductile iron pipe, unless otherwise noted herein or on the plans, shall be Mechanical Joint gray cast iron in accordance with ANSI Specification A21.10; or ductile iron, grade 80-60-03, in accordance with ASTM Specification 339.

2. Mechanical Joint fittings shall have a standard asphaltic coating on the exterior. Fittings shall also ha a cement mortar lining on the interior in accordance with ANSI / AWWA C104/A21.4, latest revision.

3. The radius of curvature of all bends, tees, and crosses shall be in accordance with AWWA Specification C110 and ANSI Specification A.21.10; or ANSI / AWWA Specification C153/A21.53 for ductile iron compact fitting. Fittings shall be as manufactured by American Pipe, U.S. Pipe, Clow, or equal.

4. All mechanical joint fittings, valves and hydrant inlets shall be provided with a joint restraining system. Restraining glands shall be manufactured of high strength ductile iron conforming to the requirements of ASTM A536. Dimensions of the glands shall be such that they can be used with the standardized mechanical joint bell and tee head bolts conforming to the requirements of ANSI / AWWA C111/A21.11 and ANSI / AWWA C153/A21.53. The mechanical joint restraining device shall have water working pressure rating of 250 psi minimum with a safety factor of at least 2:1 against separation when tested in a dead-in situation. The joint restraint system shall be as manufactured by Uni-Flange, Ebba Iron (Megalug), or approved equal.

D. Hydrants

1. Location and Spacing: Hydrants shall be provided at each street intersection and at intermediate points between intersections as recommended by the State ISO. Hydrant spacing shall be **350 to ~~600~~ 500** feet depending on the area being served.

2. Valves and Nozzles: The fire hydrants shall be 5½ inch (main valve opening) with 6-inch auxiliary valve and connection pipe with breakoff flange and coupling assembly. The fire hydrant shall have two (2) 2 ½" hose nozzles and one (1) 4 ½" pumper nozzle threaded to meet the requirements of the local Fire Department. Nozzle caps shall be equipped with chains. All fire hydrants shall be arranged for operation with operating nut of size and shape which is the same as that of the existing fire hydrants, or as specified by the local Fire Department. Pumper nozzle shall have a normal setting of between eighteen (18) and twenty-four (24) inches above the curb or centerline of road and if necessary, the Developer/Contractor shall furnish extensions.

3. Hydrant Connection: The hydrant connection to the water main shall be a minimum of 6 inches in diameter. Auxiliary valves for hydrant isolation shall be installed in all hydrant connection lines.

4. Drainage: Hydrants shall be provided with a suitable drain. Hydrant drains shall not be connected to or located within 10 feet of sanitary sewers or storm drains.

5. Type: Hydrants shall be Kennedy "K -81" or Mueller "Super Centerion".

6. Markers: 1- H.D. fiberglass marker

7. Color: Public – Safety Red Private – Safety Yellow

E. Valves

Sufficient valves shall be provided on water mains so that mains can be shut down for repairs without inconvenience to water users or creating a sanitary hazard. Valves and tee fittings shall be provided at all locations where future mains will be installed to serve future development. Valves should be located at not more than 500 foot intervals in commercial districts and not more than one block or 800 foot intervals in other districts upon written approval is by the Utilities Superintendent.

F. Brass Fittings

Shall be Ford™ brand brass fittings as specified by the City of Plymouth Water Department unless written approval is provided by the Utilities Superintendent.

G. Air Relief Valves

1. Air Relief Valves: At high points in water mains, where air can accumulate; provisions shall be made to remove the air by means of hydrants or air relief valves. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. Manual air relief valves or hydrants are to be used as approved by the City or Utilities Superintendent.

2. Air Relief Valve Piping: The open end of an air relief pipe from automatic valves shall be extended to a least one foot above grade and provided with a screened, downward facing elbow. The pipe from a manually operated valve should be extended to the top of the pit.

3. Chamber Drainage: Chambers, pits or manholes containing valves, blow-offs, etc. in a distribution system shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs or air relief valves be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water or to absorption pits underground.

H. Services

Water services shall conform to the latest edition of the Uniform Plumbing Code and to these Standards.

The water service for individual users shall be connected to the water main with a direct drilled and threaded connection or tee and a corporation stop. A service saddle can be used in certain circumstances upon the Utilities Superintendent's approval.

All water services shall be sized for the anticipated water usage at the service using a customer supplied inventory of fixtures and devises which could be connected to the City's main line, but in no case shall be less than one (1) inch **for new construction**.
The city of Plymouth Water department shall designate the size service line according to data provided by the customer.

Each service shall be perpendicular to the main and shall be Type "K' copper or ductile iron pipe and at least one inch (1") in diameter. Polyethylene tubing is acceptable providing the material is downstream of the water meter and is provided with a continuous tracing wire wire buried in the trench directly above the service and terminated in the meter pit/vault and at the foundation of the building.

1. Service Connections: All connections to the mains shall be made by the Water Department or a department approved contractor. Customers shall pay all installation costs, including connections from the main to the curb stop, and shall furnish a frost proof location with clean and easy access (no crawl spaces) for the meter. Piping from the curb stop to the meter shall be installed and paid for by the customer. **Shut off ball valves (2), 1 before and 1 after** the meter and a meter

holding device shall be furnished by the customer as specified by the Water Department.
Service lines shall be required for each house or facility served by the public water supply system. Services shall be individually metered.

2. Service Location: The Water Department reserves the right to locate the point at which the service connection shall be made and to locate the point at which the service connection shall be made and to furnish and run service pipe from the main to: 1) the curb line; 2) the inside line of the sidewalk; or 3) the customer's property; whichever is the most satisfactory location for the curb stop and valve box.

3. Size of Service Connection: The Water Department in every instance reserves the right, at its option, to designate and prescribe the size and kind of service connection, either upon original installation, or any renewal or replacement of existing connections. A corporation stop will be required at each service line tap to the distribution system.

4. Inspection: The customer shall install and maintain at his own expense, the service line from the curb stop into his own premises. The Water Department shall be notified in advance of any such connection or repair and shall reserve the right to inspect before the trench is backfilled, each service installed.

5. Materials: All service pipes between the curb stop and the meter served shall be ductile iron or type "K" copper, as approved by the Water Department. The use of existing lead pipe shall not be permitted for providing service to new buildings. Lead pipe shall be replaced at the customer's expense.

6. Number of Services Required: Each separate building or unit (except those buildings served by a master meter) shall have a separate and distinct service connection, and in no case shall more than one premises be served by a single connection, except only in cases where, at the discretion of the Water Department, the connection makes this impractical, in which event the Water Department may give permission for the use on one service connection for more than one premises, but in each case subject to the requirements and conditions as the Water Department may prescribe.

7. Special Protective Devices: Service lines for all new industrial customers, multi-stored buildings (excluding single family residences), and commercial customers as required by the Water Department, shall be equipped with an approved reduced pressure principle backflow preventer. The Water Department reserves the right, at its discretion, to require any customer to install on his service line a tank, check valve, detector check valve, reduced pressure principle backflow preventer, gate valve, or other appliances, apparatus or equipment of such a type and design as is approved by the Utility, in writing, and thereafter, to require any change, alteration, substitution, or addition to any such device as aforesaid. Failure upon the part of the customer to comply with

such requirements of the Water Department within thirty (30) days after written notice to the customer or within some agreed extension beyond such thirty (30) day period, shall authorize the Water Department at its option, and without further notice, to discontinue service.

8. Damage to Existing System: Any customer, developer, contractor, or person responsible for disturbing or damaging water service or valve boxes, once the service has been properly installed, shall be liable for the cost of the repairs.

I. Meters and Meter Pits

1. General: Unless specified in the contract between the Water Department and customer or by the rate on file, the water supplied shall be measured by a meter of standard manufacture as specified by the Water Department. The meter shall be furnished (up to 1" included in the connection fee) and installed by the Water Department according to its requirements. The customer shall provide for this purpose, free of expense to the Water Department, a suitable place near the service entrance either in the basement, on the ground floor, or in a meter pit installed at the customer's expense with the location of the meter pit to be determined by the Water Department.
All meters 1½" or greater in size, the customer shall bear the cost of the meter. After installation by the customer's licensed plumber and approved by the City of Plymouth Water Department the meter shall become the property of the City of Plymouth Water department. The City of Plymouth Water department shall be responsible for the maintenance and calibration of the meter according to AWWA standards. Valving is required before and after the meter and is the responsibility of the owner for adequate maintenance and or replacement.

2. Size: The Water Department will designate the size, type, and brand of meter to be used by any customer.

3. By-Passes: By-passes are not permitted. In special cases (ex. backflow preventers) where service should not be interrupted; a by-pass may be permitted with permission granted by the Water Department Superintendent. Approved by-passes shall not exceed two (2) inches in diameter. All by-passes shall be equipped with valves that may be secured with a padlock.

4. Meter Installation: Before the Water Department installs a meter the customer shall provide a location in the plumbing to accept the meter. The customer shall furnish and install approved **ball valves** on the inlet and outlet of the meter. **One (1) union of like materials shall be installed at the meter setter or "spud" connections for the purpose of removing/replacing meter or associated plumbing.** After the meter has been properly installed it shall become the property of the Water Department, and it shall be provided to subsequent users of the same service without further charge. The customer shall be responsible for

protecting the meter from freezing, fire, mechanical damage, and vandalism.

5. All types and brand of meters used on and off-site shall be specified by the City of Plymouth Water Department.

6. Provisions shall be made for metering of water usage to each service connection either by use of a meter pit or by a meter at the water service entrance to the building. If a service is metered at the building, a key curb stop shall be installed at the edge of the right-of-way or easement line. Water services installed for future connections shall be terminated at the right-of-way or easement line and valved and capped to insure 100 percent water tightness.
Individual booster pumps shall not be allowed for any individual service connection from the water main.
Clear space of (3) three around the meter is required and the meter shall not be enclosed with cabinetry or other objects which prohibits maintenance or replacement.

7. All meters shall be Badger Meter Inc. ™ brand with Orion ™ brand AMR, **unless specified by the Utilities Superintendent.**

8. All meter pits/vaults shall be constructed at the customer's expense according to the City of Plymouth Water Department Standards.

J. Private Fire Protection Service

1. Inspection and Testing: The private fire protection service on a customer's premises shall be subject to inspection and testing by the Water Department or any other authority having jurisdiction at such times as it is deemed necessary.

2. Design Approval: Before any modifications are made to any private fire protection service, or before service is furnished to any new private fire protection system connected to, or proposed to be connected to, and supplied with water from the Water Department's distribution mains; final plans of such fire protection system shall be filled with and approved by the Water Department. The following shall be shown on the final plans:

    a. The number of sprinkler heads to be served.
    b. The sizes and locations of the systems piping.
    c. The sizes and locations of all connections to the Water Department's service line and or mains.
    d. The sizes and locations of all sprinkler risers.
    e. The sizes, locations, and types of all valves.
    f. The sizes and locations of all hose connections, reels, and cabinets.
    g. The sizes and locations of any storage tanks connected to the system.
    h. The outlet sizes and locations of all fire hydrants.

3. Accessibility and Frost Protection: All fire protection lines within buildings must be installed in such a manner that all pipes shall be protected from frost and be easily accessible for inspection at any time. Underground pipes placed outside buildings must be placed and maintained at a minimum depth of five feet (5').

4. General Purpose Tap On Fire Protection System: No connection with a fire protection system will be permitted to supply water for general purposes unless the connection has been approved in writing by the Water Department and unless the purpose tap is metered. If such a connection is approved; it shall be made outside the building to be served and both the fire protection line and the general purpose line shall be valved (valve maintenance is the responsibility of the owner) separately in accordance to the Water Department's specifications to permit either to be turned on or off without affecting the other.

5. Check valves, Detector Check Valves, And Reduced Pressure Backflow Preventers:

   a. Double Check Valve – Shall be installed in every fire protection system. All check valves installed by the customer shall be of design and manufacture approved by the Water Department. In every case where double check valve system is approved by the Water Department, gate valves and gauges shall be installed in accordance with ISDH and AWWA recommendations and specifications.

   b. Double Detector Check Valves – The double detector check valves shall be installed by the customer at the customer's expense. The valves shall be installed with all necessary plumbing and valving to accept a meter. All required metering shall be furnished by the Water Department at the customer's expense.

   c. Backflow Preventers – Shall meet all the requirements set forth by the Water Department, ISDH, and the AWWA. Reduced pressure backflow preventers may not be installed in pits and or vaults or other confined areas below grade. The construction of by-pass lines around backflow preventers is absolutely forbidden.

   d. Backflow Device Inspection – All backflow devices in service shall be inspected by a certified inspector according to ISDH requirements for frequency of that type of device. A report of the inspection shall be sent to the Water Department for their record.

   e. Number of Services Allowed Per Tap – One service only will be allowed to any one building or premises, unless in the opinion of the Water Department, more than one is absolutely necessary for the proper protection of the premises. All fire

protection equipment connected to the Water Department's service shall be confined within the building or on the premises named in the application, and where two (2) or more connections are made for one building or premises, they shall remain separate, unless special written permission is obtained from the Water Department to connect the same in a manner approved by it.

f. Cross Connections – Any private fire protection system or any other service supplied with water from the Water Department service or any other service supplied with water from the Water Department service shall be supplied exclusively with such water and no connection shall be allowed with any other source whereby the Water Department supply may be contaminated by the failure to close valves, or leaking check valves, etc., and no auxiliary nor secondary suction pipe to any underwriters pump taking water from wells, streams, tanks of any kind, or other source whatever, whether like or similar to those enumerated will be permitted. Any private fire protection system, onsite distribution system, and plumbing on premises, or other system for use of water for any purpose whatever using water from wells, streams, or other sources than the Water Department service shall be kept absolutely separate from any such system supplied from the Water Department's service.

K. Inside Piping, Service Lines, and Shut-Off Valves

1. General: Each applicant for service shall, at his own expense, equip his service line with a suitable shut-off valve or valves just inside the foundation wall and shall provide all piping and attachments, all of which shall be assembled, installed and maintained by the customer, subject to approval of any authorized inspectors and in accordance with the Water Department's General Rules in force at that time, or as may be amended from time to time.

2. Shut-off Valves: Each service line shall have a **ball valve** on the inlet and outlet of the meter.

3. Maintenance of Service Lines and Meter Boxes:

   a. Meter Vaults and Pits – All meter boxes, pits, or vaults constructed or installed by the customer, regardless of location, and all such boxes constructed or installed by the Water Department, regardless of location, shall be maintained in good repair by the customers and at the customer's expense. The Water Department will not maintain the piping, fittings, valves, or appurtenances leading to and from such meter box. The Water Department will maintain only from the curb stop back to the main. All meter vaults and boxes shall be so designed and constructed as to be free from ground water and noxious gases. The vaults shall be equipped with O.S.H.A. approved entrances and ladders. If surface and or ground waters have a

tendency to accumulate in the vault, a sump pump shall be installed as a part of the structure. The customer must maintain the cleanliness and safety of the vault at his expense. If the customer fails to provide proper maintenance to the structure, the Water Department, at its option, may either: 1) provide necessary maintenance and bill the customer for labor and materials; or 2) discontinue water service to the customer as provided for in the General Rules, until such time as necessary repairs are made.

L. Water Main and Sewer Separation

1. Horizontal Separation: Sewers and water mains shall be laid at least 10 feet horizontally separation from each other. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, the appropriate reviewing agency may allow deviation on a case by case basis, if supported by data from the an engineer. Such deviation may allow installation of the sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so the bottom of the water main is at least 18 inches above the top of the sewer.

2. Crossings: Sewers crossings water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. The crossing shall be arraigned so the sewer joint will be equal distant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main.

3. Special Conditions: When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to water main specifications, capped two (2) feet both sides of the interference with concrete and pressure tested to assure water tightness prior to backfilling.

4.03 Easements

A. General

Whenever possible water mains shall be constructed within the public right-of-way. Should the construction be outside the limits of the public right-of-way, recorded easements shall be acquired, dedicated and recorded solely for the benefit of the City of Plymouth.

The minimum permanent easement width to be dedicated to the City for the water main is 15 feet.

All water mains shall be centered in the easement unless sewer line is present and not less than 15 feet (15') from any building line.
In that case, maintain minimum 10 ft. separation between water and sewer lines.

The easements shall be exclusively under the discretion and control of the City. Ingress and egress shall be available to the City's crew at all times. No utility companies are allowed to use the easements for installation of their utility lines without the expressed written permission of the City. All plan sheets shall clearly identify the easement and the location of all other proposed utilities. The horizontal and vertical plans shall identify all utilities proposed to cross the easement.

B. Right-of-Way Plan Sheet

1. Geographic location map showing the extent of the project and including where applicable:

   a. Directional North Arrow and Scale;
   b. County;
   c. Civil Township;
   d. Section, Township and Range Identification;
   e. Subdivision Names, Recording Information and Lot Numbers;
   f. Highway, Road and Street Identification;
   g. Rivers, Creeks and Named Ditches;
   h. Assigned Parcel Numbers Arranged in Ascending, Numerical Order from the Project Beginning to End; and
   i. List of Apparent Owners (last deed of record) by Assigned Parcel Numbers.

2. In addition to the above, there should be sufficient information on the design drawings to properly correlate with the right-of-way plan sheet; i.e. property lines, subdivision information, parcel number or name, width of right-of-way, permanent or temporary and special conditions; for example, structures, trees, shrubs to be removed or replaced, sod ding, riprap, etc.

C. Description Sheets

The following shall be provided:

1. Parcel Number;

2. Project Number;

3. Project Name;

4. Identification as to permanent or temporary easement;

5. Separate descriptions on separate sheets are required where both permanent and temporary easements are to be taken;

6. Meets and bounds descriptions shall be clear, concise and complete with sufficient detail to positively establish from known and referenced points, monuments, lines, etc. Total area should be stated at end of description, in acres;

7. Descriptions of easements from platted subdivision lots, including strips off sides of lots should include name of subdivision and recording information for the subdivision as well as affected lot number(s).
NOTE: These are usually small areas; therefore, area should be stated in square feet; and

8. Registered land surveyor's licensed in the State of Indiana, seal and signature.

D. Property Plats

1. Parcel Number;

2. Project number;

3. Project Name;

4. County;

5. Civil Township;

6. Section;

7. Township;

8. Range;

9. Owner;

10. Permanent of Temporary Legends;

11. Permanent or Temporary Easement Areas;

12. Total area of property out of which easement is to be taken;

13. Drawn By;

14. Directional North Arrow;

15. Scale;

16. Unplatted properties: complete boundaries of property description out of which easements are to be taken, including properly identified referenced corners, P.O.B.'s, monuments, roads, bearings, distances, etc.;

17. Platted subdivisions: dimensions of lot(s) as well as the lot number(s) and including the subdivision name and recording information;

18. Easement boundaries, including regulated drain boundaries, as described

in Item A. of this subsection, including referenced bearings, distances, etc., and identified as in legend; and

19. Registered land surveyor seal and signature.

4.04 Drafting Standards for Project Plans

A. General

These Standards have been established for the purpose of ensuring uniformity in the design and drafting techniques of projects to be submitted for review and acceptance.

1. All projects submitted, having more than two (2) sheets, shall have a title sheet which will include:

   a. General Overall Area Map;

   b. Vicinity Location Map;

   c. A Site Plan map Detailing the Project;

   d. Name/Title of Project, including Section Number if applicable;

   e. Owner and Engineer's Name; and

   f. Professional Engineer's Seal and Signature.

2. All plan and profile sheets are to be certified and dated by a professional engineer of the State of Indiana.

3. All sheets are to be numbered, with total number of sheets included.

4. Include detail sheet(s)/specification sheet(s), as applicable.

5. Design drawings shall be 24-inch by 36-inch.

B. Scales

The following scales for drawings are required:

1. Plan and Profile: Variable; Not to Exceed 1"=50' Horizontal and 1"=5' Vertical.

2. Cross Sections: 1"=5' Horizontal and Vertical

C. Materials

Mylar type drafting film shall be used for all reproduction "originals" to be submitted as record drawings. They shall be of a quality suitable for blueprint printing.

D. Plan and Profile Sheets

1. General

a. A North Arrow;

b. The Scales Used;

c. Project Name and Number, Sheet Number, Date Drawn, Date and Nature of Revisions;

d. All topography in the area affected by construction;

e. Right-of-Way lines; property lines and easements;

f. Locations of bench marks and their descriptions;

g. Locations of all existing and proposed utilities in the proper area; and

h. Match lines shall be easily identifiable.

2. Water Main Profile Drawings

All water main profile drawings shall include the following, as a minimum:

a. Existing and finished grade lines;

b. Depth of burial to top of pipe;

c. Elevations to USGS datum;

d. Types of materials used;

e. Profile of existing and proposed utilities; and

f. Special construction required due to unfavorable soil conditions, jacked and bored casing pipe, etc.

E. Record Drawings

All plans submitted as record ("as-built") drawings shall have all pertinent items shown on the plan view and properly scaled. All elevations, final dimensions, pipe sizes, and tie-downs are required to accurately display on the drawings.

This includes pipes, vaults, valves, hydrants, casing, etc. All sheets shall have the phrase “as-built” or “record drawing” boldly printed on them with the date, and shall be stamped and signed by a professional engineer registered in the State of Indiana.

SECTION 5

MATERIALS

SECTION 5
MATERIALS

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SECTION 5

WATER PROJECT MATERIALS

5.01 General

This section provides a description of the materials acceptable for the construction of water systems additions and improvements for the City of Plymouth. Use of other materials which are not specified herein will only be permitted with the written approval by the City and Utilities Superintendent.

All materials must be new and have been unused.

5.02 Water Mains

A. General

The following materials are acceptable for water mains:

Ductile Iron Pipe (DIP)

B. Water Main Materials

1. Ductile Iron Pipe PR350/PR250: Water main piping four inches (4") and above shall be ductile iron. DI pipe shall conform to ANSI/AWWA C150/A21.50, Thickness Design of Ductile Iron Pipe and the National Sanitation Foundation Standard No. 61. The material and properties used shall conform to ANSI/AWWA C151/A21.51, Ductile Iron Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water or Other Liquids. The joints, unless otherwise specified, shall be of the push-on type conforming to ANSI/AWWA C111/A21.11. The pipe shall be cement mortar lined, conforming to ANSI/AWWA C104/A21.4 and shall be coated outside with a bituminous coating. The gasket joint system shall conform to ASTM D 3139. The rubber gaskets shall conform to ASTM F 477.

   The pipe shall be pressure rated in accordance with recommendations of the ANSI/AWWA standards. Pressure Class shall be as follows:

   Pressure Class 350 (12" or smaller) and
   Pressure Class 250 (14" or greater)

2. Fabricator Qualifications: Firms regularly engaged in manufacture of water system products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than five years. Fabricator must have sufficient production capacity to produce required units without causing delay in work.

3. Lubricant: Lubricant shall be non-toxic and shall not support the growth of bacteria and shall have no deteriorating effects on the gasket or the pipe. It shall not impact a taste or odor to the water in a pipe that has been flushed in accordance with AWWA/ standard D 601. The lubricant containers shall be labeled with manufacturer's name.

4. Joints:

   a. Push-on and mechanical–push-on and mechanical joints including all accessories shall conform to AWWA/ANSI Standard C151/A21.51. Bolts shall be high strength cast iron with tee head and hex nuts.

   b. Flanged – Flanged joints shall not be used for underground installations except within structures. Flange joints shall meet the requirements of AWWA/ANSI Standard C151/A21.51 or ANSI B.16. All flanged joints shall be rated for 250 psi pressure and have ASA 125 lb. bolt pattern. Gaskets for flanged joints shall be cloth impregnated rubber one sixteenth (1/16) inch thick for sizes three (3) inches through eight (8) inches, and one eighth (1/8) inch thick for sizes ten (10) inches or larger. Bolt circle and bolt holes of flanges shall match those of Class 125 flanges per ANSI B 16.1.

   c. Bell and Spigot – Bell and spigot joints shall conform to AWWA/ ANSI Standard C151/A21.51.

      Gasket dimensions shall be in accordance with ASTM F 477 and the manufactures standard design dimensions and tolerances. The gasket shall be made of such size and shape as to provide an adequate compressive force against the spigot and socket after assembly to affect a positive seal under all combinations of joint and gasket tolerances. The trade name or trademark, size, mold number, gasket manufacturer's mark, and year of manufacture shall be molded in the rubber on the back of the gaskets.

      Gaskets shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used. When two hardness's of rubber are included in a gasket, the soft and hard portions shall be integrally molded and joined in a strong vulcanized bond. They shall be free of porous areas, foreign material and visible defects.

5. Fittings: Fittings shall be ductile iron with mechanical joints, glands and gaskets to properly fit the DI pipe. The radius of curvature of all bends, tees and other ductile iron fittings shall comply with ANSI/AWWA C110/A21.10 (standard) or ANSI/AWWA C153/A21.53 (compact). Iron Fittings shall have distinctly cast upon them the pressure rating and letters "DI" or "DUCTILE".
   Grip rings and Mega Lugs shall be ductile iron per ASTM A 536. Grade 65-45-12.

6. Tracing Wire: A continuous solid wire shall be buried in the pipeline trench directly above the main to facilitate main location. The wire shall be solid #12 standard copper wire with thermoplastic insulation and capable of carrying 600 volts.

7. Polyethylene Encasement:

   a. In some cases, due to soil conditions or as required by the City, polyethylene encasement may be necessary. In such cases, Cross-Laminated Polyethylene encasement materials shall be used for ductile iron pipe, fittings, valves, and fire hydrants. Cross-Laminated Polyethylene tube material shall conform to AWWA C 105 with a thickness of 6.5 mils.

   b. The minimum tube size for each pipe diameter shall be as follows:

NOMINAL PIPE	POLYETHYLENE FLAT TUBE WIDTH (INCHES)	
DIAMETER (INCHES)	BELL & SPIGOT JOINTS	MECHANICAL JOINTS
6	17	20
8	21	24
10	25	27
12	29	30
16	37	37
20	45	45
24	53	53

   c. Adhesive tape for repairs and circumferential joints shall be a general purpose adhesive tape 2 inches wide and approximately 12 mils thick and shall conform to AWWA C209 with a polyethylene backing and a butyl rubber adhesive.

5.03 Gate Valves and Appurtenances

A. Gate Valves (3" – 16")

All gate valves shall be of the resilient wedge type by Waterous Company, St. Paul, Minnesota or equal. In addition, all buried gate valves shall have non-rising stems with a two-inch nut for operating with a tee handle wrench and shall be provided with valve boxes for the proper depth of bury.

All gate valves shall conform to the latest revision of AWWA Standard C-509 covering resilient seated gate valves.

All gate valves shall be non-rising stem, opening counter-clockwise by turning the stem, and providing with a 2" square operating nut or hand wheel (dependent upon application) with the word "OPEN" and an arrow cast in the metal to indicate direction to open, which shall be open left (counter clock wise).

The wedge shall be of ductile iron completely encapsulated with urethane rubber. The urethane sealing rubber shall permanently bonded to the cast iron wedge to meet ASTM tests for rubber metal bond ASTM D429.

Stems for non-rising stem assemblies shall be cast bronze with integral collars in full compliance with AWWA. OS & Y stems shall be on bronze stock. The non-rising stem stuffing box shall be on the o-ring seal type with two (2) rings located above the thrust collar; the two (2) rings shall be replaced with the valve fully open and subjected to full rated work pressure.

There shall be two (2) low torque thrust bearing located above and below the stem collar. The stem nut shall be independent of the wedge and shall be made of solid bronze. There shall be a smooth unobstructed waterway free of all pockets, cavities, and depressions in the seat area.

The body and bonnet shall be coated with fusion bonded epoxy both interior and exterior. Each valve shall have maker's name, pressure rating and year in which manufactured cast on the body. Prior to shipment from factory, each valve shall be tested by hydrostatic pressure equal to requirement of both AWWA and 500 PSI ULFM requirements.

The use of valve box alignment discs shall be required.

B. Valve Boxes

5¼" diameter valve boxes shall be of cast iron complete with pavement rings, as applicable, and covers. Cast iron boxes shall be of extension type with screw adjustment and with flared base. The minimum thickness of metal shall be 3/16". The word WATER shall be cast in the cover. Boxes shall be installed over each outside gate valve. The boxes shall be of such length as will be adapted, without full extension, to the depth of cover required over the pipe at the valve location. A key nut extension shall be installed if the valve nut is greater than 4 feet in depth.
A dense foam insert (mud plug) is required on each valve box to prevent debris from entering and preventing the keying of the valve.

C. Valve Stem Extensions

Extension rods less than six feet (6') in length shall be made of at least Schedule 80 steel pipe. Extension rods six feet (6') in length or more shall be made of solid steel pipe. All steel shall be of the highest quality capable of operating the valve under severe conditions without permanent distortion. The operating nut

connector shall fit the operating nut closely, shall provide four (4) faces to the operating nut, shall be made of the same type of steel as the extension rod, shall be of welded manufacture, and shall be welded to the extension rod. An extension centering disc shall be located on the stem extension close to the top. An operating nut of the same steel as the extension rod and of the same size and shape as the valve's operating nut shall be placed on the end of the stem extension. The operating nut on the stem extension shall be welded manufacture and welded to the extension rod. The entire unit shall be painted immediately after manufacture and shall be free of rust or other defects.

5.04 Fire Hydrants and Flushing Hydrants

A. Fire Hydrants

1. The fire hydrants shall be 5 ½ inch (main valve opening) with 6-inch auxiliary valve and connection pipe with break-off flange and coupling assembly, standard 5' bury, and dry barrel. The fire hydrants shall have two (2) 2½ "hose nozzles and one (1) 4½" pumper nozzle threaded to meet the requirements of the local Fire Department. Nozzle caps shall be equipped with chains.

   All fire hydrants shall be arranged for operation with operating nut of size and shape which is the same as that of the existing fire hydrants, or as specified by the local Fire Department. Pumper nozzle shall have a nominal setting of between eighteen (18) and twenty-four (24) inches above the curb or centerline of road and if necessary, the Contractor shall furnish extensions. All hydrants shall turn counter-clock-wise (left) to open.

2. Hydrants shall have 6" mechanical joint inlets and auxiliary gate valves shall be mechanical joint. The valve should be a minimum of two (2) feet from the hydrant. In no case shall the valve be directly bolted to the hydrant flange.

3. The hydrants shall be "Kennedy K81™ or Mueller Super-Centurion™".

4. All pipe, fittings, and valves shall conform to the applicable specifications included in these Standard Specifications. Connecting pipe and gate valves shall be 6" size.

5. Color of the hydrants shall be: Public – Safety Red / Private – Safety Yellow

B. Heavy Duty Hydrant Markers

1. All hydrants shall be provided with a heavy duty fiberglass marker as manufactured by Pollardwater, or equal. Markers shall be manufactured from standard ⅜" diameter white laminate matrix fiberglass with four 6" white reflective tape strips that provide instant day and night visibility in all weather conditions.

2. The shaft shall be attached to a heavy-duty zinc plated carbon steel spring that allows 360-degree rod flexibility. The mounting bracket shall be sized to fit onto a standard ⅝" diameter hydrant bolt.

3. The complete assembly shall be corrosion resistant. Shaft length shall be 6 feet (6').

5.05 Service Connections

A. Service Saddles

Shall be single strap type of all stainless construction with confined "O" ring seal and AWWA thread outlet. Service saddles shall be of a design which will accurately fit pipe (O.D.) to provide a positive seal between main and saddle at the rated working pressure of the main.

The service saddle shall **only** be used on PVC or polyethylene and must be marked to indicate size of main (O.D.) and outlet size on body and strap. Service saddle shall be Ford Style 101B for service lines up to 1" in size, and 202B for service lines over 1" in size; or approved equal.
The application of all service saddle connections must receive approval from the Utilities Superintendent prior to installation.

B. Corporation Stops

All service brass shall be Ford™ brand, designed and manufactured in accordance with AWWA standard specifications C-800 and shall be individually inspected and tested for the leaks at the factory prior to shipment. Corporation stops shall be of a design which will permit use with drilling machines of current design.

C. Copper Service Pipe

All copper pipe ("K") service line for water distribution shall conform to all applicable requirements in the latest revision of ASTM and AWWA standards for Copper Tube Size (SDR-9). Only copper pipe may be used for service lines unless specifically approved by Utility Superintendent.

D. Polyethylene Service Tubing

Polyethylene tubing is **only** allowed downstream of the city water meter and must be approved by the Utility Superintendent and shall conform to the latest addition of the Unified Plumbing Code.

All polyethylene service lines shall be manufactured from High Density Polyethylene (HDPE), Copper Tubing Size (CTS), (PE3408 C-3 SDR-9) in accordance with ASTM D-2739 or the latest revision thereof (REV. January,

1998).
Tubing shall have a working pressure of 200 PSI at 73º F and the tubing shall be capable of maintain pressures of 300 PSI at 73º F for 1,000 hours. Pipe surfaces shall be smooth and free from irregularities. **Stainless steel stiffener/Inserts shall be used as reinforcing the gripping and sealing regions.** All materials must be homogeneous and uniform in appearance. All joints using polyethylene tubing shall be made by flaring the poly tubing or the Mueller "Instan-tite" connection.
Cross-linked Polyethylene (PEX) materials is not permitted for any underground installation within the jurisdiction of the City of Plymouth Water Department.
One, #12 solid copper locating wire is required to be buried directly above the polyethylene service tubing and terminated in the valve pit/vault at a height which is convient for connection and either inside or outside the foundation of the building where connection can be made if required (exact termination points are at the discretion of the Water Department, not the installer).
Tubing shall be marked with the manufacture's brand name, pipe size, working pressure, material designation, National Sanitation Foundation approval, ASTM specification, and production code. Tubing shall be manufactured to "Type K" copper O.D., and the dimensions and tolerances shall correspond with the values listed in the U.S. Department of Commerce CS-255-63 for flexible plastic pipe.

E. Metered Service Installations

1. Metered Connections: Metter Setters

a. Meter setters shall be used for services which are 1½ "or larger.

Meter setters shall be copper tube with integral inlet and outlet pack joints for service line. Meter inlet valve shall be brass of the inverted key, angle ball valve type, with "O" ring seal, smooth contour and unobstructed waterway on inlet. It shall have padlock wings, lock cap and seal wire hole. Setter shall be braced between inlet and outlet risers with a structural brass member which shall have a hole at the bottom to accept a ½-inch steel, brace pipe. Saddle nuts shall be provided for supporting meter. All setters shall be set and maintained in a vertical position.

Setters for meters shall be manufactured by Ford ™ Company or as approved by the City and Utilities Superintendent.

b. Meter Yokes

Yokes shall be used when the service line is less than 1½ ". For 1" yokes, a Ford Model Y501 yoke shall be used. For ¾ "yokes, a Ford Model Y-502 yoke shall be used. For 5/8" yokes, a Ford Model Y shall be required.

2. Service Meter Enclosures (Pits)

a. Enclosures for Meters: Individual meter enclosures for meter yokes shall be a minimum of twenty (20) inches in inner diameter. Enclosures shall be manufactured from PVC or PE and shall be of a ribbed type construction. Nominal wall thickness shall be not less than 2.0 inches. Enclosures shall include two (2) 2½"wide slots at the bottom to accommodate service tubing.

b. Covers for Enclosures (Casting): Covers shall be cast iron, Wabash Double Lid Covers, four (4) inches deep with an 11½" diameter lid opening. Lid is required to have lifter worm lock with standard pentagon bolt. The works "WATER METER" shall be cast in top of the lid. Covers shall be similar to Ford Meter Box Company, Model No. W3. The lids shall also be pre-drilled to accept either one or two AMR transmitters (to be determined by the Water Department).

C. Backflow Devices: All meters that are required to be installed with conjoining backflow devices and must meet all requirements as deemed necessary to meet the City of Plymouth Water Department Backflow Rules and regulations.

5.06 Tapping Sleeve

The tapping sleeve body shall be fabricated from 18-8 type 304 premium grade stainless steel to minimize corrosion. The body shall be of the full circumference band configuration. The tapping sleeves shall be designed for a water working pressure of 150 pounds, and shall be provided with the necessary test plugs for pressure testing. Dimensions shall be such that the tapping sleeves are installed so as to properly fit the O.D. of the existing pipes. All material shall be in accordance with AWWA Specifications.

Flanges shall be standard AWWA C207 Class D ANSI 150 lb. drilling with epoxy coated finish. Flange shall be recessed to accept tapping valve.

Bolts and nuts shall be 18-8 type 304 stainless steel with heavy hex nuts and 18-8 type 304 L stainless steel stud bolts. Nuts shall be Teflon coated to prevent galling. Washers shall be plastic lubricating type.

Bridge plate shall be 18-8 type 304 and bonded to gasket to assure even distribution of gasket pressure.

Tapping sleeves shall be as manufactured by Rockwell International, or approved equal.

5.07 Types of Joint Restraint

- Tie Rods
- Mechanical type: Romac MJ Grip Rings or Mega-Lugs
- Field-Loc® gaskets

SECTION 6

INSTALLATION / CONSTRUCTION

SECTION 6
WATER PROJECT INSTALLATION / CONSTRUCTION

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SECTION 6

WATER PROJECT INSTALLATION/CONSTRUCTION

6.01 General

This section shall provide general, minimum requirements for the installation and construction for the City of Plymouth. These standards shall apply to all areas of the construction. Where the construction passes through previously developed areas, special attention shall be given to the applicable portions of this section.

The contractor shall provide knowledgeable personnel that will perform in a workman like manner supplying a professional installation.

6.02 General Construction

A. Clearing

Preparatory to excavation, the site of all open cut excavations, embankments, and fills shall be first cleared of obstructions and existing facilities (except those which must remain temporarily or permanently in service). On all public or private property where grants or easements have been obtained, and on the property of the City, the Developer / Contractor shall remove and keep separate the top soil, and shall carefully replace it after the backfilling is completed.

B. Pavement Cutting

Prior to excavating paved areas all excavation edges falling within the pavement shall be saw cut in a neat, straight manner. Cutting shall be performed with a saw designed specifically for this purpose. The cut shall penetrate the entire pavement thickness where possible. If the existing pavement is more than 6 inches thick, then a cut of not less than 6 inch depth shall be made. If pavement cuts are made in streets which are opened to traffic prior to excavation, then the cuts shall be thoroughly filled with sand and maintained full until the excavation is performed.

C. Protection of Existing Improvements

Before any excavation is started, adequate protection shall be provided for all existing utilities and City owned structures.

D. Protection of Trees and Shrubs

No existing trees or shrubs in street right-of-ways and easements shall be damaged or destroyed. Where branches of trees or shrubs interfere with the Contractor's operations, they shall be protected by tying back wherever possible. No limbs or branches shall be cut. If his operation will not permit saving certain trees, the Contractor shall be wholly responsible for satisfying all claims for restoration or restitution resulting from their damage or removal.

If small trees and shrubs are moved or pruned to permit more working space, pruning shall be done in accordance with Home and Garden Bulletin No. 83, U.S. Department of Agriculture, "Pruning Shades Trees and Repairing Their Injuries". However, the Contractor shall obtain, in writing, the City's permission to move or prune trees or shrubs.

E. Maintenance of Public Travel

Works shall be carried out in a manner which will cause a minimum of interruption to traffic, and may close to through travel not more than two (2) consecutive blocks, including the cross street intersected. Where traffic must cross open trenches, the Contractor shall provide suitable bridges to street intersections and driveways. The Contractor shall post suitable signs indicating that a street is closed and necessary detour signs for the proper maintenance of traffic. Prior to closing of any streets the Contractor shall notify responsible municipal authorities.

All traffic control shall be in accordance with the latest edition of the Indiana Manual on Uniform Traffic Control Devices and Sections 104.04, 107 and 801 of the Indiana Department of Highways Standard Specifications.

F. Utility Interruption

The Contractor shall proceed with caution in the excavation and preparation of the trench or pit that the exact location of underground structures may be determined. Prior to proceeding with trench excavation the Contractor shall contact all utility companies in the area to aid in locating their underground services.

The Contractor shall take all reasonable precautions against damage to existing utilities. However, in the event of a break in an existing water main, gas main, sewer or underground cable, he shall immediately notify the responsible official of the organization operating the utility interrupted. The Contractor shall lend all possible assistance in restoring services and shall assume all costs, charges, or claims connected with the interruption and repair of such services.

G. Boring and Jacking

Construction of the pipeline by boring and jacking methods under highways, railroads, and streams will be permitted unless otherwise specified on the plans. Plans and details describing the materials and methods of construction proposed for use shall be submitted to the City and the Utilities Superintendent of approval.

1. Backstop: The backstop shall be of sufficient strength and positioned to support the thrust of the boring equipment without incurring any vertical or horizontal displacement during such boring operations.

2. Guide Rails: The guide rails for the boring equipment may be of either timber or steel. They shall be laid accurately to line, grade and maintained in this position until completion of the boring operations.

3. Casing Pipe: The casing pipe and joints shall be steel construction capable of withstanding the traffic load and constructed to prevent leakage from the casing or conduit throughout its entire length excepting the open ends.

   a. The casing pipe shall be welded steel pipe, new and unused. The pipe shall have a minimum yield of 35,000 psi and meet the requirements for Class B pipe under ASTM specification A-139 "Electric Fusion (Arc) – Welded Steel Pipe".

   b. The minimum wall thickness for the casing pipe shall be as follows:

Diameter of Casing	**Minimum Wall Thickness (inches)**
Under 14"	0.375
14"	0.375
16"	0.375
18"	0.375
20"	0.500
22"	0.500
24"	0.500
26"	0.500
28"	0.500
30"	0.500

   c. Where lengths of casing pipe are joined during the boring operations, care shall be taken to insure that the proper line and grade is maintained. After welding of each joint, the casing pipe exterior wall shall be coated with coal tar, or bitumastic material.

   d. The casing ends shall be suitably protected against the entrance of foreign material which would interfere with the conduit removal. Brick and mortar bulkhead walls or rubber coupling (see detail drawing) shall be used to seal the casing ends.

   e. Stream crossings shall be a minimum of 3 feet from the stream bottom (as defined by the regulating agency) and the top of the casing pipe.

4. Casing Spacers: The carrier pipe shall be centered within the casing by use of stainless steel casing spacers as manufactured by Cascade Waterworks Manufacturing Company, Yorkville, IL; or approved equal.

   Casing spacers shall be bolt on style with a two piece shell made from T-304 stainless steel of a minimum 14 gauge thickness. Each shell section shall have bolt flanges formed with ribs for added strength. Each connecting flange shall have a minimum of three 5/16" T-304 bolts. The

shell shall be lined with a ribbed PVC extrusion with a retaining section that overlaps the edge of the shell and prevents slippage. Bearing surfaces (runners) made from UHMW polymer with a static coefficient of friction of .11 - .13 shall be attached to support risers at appropriate positions to properly support the carrier within the casing and to ease installation. All metal surfaces shall be fully passivated.

Casing spacers shall be installed per the recommendations of the manufacturer, and at intervals of not more than 5'.

5. Seal Ends: After the water main is fully installed within the entire length of the casing, the Contractor shall, to the satisfaction of the City of Plymouth or designated representative, seal both ends of the casing pipe with brick and mortar bulkhead walls or rubber couplings.

6.03 Bedding and Backfill

A. General

All trenches or excavations shall be backfilled to the original surface of the ground or such other grades as required or directed. In general the backfilling shall be carried along as speedily as possible in order to avoid open excavations.

B. Backfill Materials

The following materials shall be used for backfill in accordance with and in the manner indicated by the requirements specified herein.

Class I - Angular, 6 to 40 mm (1/4 to 1 ½ inch), graded stone such as crushed stone.

Class II - Coarse sands and gravel with maximum particle size of 40 mm (1 ½ inch), including various grades of sands and gravel containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW, and SP are included in this class.

Class III - Fine sand and clayey gravel including fine sands, sand-clay mixtures and gravel-clay mixtures. Soil types GM, GC, SM and SC are included in this class.

Class IV - Silt, silty clays and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil types MH, ML, CH and CL are included in this class. These materials are not recommended for bedding. This class shall also include any excavated material free from rock (3 inches or larger), concrete, roots, stumps, rubbish, frozen material and other similar articles whose presence in the backfill would cause excessive settlement.

C. Backfill of Trench Excavations for Pipes and Structures

Bedding and Backfill materials samples shall be submitted to the City or Utilities Superintendent prior to start of construction.

D. Rigid Pipe Bedding

For purposes of this specification, rigid pipe shall include those made of ductile iron and other materials as determined by the City and Utilities Superintendent.

All rigid pipes shall be laid to the lines and grades unless otherwise directed by the City. All rigid conduit and pipe shall be bedded in compacted Class I, II, or III materials, placed on a flat trench bottom. The bedding shall have a minimum thickness of 4" or one-fourth (1/4) the outside pipe diameter below the pipe and shall extend halfway up the pipe barrel at the sides. All material shall be placed in the trench in approximately six (6) inch layers. Each layer shall be leveled and evenly distributed on both sides of the pipe so as not to disturb, displace or damage the pipe and shall be thoroughly compacted. When Class I or II materials are used compaction may be accomplished by hand or mechanical tamping or by "walking" the material in. Bedding from the halfway point on the pipe to a point twelve (12) inches above the top of the pipe shall be a Class I, II, III, or IV material placed in six (6) inch layers and thoroughly compacted to prevent settlement. Class III and IV material shall not be used when the trench is located in an area subject to vehicular traffic.

E. Backfill Above Pipe

For purposes of this specification, trenches shall be considered subject to vehicular traffic if all or any portion of the excavation is located within five (5) feet of a roadway or alley which is routinely traveled by powered vehicles. In the event of any question regarding the susceptibility of an area to traffic, the City and the Utilities Superintendent decision shall govern.

1. Method A – Backfill in Areas Not Subject to Vehicular Traffic: The trench between a level twelve (12) inches above the top of the pipe and the ground surface shall be backfilled with Class I, II, III or IV materials, as described above, deposited with mechanical equipment in such a manner that it will "flow" onto the bedding and not free fall. The Contractor shall consolidate the backfill by the back and forth travel of a suitable roller, wheeled device or other similar heavy equipment until no further settlement is obtained. Heavy equipment shall not be used until there is a cover of not less than three (3) feet over the pipes. To assist in promoting maximum settlement, the surface of the trench shall be left in a slightly rounded condition. Periodical dressing of the backfill in the trench to promote the drainage and safety conditions shall be made during the course of the work.

2. Method B – Backfill in Areas Subject to Vehicular Traffic (Mechanical Compaction): The trench between a level of twelve (12) inches

above the top of the pipe and the surface, which are located in areas subject to or possibly subject to vehicular traffic, shall be backfilled with Class I or II materials, deposited in uniform horizontal layers of two (2) feet +/- six (6) inches. Each layer shall be thoroughly compacted by mechanical tamping utilizing a crane mounted hydraulic vibratory compactors. Each layer shall be thoroughly compacted before the next succeeding layer is placed. This procedure shall be followed where trench walls remain stable during compaction. If in the opinion of the Utilities Superintendent and City, and/or their representative (inspector), the trench walls become unstable during compaction, then the Utilities Superintendent, City and/or their representative (inspector) may authorize the Contractor to push from the back of the trench the Class I or II material into the trench the full depth, not to exceed twenty (20) lineal feet horizontally along the trench bottom and compact using the vibratory compactor in two (2) foot diagonal lifts.

The crane mounted vibratory compactors shall be capable of producing 1900 cycles per minute and have a compaction plate with the minimum dimensions of twenty-three by thirty-one (23 x 31) inches. The compactor shall be similar to those as manufactured by Allied, Ho-Pac, or equal.

When Class I or II materials do not contain sufficient moisture to obtain proper compaction, in the opinion of the Utilities Superintendent, City and/or their representative, it shall be moistened or wetted as directed by the Utilities Superintendent, City and/or their representative.

F. Temporary Surfaces Subject to Traffic

All streets shall be open to traffic immediately after completing the backfill operation. This shall be accomplished by installing the compacted aggregate base immediately after granular backfill. The use of class II backfill as a temporary surface is specifically prohibited.

G. Maintaining Trench Surfaces

All surface settlement of the backfill along trenches located beneath streets, roads, alleys, driveways and parking lots which are subject to traffic shall be kept filled level with or slightly above the original paved surface at all times with compacted aggregate base material until the permanent pavement is satisfactorily restored. When temporary asphalt pavement is used, depressions and “pot holes” shall be promptly filled with the temporary asphalt material. Special attention shall be given to the timely and proper maintenance, leveling and grading of the surface of all backfilled trenches, especially those subject to traffic and especially following rains. The surface of street, roads and alleys shall be maintained smooth and free of ruts and water trapping depressions by periodic power blading, scarifying; and/or filling settled areas, ruts, pockets, or holes with compacted aggregate base material or temporary asphalt where used.

As a dust preventive, calcium chloride shall be applied over the surface of the compacted aggregate base in such amounts and at such times as are necessary

to avoid or eliminate dust complaints from nearby residents. In event of any question regarding the existence or nonexistence of a dust nuisance, the Utilities Superintendent and the City's decision on the matter will govern. The material used shall be Regular Flake Calcium Chloride having a minimum chemical content of Calcium Chloride of seventy-seven percent (77%). Unless otherwise specified or ordered by the Utilities Superintendent and City, the rate of application shall be one and one half (1½) pounds per square yard of surface covered.

Wherever surface settlement is not important, unless otherwise specified or directed, the backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation. Just prior to the completion of all work under the contract, any surface settlement below original ground surface shall be refilled in a satisfactory manner, and reseeded as specified if required.

6.04 Water Main Installation

A. General

In general, installation of buried water mains shall conform to the requirements of the manufacturer, the AWWA Standard for the type of pipe being installed, or as specifically indicated on the plans or specified herein.

Extreme care shall be taken in handling pipe to prevent damage. Pipe, fittings and valves shall not be dropped to ground or into trench; they shall be carefully lowered, piece by piece, using crane, backhoe, or other approved lifting device. During cold weather, valves and hydrants shall not be stored where trapped moisture can freeze and damage fittings.

Where water is encountered in trench, Contractor shall furnish and operate suitable pumping equipment of capacity adequate to dewater trench, dispose of such water, and maintain drainage conditions, as approved by the City and Utilities Superintendent. It is essential that discharge of trench dewatering pumps be conducted to natural drainage channels, drains or storm sewers. No pipe shall be laid in any water without the City's and Utilities Superintendent's approval.

Mains shall be laid and maintained to the indicated lines with fittings, valves and hydrants at required locations. All valve and hydrant stems stall be set plumb.

Wherever obstructions not shown on the plans are encountered during the process of the work and interfere to such an extent that an alteration in the plan is required, the City or the Utilities Superintendent shall have the authority to change the location from the shown line and grade.
The excavations for construction of pipe lines shall be of sufficient width, and only of sufficient width to permit the work to be constructed in a workmanlike manner. Working space shall be provided in all pipe trenches to allow room all around for the proper making of joints and the drainage of water, if necessary. Sheeting shall be used where necessary to protect curb, walk, trees, and other

utility lines. Except as otherwise specified, the excavation work for the pipes, valves and hydrants shall be performed in accordance with these Standards.

Bell holes shall be provided at each joint to permit the jointing to be made properly. The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes, except that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of eighteen (18) inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. Any part of the bottom of the trench excavated below the specified grade shall be corrected by filling with approved material, thoroughly compacted in three (3) inch layers. The finished sub grade shall be prepared accurately by means of hand tools. No blocking under pipes will be permitted except as approved by the Utilities Superintendent under special conditions.

Where the bottom of the trench at sub grade is found to be unstable or to include ashes, cinders, all types of refuse, vegetable or other organic material, or large pieces or fragments of inorganic material which in the judgment of the Utilities Superintendent should be removed, the Contractor shall excavate, remove and satisfactorily dispose of such unsuitable material to the width and depth ordered by the Utilities Superintendent. Before the pipe is laid, the sub grade shall then be made by backfilling with approved Class I or Class II material as defined in these Standards. The fill material shall then to be thoroughly compacted by means of hand or mechanical tamping to a minimum 85% Standard Proctor Density.

In event of rock excavation or where ledge rock, boulders and large stones, or hard pan, shale or cemented gravel, are encountered in the bottom of the trench, then said materials shall be removed to provide a clearance of at least six (6) inches below and on each side of all pipe, valves and fittings. The space between the rock or other hard trench bottom and the pipe shall be filled with Class I or II material and hand or mechanically tamped as explained above.

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient protection of the work. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Before lowering and while suspended, the pipe shall be inspected for defects and rung with a light hammer to detect cracks. Any defective, damaged or unsound pipe shall be rejected. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench, and shall be kept clean by approved means during and after laying.
The spigot shall be centered in the bell, and the pipe brought into the true alignment and secured there with earth carefully tamped on each side, excepting at the bell holes. Care should be taken to prevent dirt from entering the joint space. At times when pipe laying is not in process, the open ends of pipe shall be closed by approved means, and no trench water shall be permitted to enter

the pipe.

Cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying and for lines on an appreciable slope, bells shall face upgrade. Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane to avoid obstructions, to plumb stems, or for other reasons, the degree of deflection shall be within permissible limitations as defined by the manufacturer.

All plugs, caps, tees and bends shall be provided with restrained joints and grip rings. The restrained joints shall be of adequate strength to prevent movement, as approved by the City of the Utilities Superintendent.

All bedding and backfill material shall be placed and compacted in accordance with the applicable portions of these Standards. (Section 6.03).

B. Depth of Cover for Water Mains

All water mains shall be constructed with a normal minimum earth cover of sixty (60) inches over the top of the pipe and a maximum of seventy two) 72) inches except as follows:

1. For purpose of avoiding direct interference with existing structures or utilities, the City or Utilities Superintendent may authorize decrease depth of cover.

2. For the purpose of making grade changes within tolerable limits, the depth may be increased to an approved depth.

3. Unless otherwise shown on the plans or permitted by the City or Utilities Superintendent, the new mains shall cross beneath the existing mains, except in cases where the specified cover can be maintained by crossing above the existing mains.

4. Where connections to existing mains dictates changes in the required depth of cover.

C. Connections to Existing Mains

All connections to City mains shall be made by the Water Department or by an approved Contractor. The type of connection to be made shall be at the discretion of the Water Department. The cost for the connection to the City mains shall be based upon costs for materials and labor and shall be billable to the developer.

6.05 Gate Valve and Valve Box Installation

A. Installation

Gate valves and valve boxes shall be installed per the manufacturer's recommendations.

The stem extension shall sit solidly on the valve operating nut and shall turn freely. The extension shall be bolted to the valve operating nut in a manner such that the bolt prohibits the extension from being pulled off the operating nut but does not transmit any force from the extension to the operating nut during operation of the valve, thus prohibiting the bolt from shearing.

The extension must of such a length that the nut on the extension shall be between thirty (30") and thirty-six inches (36") below the finished grade.

Valve box alignment discs and dense foam debris inserts (mud Plugs) shall be required on each valve box.

B. Testing

Each valve stem extension shall be tested by closing the valve, reducing the pressure on one (1) side of the valve to zero (0), then opening the valve with the use of the extension. Any permanent distortion or damage to the valve stem extension is unacceptable.

6.06 Hydrant Installation

Hydrant barrels shall be constructed in such a manner that it is not necessary to cut off the water or to excavate to make repairs. The barrel of the hydrants shall be constructed in sections which are to be jointed in such a manner that the upper section of the barrel extending above the ground may be separated from the lower section by impact without injury to the stem or the barrel.

Hydrants shall be located in such a manner as to provide complete accessibility, and in such a manner that the possibility of damage form vehicles or injury to pedestrians will be minimized, when set in the space between the curb or sidewalk or between the sidewalk and property line, no portion of the hydrant or nozzle cap shall be within six (6) inches of the sidewalk. All hydrants shall stand plumb and shall have their nozzles parallel or at right angles to the curb. They shall conform to the established grade, with nozzle at least twelve (18) inches above the ground.

Hydrants shall be thoroughly cleaned of dirt and other foreign matter before setting, and the hydrant shall be suitably anchored with a hydrant adapter. Said adapter shall be at least twenty-four (24) inches in length. All hydrants are to be properly supported and braced and surrounded with approximately five (5) cubic feet of washed gravel.

The 4½" "pumper nozzle or steamer" shall be positioned to face the street.

An "OUT OF SREVICE" bag or ring shall be placed on all new hydrants until approved for use.

6.07 FITTINGS

All fittings shall be installed with proper support so as not to hang from the pipe. All crosses, tees, caps, plugs, wyes, and bends 25º and greater shall have concrete thrust blocks or appropriate mechanical restraints placed in the proper position and extending to undisturbed ground to resist movement.

6.08 Service Meter Enclosure Installation (PITS)

Enclosure shall be set vertically on a base of clean, washed gravel a minimum of one (1) foot deep and twelve (12) inches beyond outside of enclosure. Backfill shall be tamped in six (6) inch layers all around enclosures in excavated area to maintain stability and prevent settlement. Meter enclosure locations shall be as determined by the Developer / Contractor and approved by the City or Utilities Superintendent. Generally, meters shall be placed in lawns as near as possible to dedicated right-of-way lines.

SECTION 7

RESTORATION OF SURFACES

SECTION 7
RESTORATION OF SURFACES

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SECTION 7

RESTORATION OF SURFACES

7.01 General

Restoration of surfaces within the public right-of-way and easements shall include the removal of the existing surface, the disposal of the surplus material in an approved method, and the construction of new surfaces and adjusting all new and existing structures for proper grade prior to paving as indicated on the plans and/or as specified in these Standards.

7.02 Restoration of Paved Surfaces

A. Restoration

After all excavations within the limits of paved surfaces have been properly backfilled and compacted, the paved surfaces shall be restored to a condition as good as or better than existed prior to the beginning of the work, in accordance with the following specifications.

Paved Surfaces: Streets, alleys, sidewalks, driveways, curbs and gutters, not constructed or maintained by the State Highway Department, but paved with asphalt, concrete, cinders, crushed stone, waterbound macadam, oil-bound macadam, or heterogeneous paving materials, which are wholly or partially removed, damaged, or disturbed by the Contractor's operations, shall be restored with like or better materials, acceptable to the City, to a condition as good as or better than existed prior to the beginning of the work, so that movement of traffic, both vehicular and pedestrian, through the restored way shall be as free, safe and unimpeded as before.

B. Temporary Surface

Temporary trench surfaces shall be installed and maintained in accordance with these specifications. This temporary surface shall be maintained by the Contractor until the permanent pavement is placed. Before placing permanent pavement, all or parts of the temporary surface shall be removed, as necessary, and hauled from the site of the work.

C. Temporary Pavement Replacement

Trench surfaces of highly traveled streets and roads may be, at the direction of the City, required to receive a temporary pavement replacement of cold mixed bituminous pavement. This temporary pavement shall be surface mixture Class A or B prepared and placed in accordance with Section 406 Cold Mixed Bituminous Pavement of the latest edition of the Indiana Department of Transportation Standard Specifications. Prime and tack coats shall not be required. All temporary pavements shall be maintained by the Contractor to proper grade so

as not to impede the safe flow of traffic until the permanent pavement replacement is made.

D. Permanent Paving

Permanent paved surfaces shall be restored in accordance with the following requirements, unless otherwise set forth by the City Engineer, in all cases, the methods and materials of restoration shall meet the requirements of the Indiana Department of Transportation, as applicable.

1. Class "B" Concrete Pavement

Existing local streets, roads, alleys, driveways and parking areas consisting of concrete pavement shall be restored according to the following requirements.

Areas subjected to excavation or damage by the Contractor is to be replaced as a whole. Sidewalks to be replaced in complete sections, streets and driveways as complete sections or replaced with sections that coincide with the original pattern, and to the City's satisfaction.

Prior to placing concrete, the existing edges are to be saw-cut in a neat straight manner, sub-base compacted, wetted down and edges swept clean. The use of flexible joint material is required as needed. All chunks of existing material larger than three by three (3" x 3") inches are to be removed.

Class "B" concrete pavement shall consist of a cast in place, layer of Class A concrete with one (1) layer of woven wire fabric (6 x 6 _ W1.4 x W1.4) meeting ASTM Designation 497. The concrete layer shall be six (6) inches thick. All rigid concrete pavement work and materials shall meet the latest specifications of the Indiana Department of Transportation.

2. Class "C" Asphalt Pavement

Existing local streets and roads consisting of asphalt paving shall be restored with binder and surface of the thickness specified and as follows:

Areas subject to Class C asphalt pavement replacement shall have the existing edges (those created by cutting prior to excavation) re-cut in a neat straight manner as to remove irregularities and damaged areas. Manholes, service line trenches and existing valve areas are to be boxed out in a neat manner. All cuts shall be parallel or perpendicular to the trench. Curved or diagonal cuts shall not be allowed. All chunks of existing material larger than three by three (3 x 3) inches are to be removed.

The aggregate base course, including the previously placed temporary surface or pavement, shall have the upper portions removed to allow placement of the binder and surface. After the base is cutback, it shall be re-compacted with a ten (10) ton roller or other suitable equipment if approved by the City Engineer. Care shall be taken to assure that not less then six (6) inches of compacted aggregate base remains below the permanent pavement.

A tack coat shall be applied to the cleaned and patched surface at a rate of 0.05 to 0.10 gallons per square yard immediately prior to placing of bituminous mixtures.

The binder course(s) shall consist of compacted Hot Asphaltic Concrete, Type A, Size No. 9LV or 11LV as defined by the latest edition of the Indiana Department of Transportation Standard Specifications. Compaction shall be accomplished with suitable smooth wheel rollers. Generally, conventional self-propelled rollers of not less than 10 tons gross weight shall be used. The City Engineer may allow other specialized rollers for narrow trenches or lighter rollers with vibratory action. The City Engineer shall consider alternate equipment only if Contractor requests same in writing and includes technical data on the specific equipment to be considered.

The quantity and thickness of binder courses required shall match the existing pavement, but not less than one (1) course, three (3) inches in thickness.

When the existing pavement surface is granular material, or a new granular base is placed, the surface shall be fine graded and compacted by rolling to produce a smooth uniform surface free of voids and depressions. A prime coat, if specified, shall be applied to the graded and compacted granular surface at the rate of 0.30 to 0.50 gallons per square yard prior to the placing of bituminous mixtures or surface seal coats.

The surface course shall consist of compacted Hot Asphaltic Concrete Surface Type A (Size No. 11LV or 12LV), as defined by the latest edition of the Indiana Department of Transportation Specifications and placed in the same manner as described above for binder. The surface thickness shall match the existing pavement, but not less than one (1) inch.

3. Adjustments of Shoulders Necessitated by Resurfacing

The shoulders of the road shall be adjusted to the elevation of the resurfacing with all materials (i.e., earth, sod, gravel, crushed stone, asphalt, etc.) necessary. The transition may be made within a distance of one (1) foot to one and one-half (1 ½) feet from the edge of paving except in unusual cases where a greater distance is required. Existing driveways

shall be primed and wedged from a featheredge to the final height of the resurfaced street paving.

7.03 Restoration of Ground Surfaces

All ground surfaces in public Rights of Way and easements that have been damaged or destroyed by the Contractor's operations shall be restored in accordance with the following specifications. All surplus material, rock, trees, shrubs, concrete pipe, asphalt, crushed stone, etc., not to be used in the Contractor's restoration operations shall be removed from the site and disposed of in an acceptable manner.

A. Restoration of Grassed Areas with Sod

Where shown or required by the City, established grassed areas shall be restored with sod containing grasses of comparable quality. Sod shall be placed and rolled so that the final elevations of the area being restored are the same as existed prior to the beginning of construction. Sod shall be pegged where necessary, and shall be watered and cared for to assure its survival.

B. Restoration of Grassed Areas with Seed and Mulch

The Contractor shall seed and mulch in one of the following manners:

1. The ground shall be loosened approximately three (3) inches deep with a disc or a harrow and fertilized with twenty-five (25) pounds of 10-10-10, or equivalent, and one hundred (100) pounds of agricultural lime per one thousand (1,000) square feet.

   The mixture of seed applied shall be as follows:

   35% Kentucky Bluegrass
   30% Perennial Rye Grass (Lolium Perenne)
   30% Kentucky 31 Fescue
   5% Inert Matter

   The seed shall be applied at a rate of four (4) pounds per one thousand (1,000) square feet and shall be well raked or boarded into the soil and mulched with straw of sufficient thickness to hold the seed until it has germinated.

2. Mulching Material: Materials for mulching shall be wheat, oats, barley or rye straw only. All materials shall be reasonably free from weed seeds, foreign material, and other grasses and chaff, and shall contain no Johnson Grass. The straw shall be reasonably bright in color and shall not be musty, moldy, caked, or of otherwise low quality. The straw shall be dry on delivery, and spread evenly.

Mulch netting may be required on special areas designated by the City to hold mulch in place until turf is established. The net shall be made of a tightly twisted craft paper yarn, leno woven with a wrap count of one (1) pair of yarns per two (2) inches and a filling count of two (2) per inch. Salvage edges and center shall be reinforced with polyethylene filament. The material shall have a minimum width of forty-five (45) inches. Pinning of the mulch netting is required.

Approved Spectra Tech straw woven netting is also acceptable as mulching materials.

SECTION 8

EROSION CONTROL

SECTION 8
EROSION CONTROL

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SECTION 8

EROSION CONTROL

8.01 General

This section provides the general guidelines for the control of erosion and sediment for construction sites. Control of sedimentation for construction site may be accomplished through utilization of a variety of control practices. The complexity of the erosion and sediment control plan will vary depending upon individual site conditions. The goal of such a plan is to limit the quantity of sediment leaving the construction site. The Contractor's plan must be approved by the City.

In addition, the Contractor must also comply with Rule 5 327 IAC 15-5 or Rule 13 327 IAC 15-13 for land alteration which disturbs 1 acre or more.

If the project disturbs less than 1 acre; Best Management Practices (BMP's) erosion control measures still must be instituted to prevent erosion and sedimentation from leaving the construction site. If the project necessitates the preparation of a Stormwater Drainage Plan as per the current Storm Drainage and Sediment Control Ordinance; the BMP's shall be identified and addressed in the Stormwater Drainage Plan.

8.02 Permitting Requirements

If the Owner/Contractor is required to submit a soil erosion control plan to the State under Rule 5 (327 IAC 15-5) or Rule 13 (327 IAC 15-13), such plan shall be deemed in compliance with City requirements. In this case all applicable State and Federal permits or notices for land disturbing activities shall be obtained or filed prior to beginning land disturbing activities.

The City of Plymouth is an MS4 Community and is in transition between Rule 5 327 IAC 15-5 and Rule 13 327 IAC 15-13. Hence, the contractor shall provide the City of Plymouth Department of Stormwater Management with copies of all applications, plan narratives, submittals; plan and other erosion and sediment control related information shall be submitted to the city. This includes but is not limited to Notice of Intent (NOI), Stormwater Pollution Protection Plan (SWPPP), and the Notice of Termination (NOT) for all projects with land alteration which disturbs 1 acre or more.

8.03 Design Guidelines

In order to fully achieve an acceptable level of erosion and sediment control on the construction site, the following design principles shall be fully adhered to during site analysis and development of the erosion and sediment control plan:

A. Existing site contours should be followed as close as reasonably possible in order to minimize cut and fill.

B. Existing natural vegetation should remain undisturbed for as long as possible during the construction activities. Naturally vegetated areas along property lines,

jurisdictional wetlands, lakes, and watercourses, both natural and man-made, should be left undisturbed during all phases of the site construction. These vegetative filter strips will be required at the discretion of the City.

C. A logical sequencing of site construction activities must be provided in order to minimize the size of exposed land areas, and the length of time land areas are left without some form of temporary or permanent soil protection.

D. Soil stockpiles shall be stabilized utilizing either vegetative establishment, sediment trapping barriers, or erosion control measures such as tarping or mulching, singly or in combination.

E. Storm sewer inlets which are made operable either before or during the construction phase of development shall be provided with protection from siltation.

F. Stable, properly maintained construction traffic access routes and stream crossings shall be identified on the site erosion and sediment control plan as needed. These construction access routes shall be installed as part of the site perimeter sediment control barriers, prior to the initiation of on-site land alteration activities. Where sediment is transported onto public street or road surfaces, these streets or roads shall be cleaned thoroughly at the end of each day. Sediment shall be removed by either scraping, shoveling or sweeping and be transported to a controlled fill area. Street washing will be allowed only if wash water flows to a controlled sediment trapping area.

G. Runoff velocities shall be kept as low as possible.

H. A thorough maintenance and follow-up program, and identification of the person(s) responsible for its implementation will be required.

The latest edition of the Indiana Handbook for Erosion Control in Developing Areas (HECDA) [being updated to the Indiana Stormwater Quality Manual] shall be used for detailed technical guidance for all erosion and sediment control practices. The following general practice guidance applies to the development of all control plans:

A. Perimeter Control - Perimeter control measures shall be installed as specified on the approved plan, including: construction access drives, straw bale dams and fabric fencing, temporary sediment traps, sediment basins, and diversions.

B. Vegetative Control - Disturbed areas which are at finish grade shall be permanent seeded within seven (7) days. At the discretion of the City; barren areas to be rough graded and left undisturbed for more than thirty (30) days shall be established with temporary vegetation; and dormant seeding will be required during seasonal periods (October through February) for those barren areas to be left undisturbed for one hundred and twenty (120) days or longer.

C. Slope Protection - Slope protection shall be provided by use of temporary and permanent diversion levees, vegetative cover, and slope drains. Concentrated

storm water flows shall not be allowed to flow down cut or fill slopes without proper slope stabilization.

D. Sediment Trapping - To achieve the goal of preventing sediment from leaving the construction site, the City will require the use of sediment barriers such as fabric fencing, straw bale dams, and sediment basins.

E. Protection of Outlet Channel - Concentrated storm water runoff leaving a development site shall be outletted to an open channel, storm sewer pipe or culvert which is capable of receiving this discharge. Runoff velocities shall be controlled during all storm events so that the peak runoff velocity during and after the completion of the land alteration approximates existing conditions.

The principles and practices provided by the State in Rule 5 or Rule 13 are to be followed in the development of all control plans. Rule 5 or Rule 13 does not give specific requirements for use of various practices leaving that to the localities. Individual practices can be modified or waived upon request to the City based on special site characteristics and conditions.
The designer should rely on the Indiana Handbook for Erosion Control in Developing Areas (HECDA) [being updated to the Indiana Stormwater Quality Manual] for detailed design, construction and maintenance criteria for all erosion control practices. Such criteria shall be required by the City unless waived in writing. The manual can be obtained from:

Urban Conservation Program
Division of Soil Conservation
Indiana Department of Natural Resources
402 West Washington Street, Rm. W-265
Indianapolis, Indiana 46204-2748

Local information may be received from:

City of Plymouth
Department of Stormwater Management
900 Oakhill Ave.
Plymouth, IN 46563
Phone: 574-936-3614
Fax: 574-936-3017
E-mail: publicworks@plymouthin.com

SECTION 9

INSPECTION, TESTING, AND ACCEPTANCE

SECTION 9
WATER PROJECT INSPECTION, TESTING AND ACCEPTANCE

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SECTION 9

WATER PROJECT INSPECTION, TESTING AND ACCEPTANCE

9.01 General

This section describes the minimum requirement and general procedures for the inspection, testing and acceptance of systems dedicated to the City of Plymouth.

Connection permits for utility service will not be issued until all the requirements of this section are fulfilled.

9.02 Inspection

Inspection of the construction shall occur for the duration of the project, including the installation of service connections. Inspection fees shall be as set forth in Section 3.

A. General Requirements

1. Contractor and / or Owner shall provide notice to the City and his representative of the planned commencement of construction thirty (30) days prior to such commencement.

2. Once the construction starts, the Contractor shall be responsible for informing and / or notifying the inspection representative assigned of the following (NOTE: The City may require as much as five (5) working days notice to provide inspection services during construction.):

    a. Daily work schedule, including any changes in schedule;
    b. Prior notification if work is to be performed on weekends and / or holidays;
    c. Date tests are to be performed; and
    d. Date as-built verification is to be performed.

3. The City, upon request of the Contractor and / or Owner, will schedule the Final Inspection.

All testing required shall be paid for by the Contractor and performed under the observation of the City or City's representative. It shall be the Contractor's responsibility to schedule the testing with the City representative and / or City. Test results obtained in the absence of the presence of the City will not be accepted.

9.03 Water Main Testing and Disinfection

A. General

After the pipe has been laid and backfilled, all newly laid pipe or any valve sections of it shall, unless otherwise expressed specified, be subjected to a hydrostatic pressure tests. The duration of each pressure test shall be for a period of not less than two hours and not more than six hours. The basic provisions of AWWA C-600, Section 4 shall be followed for all pressure testing.

The test pressure shall not exceed pipe and/or thrust resistant design pressures. The test pressure shall not vary by more than plus or minus 5 psi for the duration of the test.

All newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing or 150 psig whichever is greater.

B. Pressurization

Each valve section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City / Utilities Superintendent. The pump pipe connection and all necessary apparatus, including gauges and meters shall be furnished by the Contractor. Before applying the specified test pressure, air shall be expelled completely from the test section. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at all points so that the air can be expelled as the section is filled with water. After all the air has been expelled, the corporation cocks shall all be closed and the test pressure applied. At the conclusion of the pressure test the corporation cocks shall be removed and plugged or left in place at the direction of the City / Utilities Superintendent.

Any exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants or joints that are discovered following the pressure test shall be repaired or replaced with sound material approved by the City / Utilities Superintendent and the test shall be repeated until it is satisfactory to the City / Utilities Superintendent.

C. Leakage Test

After the completion of the pressure test a leakage test shall be conducted to determine the quantity of water lost by leaking under the specified test pressure. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled.

Leakage shall not be measured by a drop in pressure in a test section over a period of time.

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

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

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = normal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

D. Acceptance

Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified, the Developer/Contractor shall at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance.

All visible leaks are to be repaired regardless of the amount of leakage. All flanged pipe shall be "bottle-tight".

If the section under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

E. Chlorination of Water Mains

1. Chlorination of New Water Mains: Before being placed in service, all new water distribution systems, or extensions to existing systems, or any valved section of such shall be chlorinated. Prior to chlorination, all dirt remaining in the pipe after completion shall be removed by a thorough flushing through the hydrants, where available, otherwise through other approved temporary connected to be provided by the Developer / Contractor for the purpose. This shall be done after the pressure test and may be done either before or after the trench has been backfilled. Each valved section of newly laid pipe shall be flushed independently. The flushing velocity shall be not less than 2.5 feet per second through the completed new main.

   A chlorine gas-water mixture shall be applied by means of a solution feed chlorinating device or where approved by the City / Utilities Superintendent a solution of calcium hypochlorite (H.T.H.) or Perchloron may be injected under low pressure.

The preferable point of application of the chlorinating agent shall be at the beginning of the pipe line extension, or any valved section of the pipe, and through a corporation stop inserted in the side of the newly laid pipe. The water inject for delivering the gas-water or calcium hypochlorite mixture into the pipe shall be supplied from a tap on the upstream side of the valve controlling the flow into the pipe line extensions.

Water from the existing distribution system or any completed extension of the system, entering the newly laid pipe line, shall be controlled to flow very slowly during the application of chlorine. The rate of chlorine gas-water mixture or calcium hypochlorite solution flow shall be in such proportion to the rate of water entering the pipe that the treated water flowing from the far end of the main contains at least forty to fifty parts per million (40 – 50 ppm) of chlorine residual. Back pressure, causing a reversal of flow in the pipe being treated shall be prevented. The chlorine solution shall remain in the pipe for at least twenty-four (24) hours. After the chlorine treated water has been retained for the required time, the chlorine residual at pipe extremities and at representative points shall be at least ten (10) parts per million. In the process of chlorinating newly laid water pipe involving more than one (1) valved section, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent.

Following chlorination, all treated water shall be thoroughly flushed to the sanitary sewer so the newly laid water pipe line at the extremities until the replacement water throughout the length shall, upon test, be proved comparable in quality to the water served the public from the existing water supply system. Samples of the water for tests shall be taken by or under the direction of the City and in accordance with methods of sampling as recommended by the State Board of Health. The bacteriological test shall be performed by the State Board of Health Laboratory or by a testing laboratory which is approved for bacteriological testing by the State Board of Health. The City's representative will send the samples to the State Laboratory, unless otherwise directed by the City.

At least two (2) sets of successive satisfactory bacteriological samples taken at twenty-four (24) hour intervals shall be obtained from the newly laid pipe lines and equipment before water is discharged through them to the existing system. The new piping shall be lightly flushed a second time prior to taking the second sample. Should the test of the second or last taken sample prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that water sampled from the newly laid pipe conforms to the requirement stated above.

When the bacteriological tests of the samples of water taken from the new mains prove to be satisfactory and before the new mains are placed in service, the City shall increase the chlorine dosage of the water being delivered to the entire distribution system as specified herein under the heading of “City’s Responsibility for Temporary Step-up of System Chlorination”.

2. Reconnection of Services: The reconnection of existing building services from existing water mains to new mains shall not be made until the water in the newly constructed mains has been disinfected and satisfactorily tested as specified herein under the heading of “Chlorination of New Water Mains”.

3. Chlorination Procedure When Cutting into Existing Mains: Under ideal trench and installation conditions with full time inspection by the City, the Developer / Contractor may be permitted to make cuts into existing pipe lines for the insertion of valves, fittings, repairs or for other purposes by the following procedure of disinfection: Sprinkle the inside surfaces of the appurtenances to be installed with a dry hypochlorite (or apply a hypochlorite slurry) and place a small quantity of the hypochlorite powder into the ends of the existing pipe on either side of the opening before the new pipe and fittings are installed.

   At the discretion of the Utilities Superintendent or the City and / or when the trench and installation conditions are not ideal for making the cuts into existing mains, the Developer / Contractor shall introduce the solution of chlorine or the suspension of hypochlorite into the isolated or valved-off sections of mains through a tap in the main to be made for this special purpose or through a fire hydrant when one is available in a suitable location.

   In either of the two (2) above procedures, the chlorine introduced should be in sufficient amount to insure a high concentration, forty to fifty parts per million (40 – 50 ppm), reaching every part of the isolated section of mains. The maximum permissible contact period shall be used after which the water bearing strong chlorine solution shall be flushed out of the isolated section of mains before they are returned to service.

   The Developer / Contractor shall schedule the making of all the project cut-in connections to existing mains as close together, time-wise, as is feasible. He shall notify the Water Works Superintendent at least seventy-two (72) hours in advance, so arrangements can be made for inspection of the work and so the City can step up the system chlorination and notify the affected water customers.

All water customers who will be affected by the isolated section of mains for the purpose of making the cut-in connections and disinfection should be given advanced notification by the Water Works Department if possible through the local newspaper or by personal notice to each customer.

4. City's Responsibility for Temporary Sep-Up of System Chlorination: At least eight (8) hours prior to the making of cuts into existing pipe lines for the insertion of valves, fittings, repairs and the connection of new mains to existing mains and prior to the placing of newly constructed water mains into service, the City will increase the chlorine dosage of the water supply to the system to effect a free chlorine residual of at least 0.5 ppm, or a combined available chlorine residual of at least 1.0 ppm. The said chlorine residual shall be maintained by the City for a sufficient period of time to establish a record of satisfactory bacteriological quality of the water throughout the distribution system. After at least two (2) successive sets of satisfactory bacteriological samples of water have been taken from the system at approximate twenty-four (24) hour intervals, the stepped-up chlorination may be cut back to the normal dosage.

F. Sampling

1. The City of Plymouth Water department shall determine the number and location of sampling points to be used. The Water Department shall be responsible for collection and testing of bacteria samples required. In no instance shall a fire hydrant be used for sampling.

2. Any additional work or materials needed to achieve satisfactory test results shall be provided by the contractor.

9.04 Fire Hydrant Testing

Hydrants shall be flushed and flow / pressure tested after installation. Contractor shall submit test results to the City.

9.05 Documentation. Dedication and Acceptance Procedures

A. Documentation Requirements

In order for the City Council to accept dedicated facilities, the following items shall be completed and on file:

1. Copies of all testing reports and data;
2. Copies of all O&M Manuals (if applicable);
3. Pump manufacturer's certification letter (if applicable);
4. Final payment for inspection services;
5. Service line location forms;
6. As-built drawings;
7. Performance and / or maintenance bonds (if required);
8. Daily inspection reports;

9. Legal description of the laid to be dedicated to the City; and
10. A written statement of facilities present on those lands. The written statement shall include:

    a Identification of the type and nature of facilities present
    b Dimensions of the facilities present
    c Totals for each type of facility present (example: 1,000 ft. of water main, 34 service connection, 1 booster station, etc.)

B. Dedication

The City shall review the above mentioned requirements and prepare a document stating that the work has been completed, the requirements have been met, and all items are in proper form. The City shall include in the statement a recommendation on acceptance / denial of the facilities and may also include comments regarding the project. The City shall present to the City Council its findings in a public meeting for their consideration.

C. Acceptance

The City Council shall receive the recommendation from the City representative, and upon review by the City Attorney and Mayor, shall make a determination as to acceptance of the facilities. A majority approval of the Council members present at the meeting is required for acceptance. The City Council shall accept dedicated facilities by resolution.

SECTION 10

CITY CHECKLISTS

SECTION 10
CITY CHECKLISTS

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Certificate of Substantial Completion.....10- 5

CITY OF PLYMOUTH

WATER PROJECTS
PROCEDURES FOR CONSTRUCTION (CHECK LIST)

Date Received/ Requested	Date Appr. / Sent	
		PROJECT NO.:_____
		PROJECT NAME:_____

_____ _____ 1. Developer submits three (3) sets of preliminary plans of proposed development/project with estimated capacity demand for water to 900 Oakhill Avenue Plymouth, IN 46563 for preliminary review and response. These plans shall contain the following information:

A. Schematic of the proposed system.
B. Total number of lots.
C. Projected flow rate.
D. Point of connection to the existing system.

Plans will be forwarded to the Utilities Superintendent for approval. Once approved, the Superintendent will notify the Plan Commission of its decision.

_____ _____ 2. Developer submits three (3) sets of **final** construction plans, construction permit application, and contract application to 900 Oakhill Ave. Plymouth, IN 46563.

_____ _____ 3. Utilities Superintendent will forward construction plans and permit application to the City's Engineer for review, and application for a contract to the City's Attorney if applicable.

_____ _____ 4. Utilities Superintendent will confer with IDEM that a "Notice of Intent" has been filed.

_____ _____ 5. City's Engineer and/or Utilities Superintendent will review the plans and permit application for completeness, conformance with the City standards, and evaluate whether the existing distribution system can accommodate the water demands by this project. The City's Engineer will request the developer's engineer to make any needed changes in the plans.

_____ _____ 6. The Utilities Superintendent will recommend (not recommend) approval of the plans for construction to the Common Council.

_____ _____ 7. Water contract (if applicable) is executed by City and Developer and recorded by the City. City approves issuance of construction permit.

Date Received/ Requested	Date Appr. / Sent		
_____	_____	8.	Developer transmits bond and insurance certificate.
_____	_____	9.	The developer receives Construction Permit from the City.
_____	_____	10.	The City of Plymouth will notify IDEM that a construction permit was issued if required.
_____	_____	11.	Utilities Superintendent notifies City engineer that project is ready for construction inspection.
_____	_____	12.	The developer's contractor begins construction by notifying the City at least 48 hours in advance of beginning work and on a daily basis during construction so location of existing taps or the location of the City's utilities can be made.
_____	_____	13.	The water system is pressure tested and bacteria tested. Manholes are vacuum tested.
_____	_____	14.	The developer's engineer submits two (2) sets of proposed record drawings (as-built) and any easements required to the City's Engineer for review.
_____	_____	15.	The City or its representative prepares a punch list for the project.
_____	_____	16.	The developer's contractor/engineer completes punch list.
_____	_____	17.	The City or its representative re-inspects the project.
_____	_____	18.	The developer's engineer submits three (3) sets of prints and one (1) set of reproducible mylars of the approved record drawings for the City's files. As-built drawings shall also be submitted on 3 ½" computer disk or compact disk in either vector format (DWG, DXF files) or Portable Document File format (PDF files).
_____	_____	19.	The City's Engineer recommends approval for acceptance for maintenance to the Plymouth City Council.
_____	_____	20.	All easements are accepted and recorded by the Developer with notice provide to the City of Plymouth.
_____	_____	21.	The City Council approves the sewer system for acceptance for maintenance and issues a Letter of Acceptance to the Developer.

CITY OF PLYMOUTH
PLAN & SPECIFICATION REVIEW CHECKLIST

NAME OF PROJECT:_____

DESIGN ENGINEER:_____

I. Completeness and Conformance with City Standards

A. Water Main
1. Pipe Material and Installation ..... _____
2. Valve Material and Installation..... _____
3. Hydrant Material and Installation ..... _____
4. Pipe Size: 6-Inch Min. (10-States)..... _____
5. Depth: 5' Min. to Top of Pipe ..... _____
6. Pipe Bedding & Backfill Materials & Construction ..... _____
7. Specs Complete ..... _____
8. Details Complete ..... _____
9. Air/Vacuum Release Stations..... _____

B. Services
1. Wyes Connected to Sewer, Not Manholes..... _____
2. Meter Connection Requirements (See Specs) ..... _____
3. Tap Size: 1" Minimum for Single Family..... _____
4. Taps Provided for All Lots ..... _____
5. Pipe Material..... _____
6. Service Locations, Length Indicated on Plans..... _____
7. Details Complete ..... _____
8. Specs Complete ..... _____

C. Connections to Existing Mains
1. Details of Connections..... _____
2. Existing Mains Sizes & Materials Indicated ..... _____
3. Compare Existing Mains to City Sewer Map ..... _____

D. Other Utility Conflicts
1. Horizontal Separation of 10' Min. To Water Lines ..... _____
2. Vertical Separation of 18" to Water Lines..... _____
3. Horizontal & Vertical Separation between Other Utilities ..... _____

E. Miscellaneous
1. Easement Widths: 12' up to 10' Deep, 2' More for Every 1' Deeper..... _____
2. Engineer's Seal & Signature..... _____
3. Page Numbers, Set Complete..... _____
4. Specs Complete ..... _____
5. North Arrow on Each Sheet..... _____
6. Benchmark Indicated on Plans..... _____
7. Scale Indicated on Plans..... _____
8. Roads Labeled ..... _____
9. Contours Labeled ..... _____

10. Existing & Final Grade Shown on Profiles ..... _____
11. Check Additional Notes, Details, Spec. Sections ..... _____

III. Cost Estimate

PLAN REVIEW DATE:
LETTER SENT:
PLANS RESUBMITTED:
APPROVAL DATE:

CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER's Project No.: _____.....
ENGINEER's Project No.: _____

Project: _____

CONTRACTOR: _____

Contract for: City of Plymouth……..
Contract Date: _____

This Certificate of Substantial Completion applies to all Work under the Contract Documents, or to the following specified parts thereof:

To: City of Plymouth, Indiana
OWNER

And To: _____
CONTRACTOR

The work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR, and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

_____
DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all

the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR with ___ days of the above date of Substantial Completion.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as follows:

RESPONSIBILITIES:

OWNER: _____

CONTRACTOR: _____

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER ON _____, 20___

_____
ENGINEER

BY: _____

CONTRACTOR accepts this Certificate of Substantial Completion on _____, 20___

_____
CONTRACTOR

BY: _____

OWNER accepts this Certificate of Substantial Completion on _____, 20___

_____
OWNER

BY: _____

APPENDIX "A"

STANDARD

DETAILS

CITY OF PLYMOUTH, INDIANA
WATER DEPARTMENT CONSTRUCTION STANDARDS

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4. Service Line, Curb Box & Interior Meter Installation for 3/4" & 1" Meter
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7. Restrained Joints Installation Details
8. Restrained Pipe – Minimum Footage Details
9. Standard Hydrant Installation Detail
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11. Hydrant Installation – Section View
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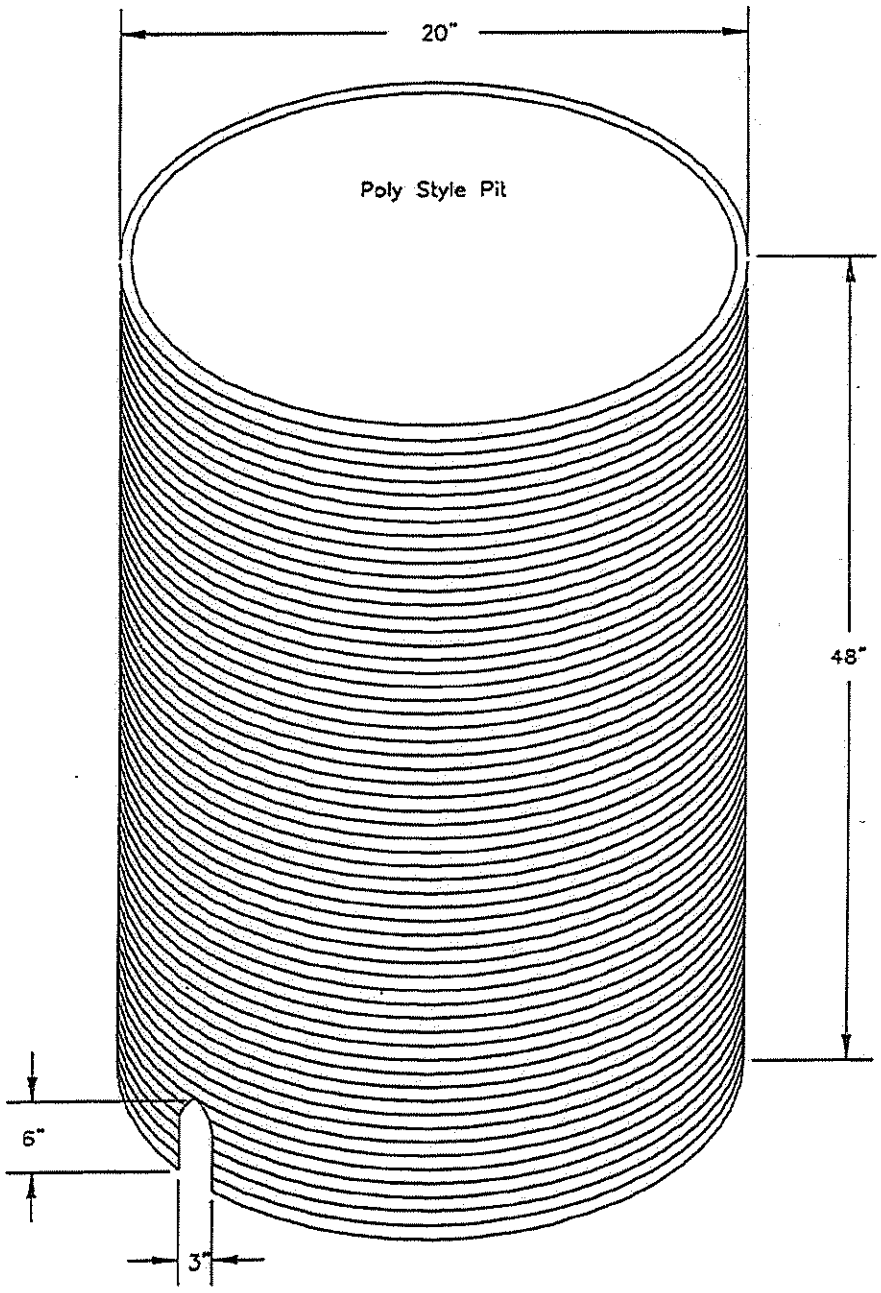
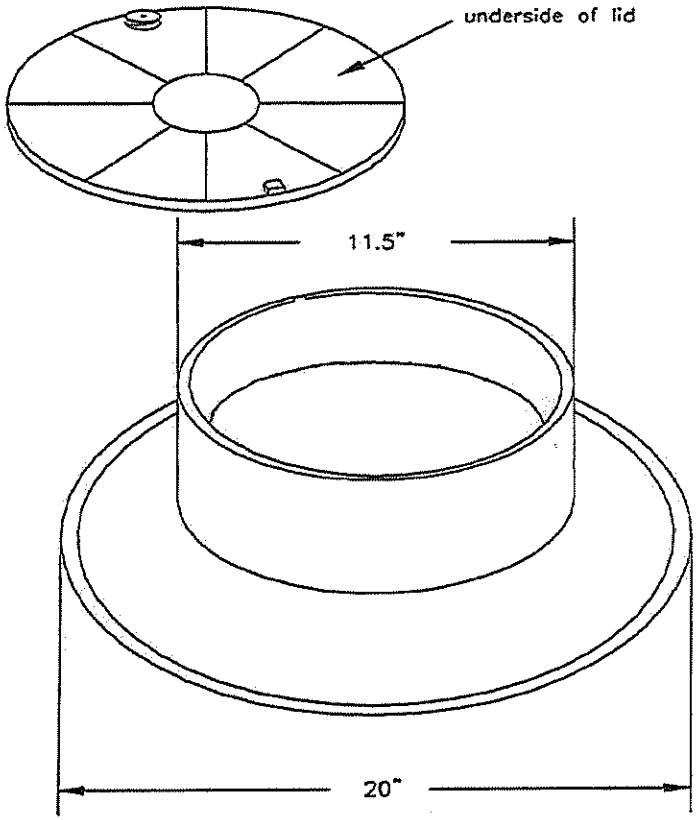
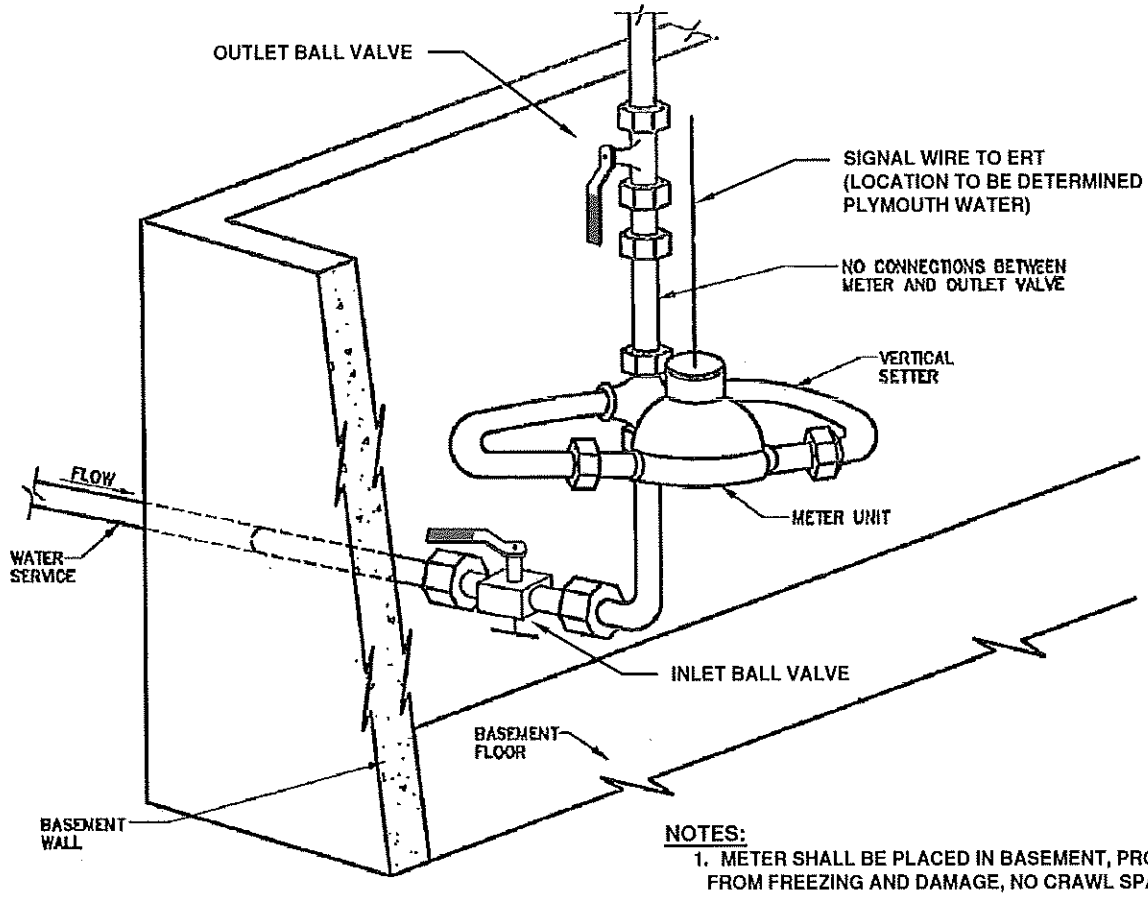
29. Double Installation Backflow Preventer Detail
30. Casing Checks & End Seals Details
31. Open Cut Crossing Under Conflicting Utility
32. Minimum Protection Details for Bulk Tankers



Wabash Double Lid Cover



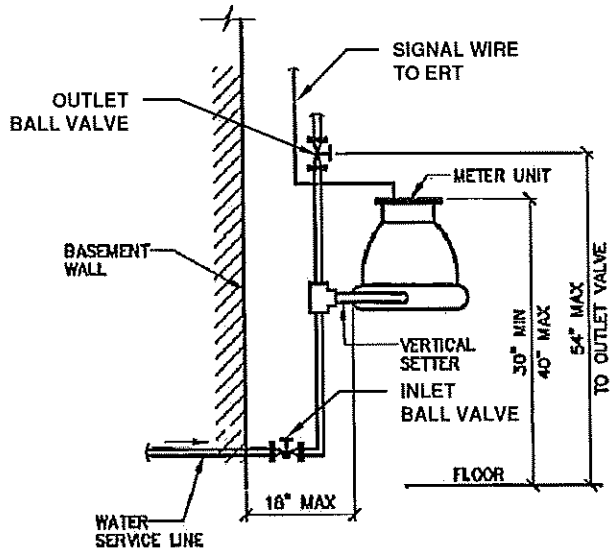
City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
5/8" x 3/4" & 1" Pit & Lid		NO:	1



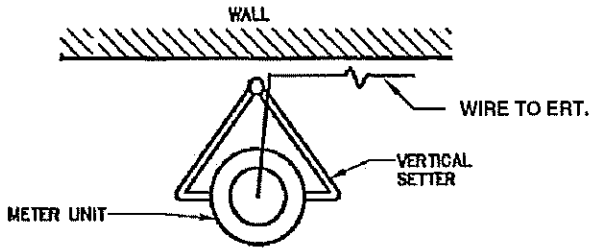
ISOMETRIC VIEW

NOTES:

1. METER SHALL BE PLACED IN BASEMENT, PROTECTED FROM FREEZING AND DAMAGE, NO CRAWL SPACES.
2. NO CONNECTIONS ARE PERMITTED BEFORE THE METER OUTLET VALVE EXCEPT AS SHOWN ON THIS DRAWING.
3. METERS REQUIRE ELECTRONIC DIGITAL ENCODER REGISTER OR MECHANICALLY ENCODED REGISTER WITH REMOTE ERT AND 10 FT. OF SIGNAL CABLE. ERT IS NORMALLY LOCATED NEAR BASEMENT CEILING AT WALL FACING STREET. BUT MAY BE MOUNTED ON OUTSIDE OF BUILDING.

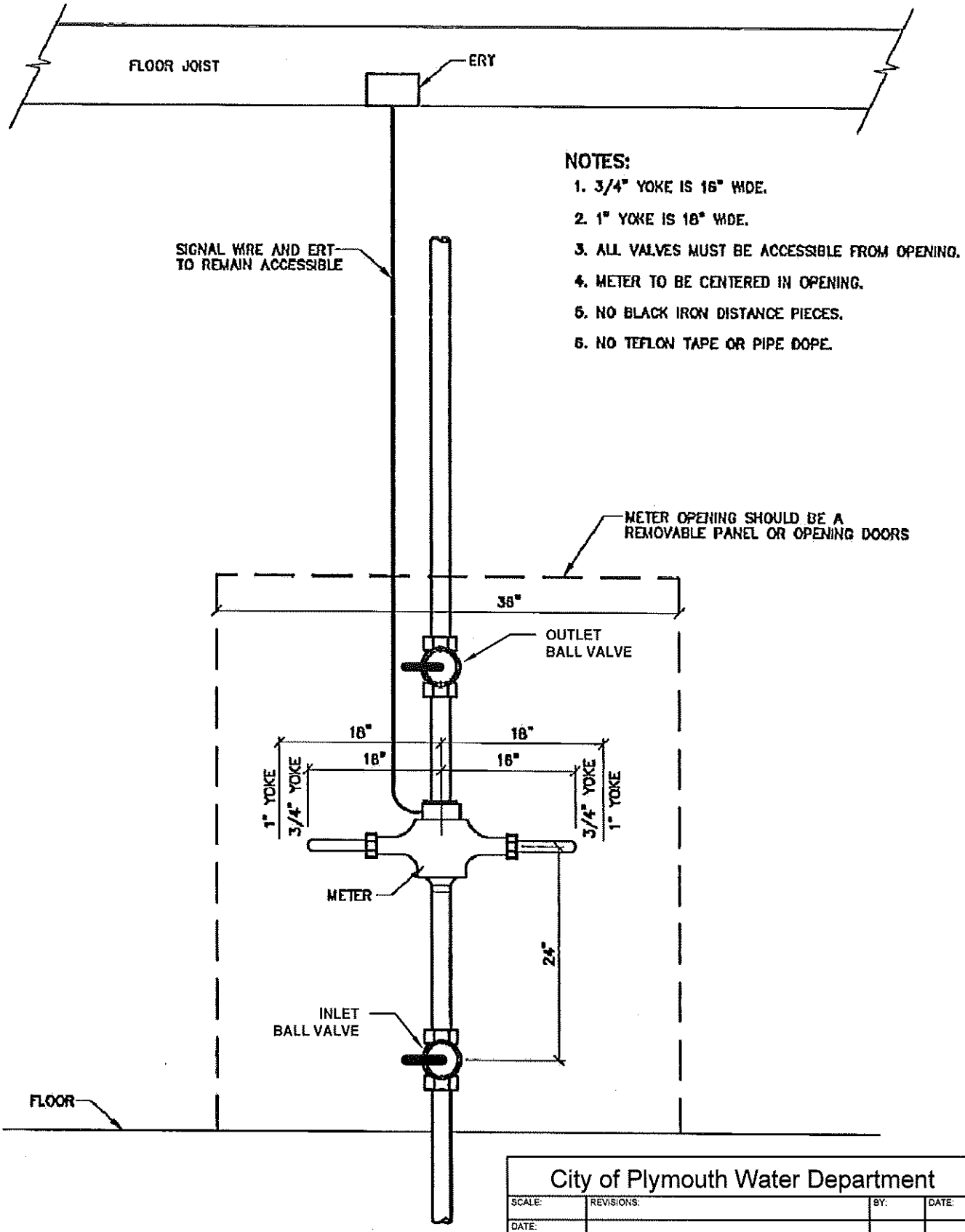


ELEVATION



PLAN

City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPVD BY:			
INTERIOR SETTING FOR $\frac{5}{8}$", $\frac{3}{4}$", & 1"METER WITH AMR		NO:	2



NOTES:

1. 3/4" YOKE IS 16" WIDE.
2. 1" YOKE IS 18" WIDE.
3. ALL VALVES MUST BE ACCESSIBLE FROM OPENING.
4. METER TO BE CENTERED IN OPENING.
5. NO BLACK IRON DISTANCE PIECES.
6. NO TEFLON TAPE OR PIPE DOPE.

City of Plymouth Water Department

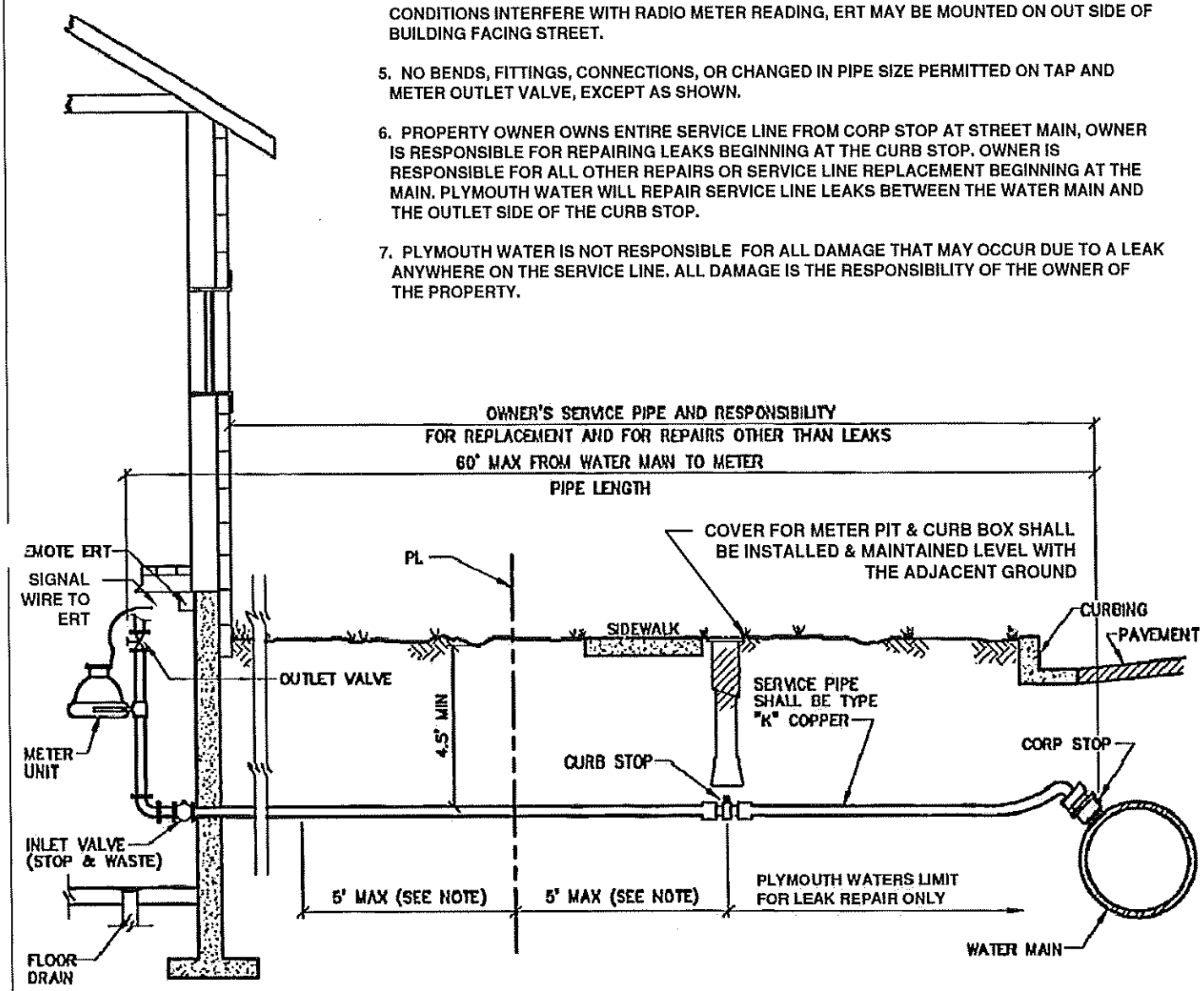
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

INTERIOR SETTING FOR $\frac{5}{8}$", $\frac{3}{4}$" & 1" METER WITH AMR-WALL SECTION

NO: 3

NOTES:

1. PLACE STOP BOX WITHIN 5 FT. EITHER SIDE OF PL. PLACEMENT OUTSIDE PL. IS PREFERRED.
2. INDOOR METER SETTING IS PERMITTED ONLY IF TOTAL LENGTH OF SERVICE PIPE DOES NOT EXCEED 60 FT. FROM MAIN TO METER SETTING.
3. INDOOR METER SHALL BE PLACED IN BASEMENT.
4. REMOTE ERT WILL BE MOUNTED BY PLYMOUTH WATER AT TIME METER IS SET. ERT IS USUALLY LOCATED NEAR BASEMENT CEILING ON OUTSIDE WALL FACING STREET. IF CONDITIONS INTERFERE WITH RADIO METER READING, ERT MAY BE MOUNTED ON OUT SIDE OF BUILDING FACING STREET.
5. NO BENDS, FITTINGS, CONNECTIONS, OR CHANGED IN PIPE SIZE PERMITTED ON TAP AND METER OUTLET VALVE, EXCEPT AS SHOWN.
6. PROPERTY OWNER OWNS ENTIRE SERVICE LINE FROM CORP STOP AT STREET MAIN, OWNER IS RESPONSIBLE FOR REPAIRING LEAKS BEGINNING AT THE CURB STOP. OWNER IS RESPONSIBLE FOR ALL OTHER REPAIRS OR SERVICE LINE REPLACEMENT BEGINNING AT THE MAIN. PLYMOUTH WATER WILL REPAIR SERVICE LINE LEAKS BETWEEN THE WATER MAIN AND THE OUTLET SIDE OF THE CURB STOP.
7. PLYMOUTH WATER IS NOT RESPONSIBLE FOR ALL DAMAGE THAT MAY OCCUR DUE TO A LEAK ANYWHERE ON THE SERVICE LINE. ALL DAMAGE IS THE RESPONSIBILITY OF THE OWNER OF THE PROPERTY.



ANY VARIATION FROM THIS STANDARD REQUIRES APPROVAL PRIOR TO INSTALLATION FROM PLYMOUTH WATER.

City of Plymouth Water Department

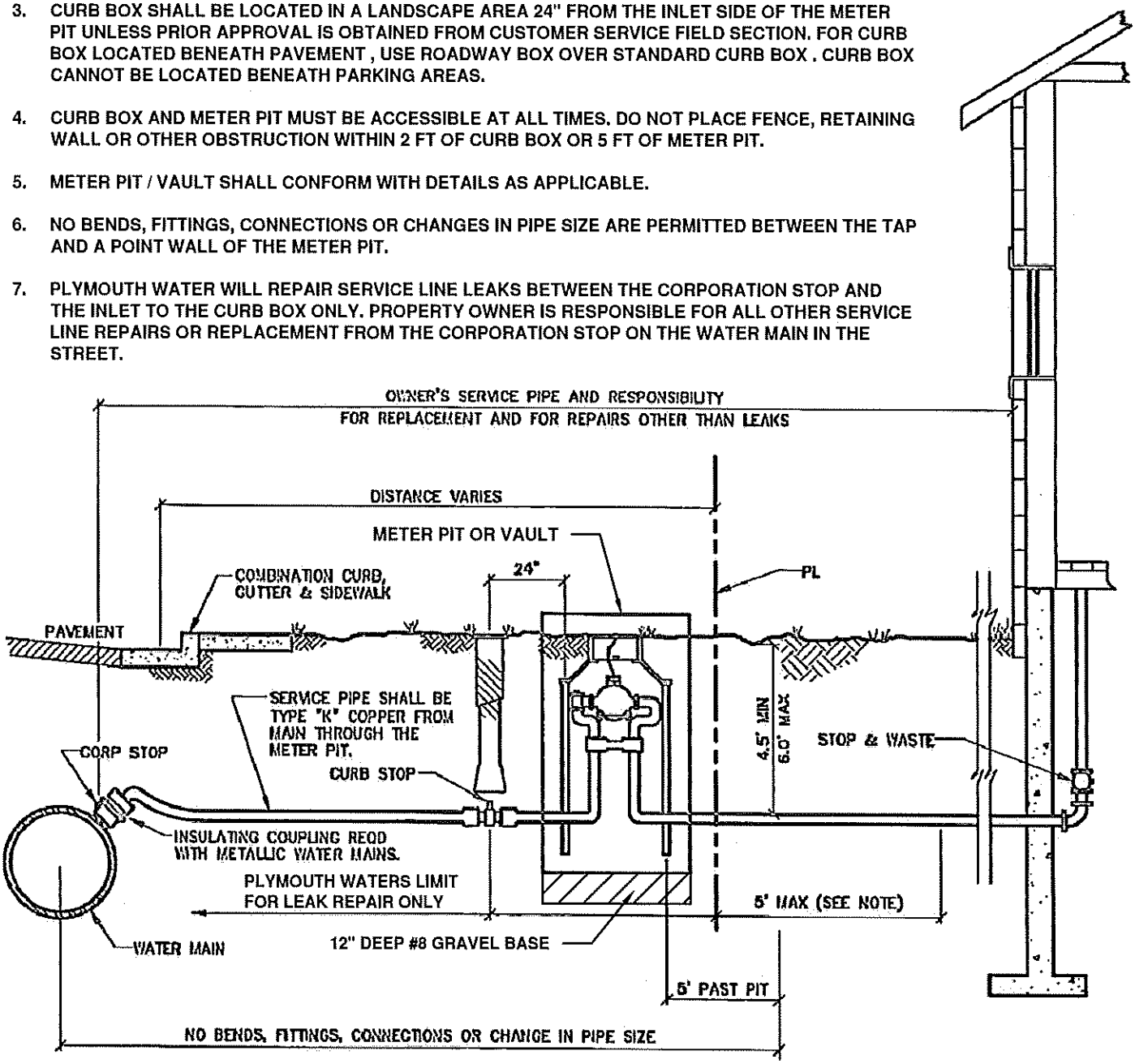
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPVD BY:			

SERVICE LINE CURB BOX & INTERIOR METER INSTALLATION FOR $\frac{5}{8}$", $\frac{3}{4}$" & 1" METER

NO: 4

NOTES

1. PLACEMENT OF CURB BOX CAN VARY FROM A MIN OF 3 FT OUTSIDE THE PL TO A MAX OF 5 FT INSIDE THE PL. PLACEMENT OF THE CURB BOX IN THE PUBLIC ROW IS PREFERRED.
2. IF THERE IS A TREE LAWN, BOTH CURB BOX AND METER PIT SHOULD BE LOCATED BETWEEN CURB AND SIDEWALK.
3. CURB BOX SHALL BE LOCATED IN A LANDSCAPE AREA 24" FROM THE INLET SIDE OF THE METER PIT UNLESS PRIOR APPROVAL IS OBTAINED FROM CUSTOMER SERVICE FIELD SECTION. FOR CURB BOX LOCATED BENEATH PAVEMENT , USE ROADWAY BOX OVER STANDARD CURB BOX . CURB BOX CANNOT BE LOCATED BENEATH PARKING AREAS.
4. CURB BOX AND METER PIT MUST BE ACCESSIBLE AT ALL TIMES. DO NOT PLACE FENCE, RETAINING WALL OR OTHER OBSTRUCTION WITHIN 2 FT OF CURB BOX OR 5 FT OF METER PIT.
5. METER PIT / VAULT SHALL CONFORM WITH DETAILS AS APPLICABLE.
6. NO BENDS, FITTINGS, CONNECTIONS OR CHANGES IN PIPE SIZE ARE PERMITTED BETWEEN THE TAP AND A POINT WALL OF THE METER PIT.
7. PLYMOUTH WATER WILL REPAIR SERVICE LINE LEAKS BETWEEN THE CORPORATION STOP AND THE INLET TO THE CURB BOX ONLY. PROPERTY OWNER IS RESPONSIBLE FOR ALL OTHER SERVICE LINE REPAIRS OR REPLACEMENT FROM THE CORPORATION STOP ON THE WATER MAIN IN THE STREET.



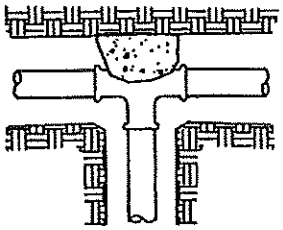
ANY VARIATION FROM THIS STANDARD REQUIRES APPROVAL PRIOR TO INSTALLATION FROM PLYMOUTH WATER

City of Plymouth Water Department

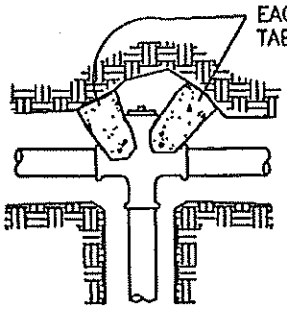
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

SERVICE LINE CURB BOX & EXTERIOR METER INSTALLATION

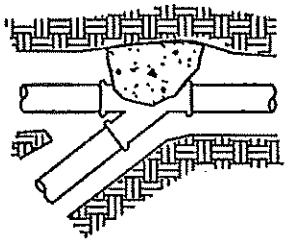
NO: 5



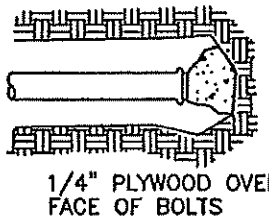
TEE



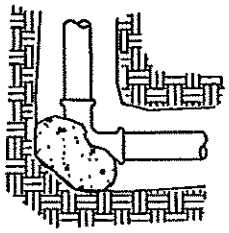
PLUGGED CROSS



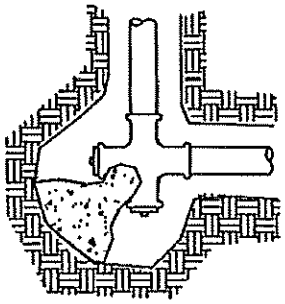
WYE



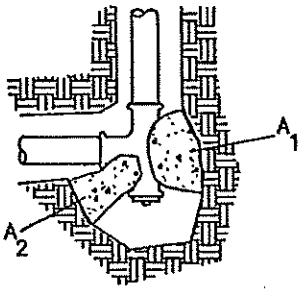
PLUG OR CAP



BEND



PLUGGED CROSS



PLUGGED TEE

1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED SOIL.
2. KEEP CONCRETE CLEAR OF JOINTS AND ACCESSORIES.
3. IF NOT SHOWN ON PLANS, REQUIRED BEARING AREAS AT FITTING SHALL BE AS INDICATED BELOW, ADJUSTED IF NECESSARY, TO CONFORM TO THE TEST PRESSURES AND ALLOWABLE SOIL BEARING STRESSES STATED IN THE SPECIAL SPECIFICATIONS.
4. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS STANDARD DETAIL.
5. ALL CONCRETE SHALL BE 3000 PSI AT 14 DAYS.

BEARING AREA OF THRUST BLOCKS IN SQUARE FEET

FITTING SIZE	TEE, WYE, PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN A_1	TEE PLUGGED ON RUN A_2	45° BEND	22-1/2° BEND	11-1/4° BEND
4	1.0	1.4	1.9	1.4	1.0	1.0	1.0
6	2.1	3.0	4.3	3.0	1.6	1.0	1.0
8	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10	5.9	8.4	11.8	8.4	4.6	2.4	1.2
12	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16	15.0	21.3	30.0	21.3	11.6	6.0	3.0
18	19.0	27.0	38.0	27.0	14.6	7.6	3.8
20	23.5	33.3	47.0	33.3	18.1	9.4	4.7
24	34.0	48.0	68.0	48.0	26.2	13.6	6.8

ABOVE BEARING AREAS BASED ON TEST PRESSURE OF 150 p.s.i. AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE THE FOLLOWING EQUATION: BEARING AREA = (TEST PRESSURE/150) X (2000/SOIL BEARING STRESS) X (TABLE VALUE)

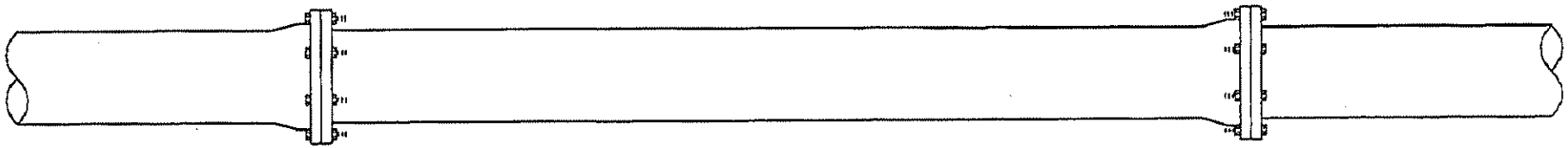
City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPVD BY:			

THRUST BLOCKING DETAILS

NO: 6

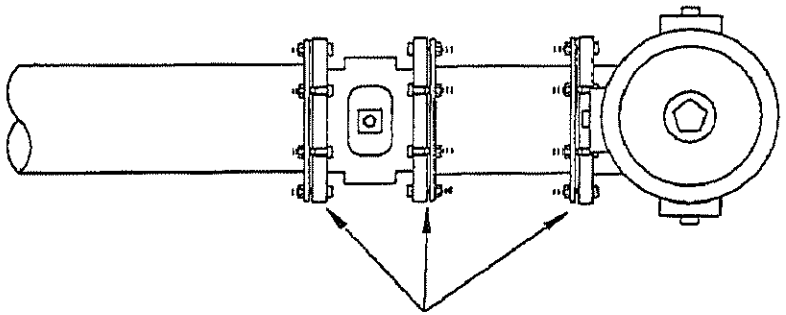
RESTRAINED JOINTS ON STANDARD MJ PIPE



typical m.j. fittings
joints restrained by a mega-lug flange or grip ring.

typical m.j. fittings
joints restrained by a mega-lug flange or grip ring.

ANCHOR COUPLING (TIE BACK) OR PLAIN END PIPE WITH MEGA-LUG OR GRIP RINGS



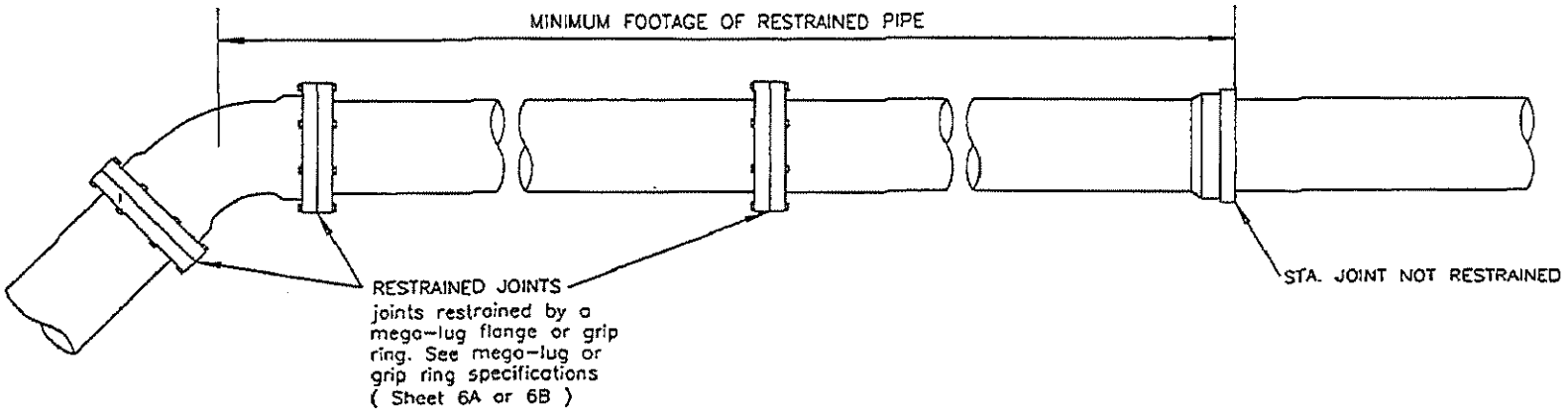
typical m.j. fittings
joints restrained by a mega-lug flange or grip ring.

City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

RESTRAINED JOINTS INSTALLATION DETAILS

NO: 7



COVER / MAIN DIA.	DEGREE OF ELBOW											
	11 1/4 DEGREE			22 1/2 DEGREE			45 DEGREE			90 OR DEAD END		
	4'	5'	8'	4'	5'	8'	4'	5'	8'	4'	5'	8'
4 INCH PIPE	–	–	–	–	–	–	3	3	2	10	8	5
6 INCH PIPE	–	–	–	2	–	–	5	4	2	14	12	7
8 INCH PIPE	–	–	–	2	2	–	6	5	3	20	16	10
10 INCH PIPE	–	–	–	3	2	1	8	7	4	28	22	14
12 INCH PIPE	–	–	–	3	3	2	12	9	6	39	30	19
16 INCH PIPE	2	1	–	5	4	3	17	14	9	58	47	30
20 INCH PIPE	2	2	–	6	5	3	22	18	12	75	62	40
24 INCH PIPE	3	2	–	7	6	4	26	22	14	88	73	47
30 INCH PIPE	3	2	–	9	7	5	29	26	18	104	86	57
36 INCH PIPE	3	3	–	11	9	6	39	34	21	128	111	70
42 INCH PIPE	3	3	–	12	10	7	42	35	24	139	116	78
48 INCH PIPE	4	3	–	13	11	7	47	39	26	155	129	86
54 INCH PIPE			–			8			30			98

MINIMUM FOOTAGE OF RESTRAINED PIPE FOR VARIOUS DIAMETER & DEGREES DUCTILE IRON ELBOWS

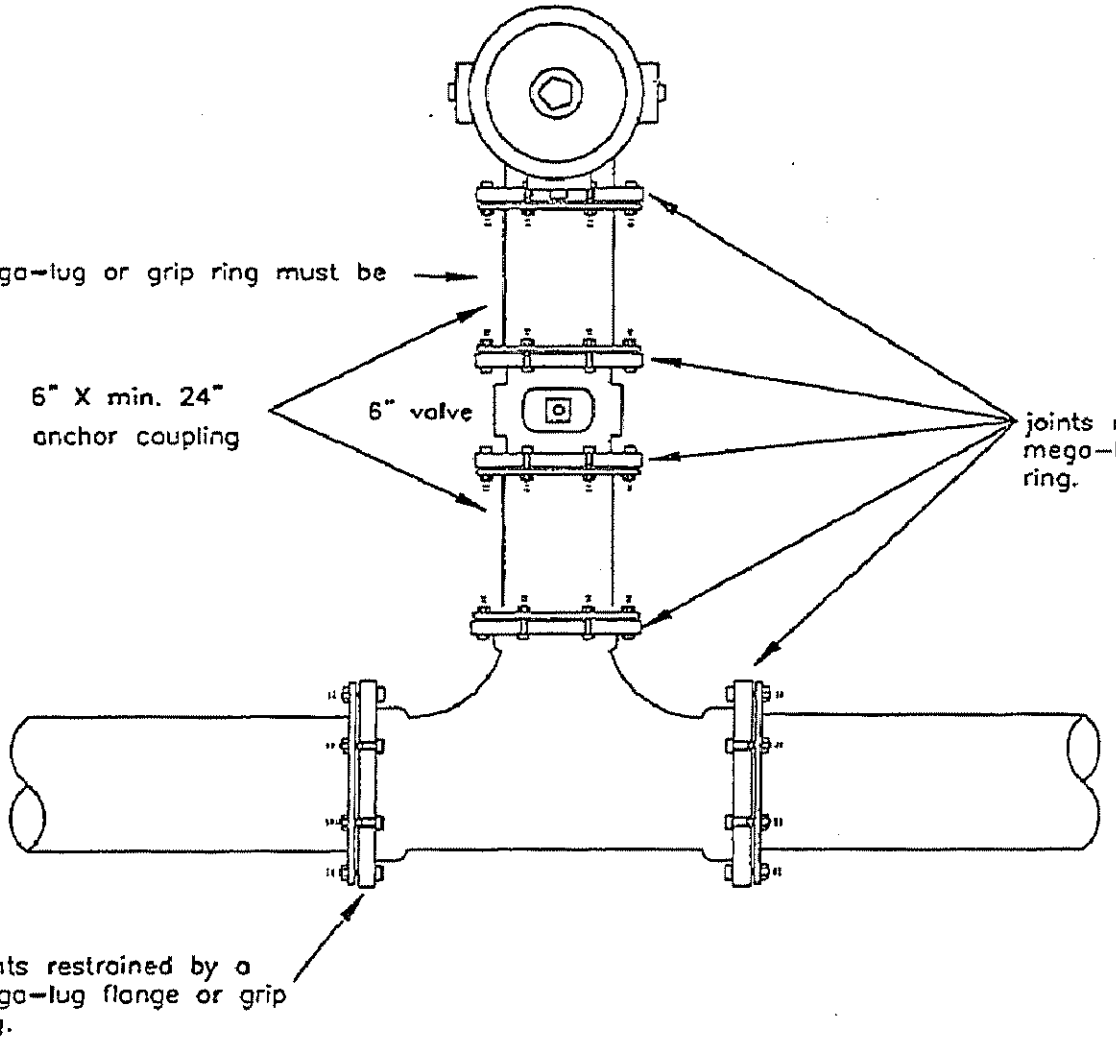
City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

RESTRAINED PIPE - MINIMUM FOOTAGE DETAILS

NO: 8

If longer than 24" lead, a mega-lug or grip ring must be used on both joints.



Note:
This arrangement can be used on all sizes of water main.

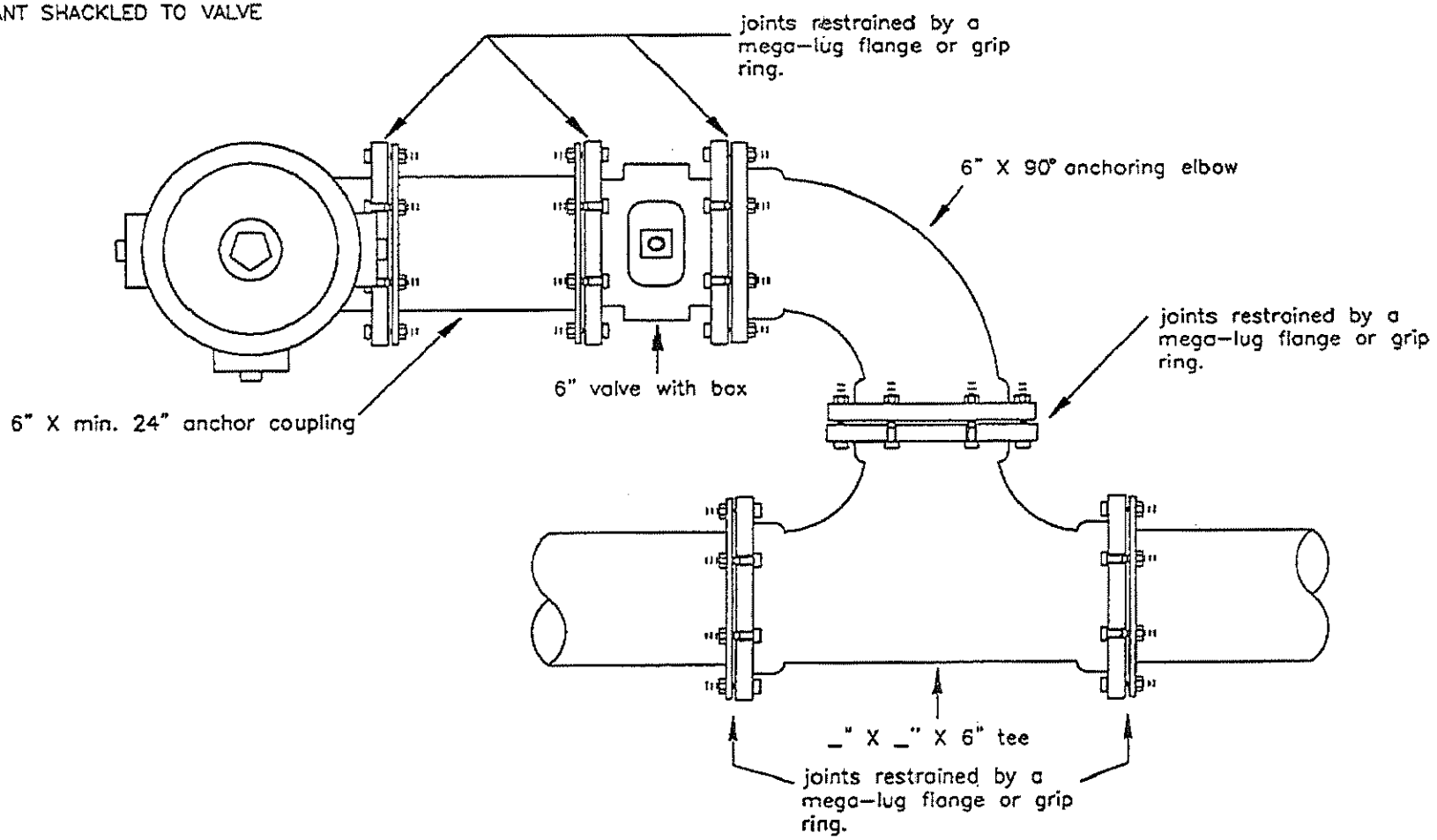
City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

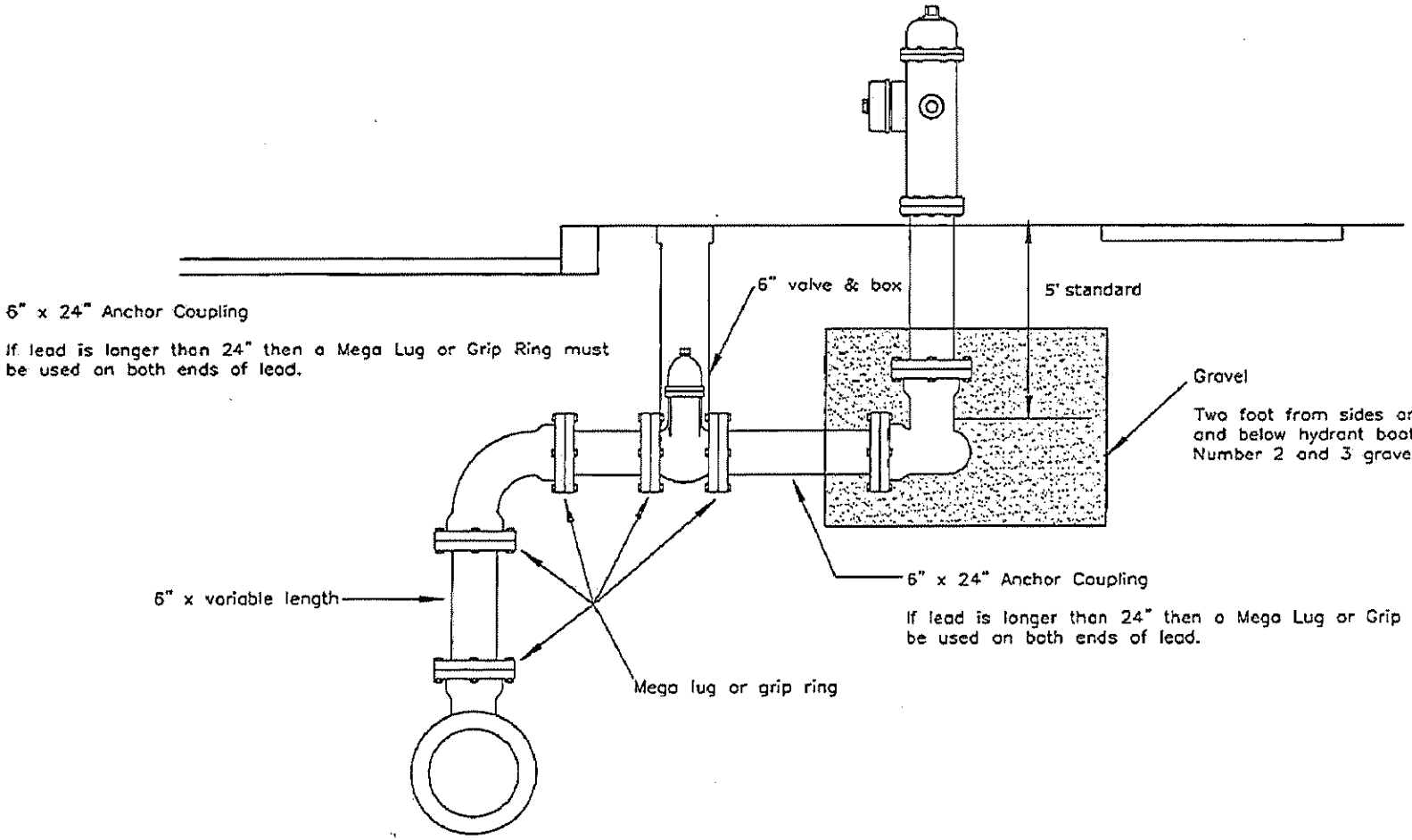
STANDARD HYDRANT INSTALLATION DETAILS

NO: 9

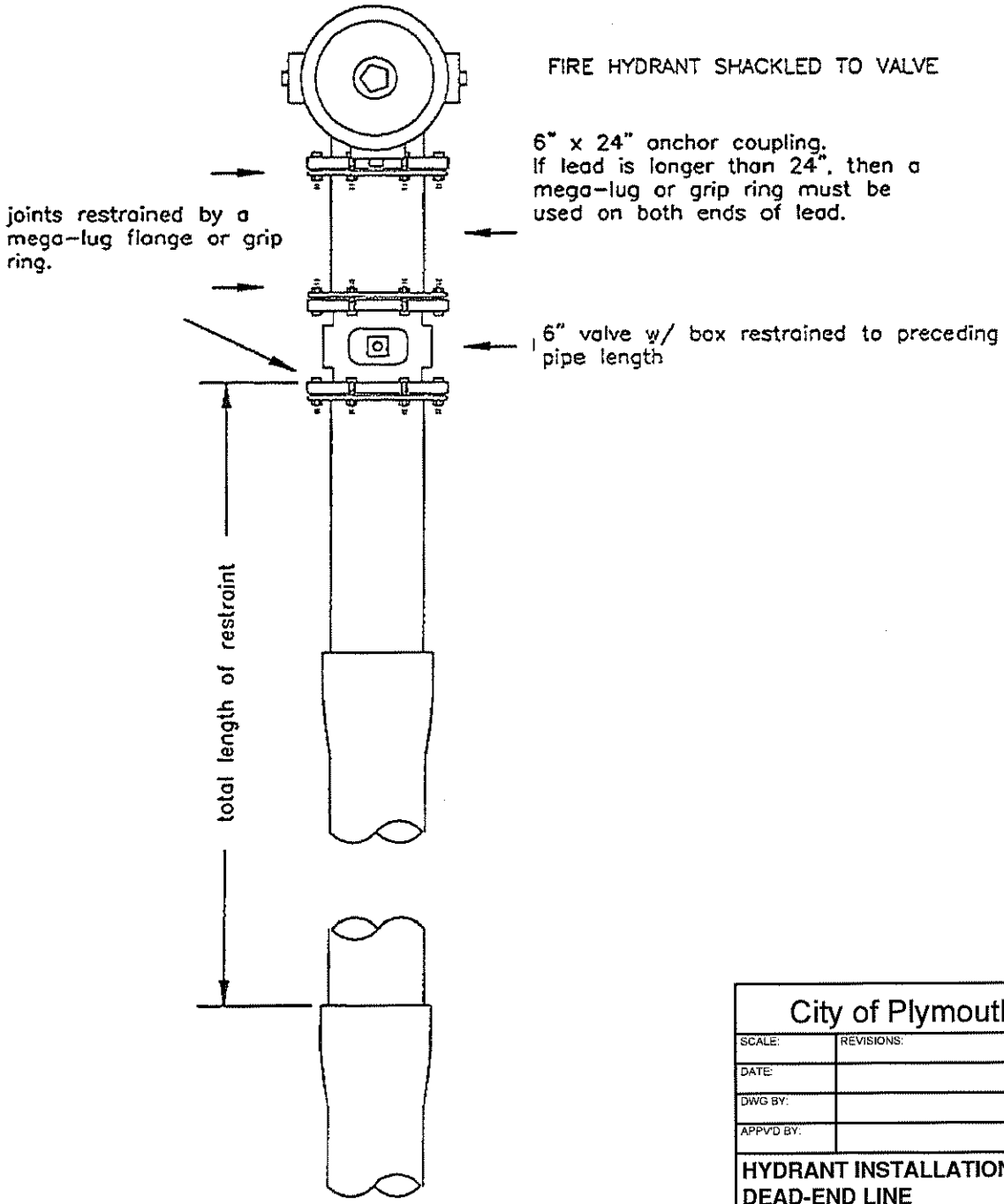
FIRE HYDRANT SHACKLED TO VALVE



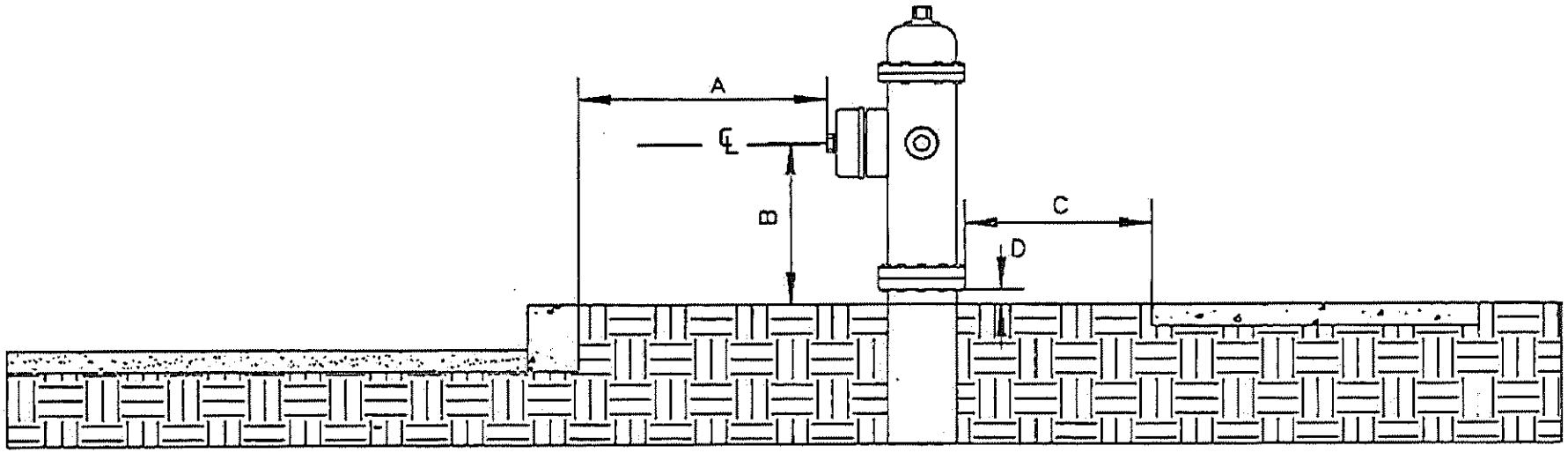
City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
LIMITED SPACE HYDRANT INSTALLATION DETAIL		NO:	**10**



City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
HYDRANT INSTALLATION SECTION VIEW		NO:	**11**



City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
HYDRANT INSTALLATION ON DEAD-END LINE		NO:	12



A. PUMPER NOZZLE MUST BE 36" BACK OF CURB.

B. PUMPER NOZZLE MINIMUM OF 18" C/L ABOVE GROUND LINE.

C. NO PART OF HYDRANT CAN BE CLOSER THAN 6" TO EDGE OD SIDEWALK.

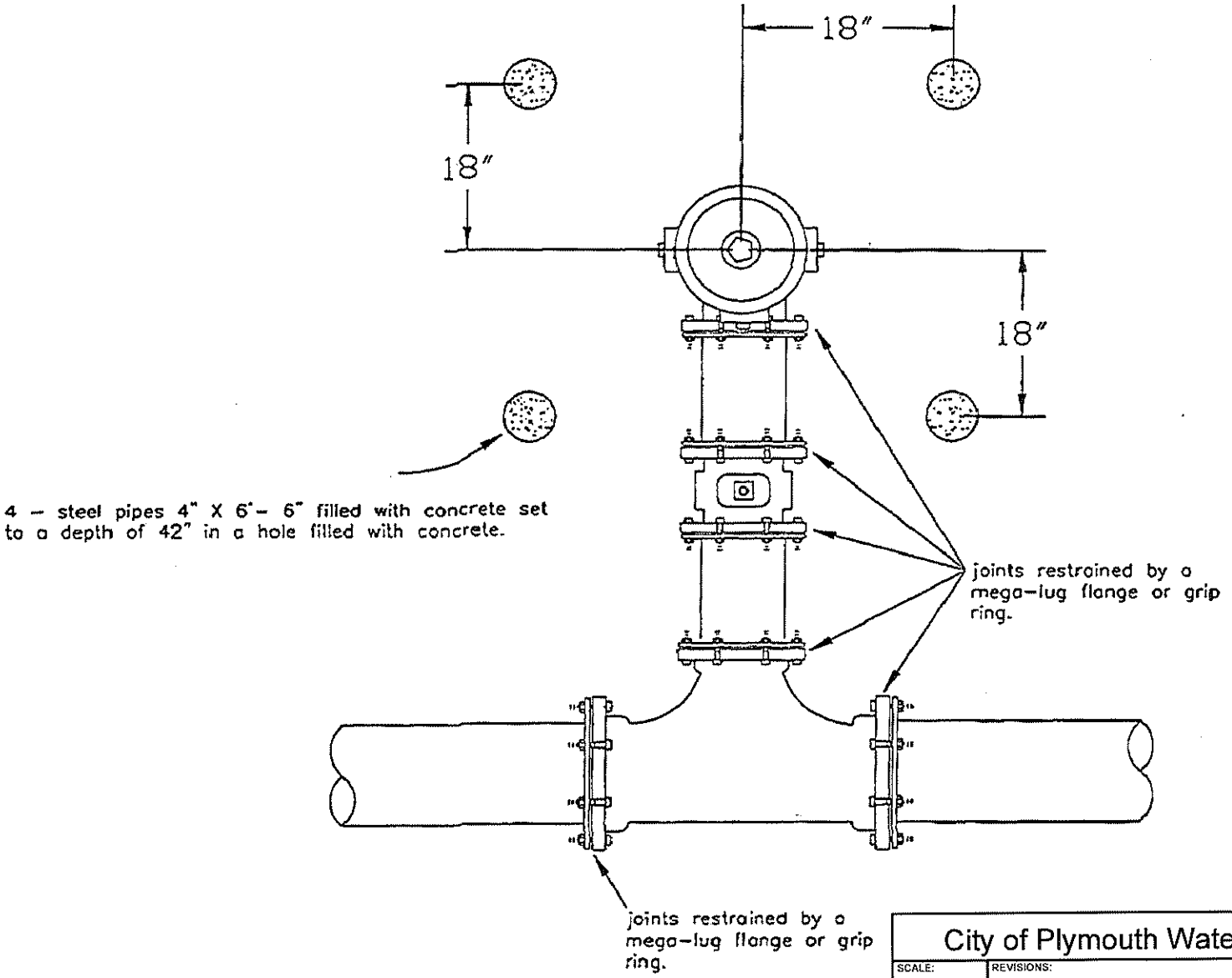
D. HYDRANT MUST BE NO LESS THAN 2" AND NO MORE THAN 8" ABOVE GRADE TO FLANGE OR GROUND LINE MARK ON HYDRANT.

City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

HYDRANT DIMENSIONS FROM GRADE

NO: 13



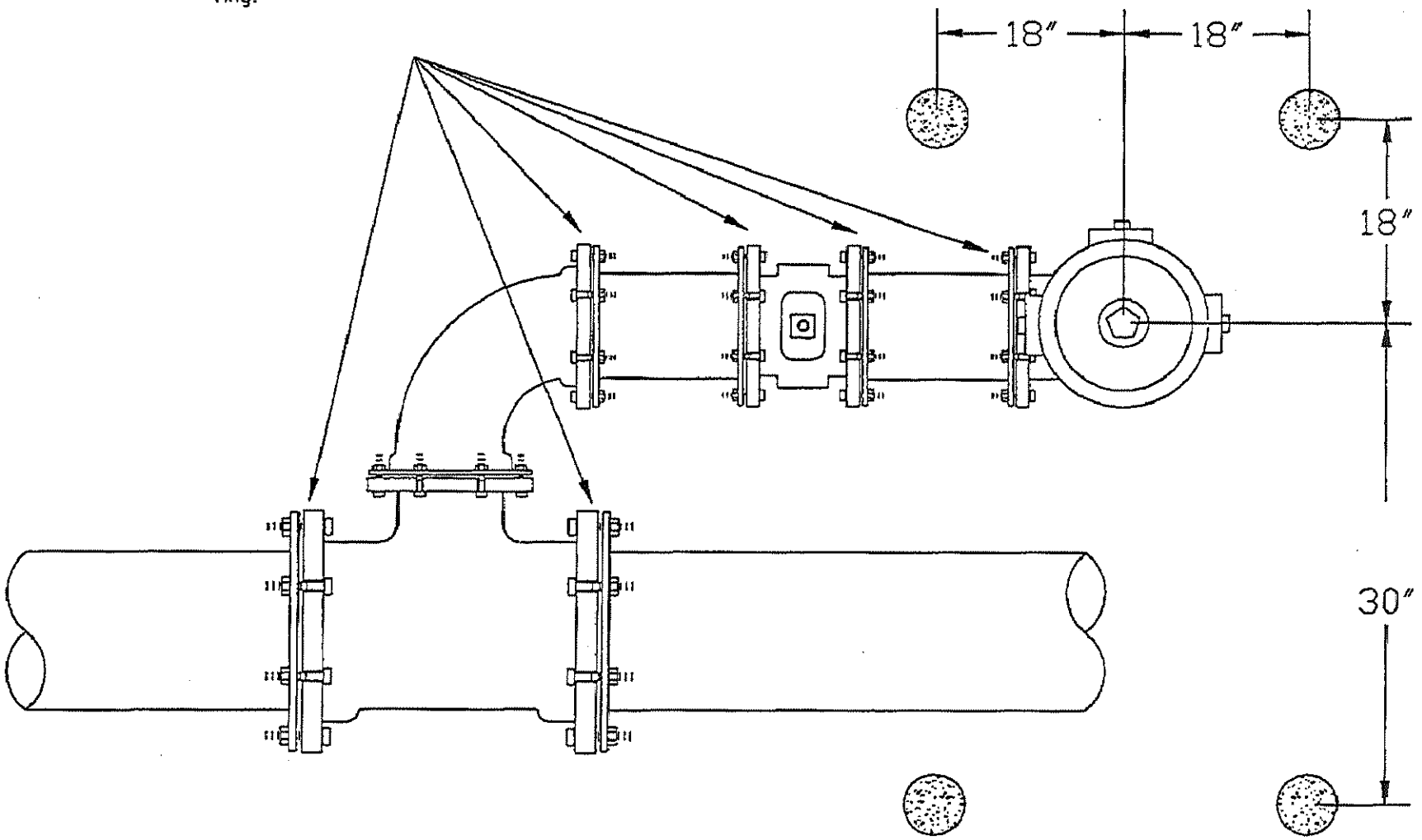
City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

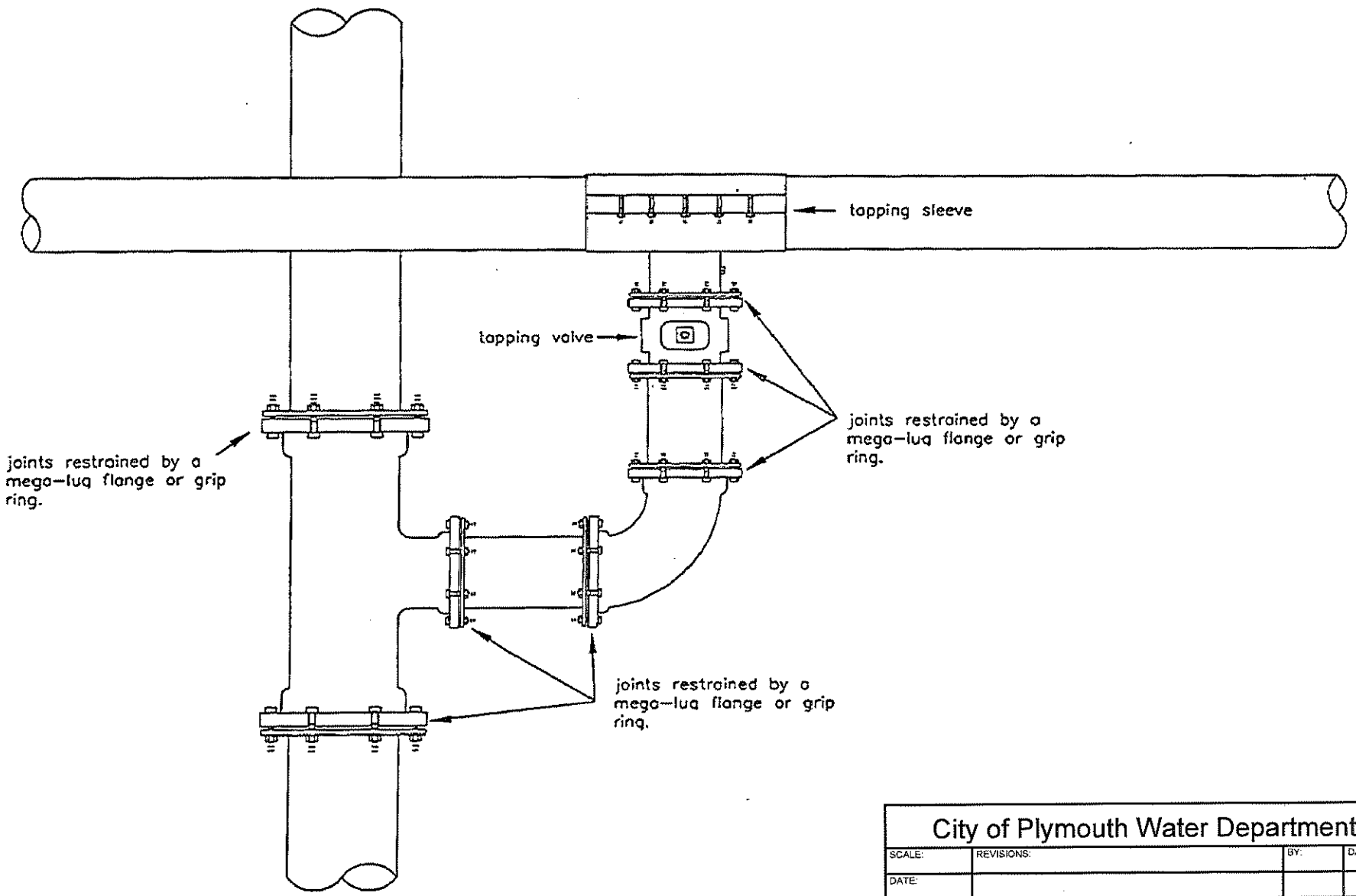
HYDRANT GUARD POST INSTALLATION ON STANDARD HYDRANT

NO: 14

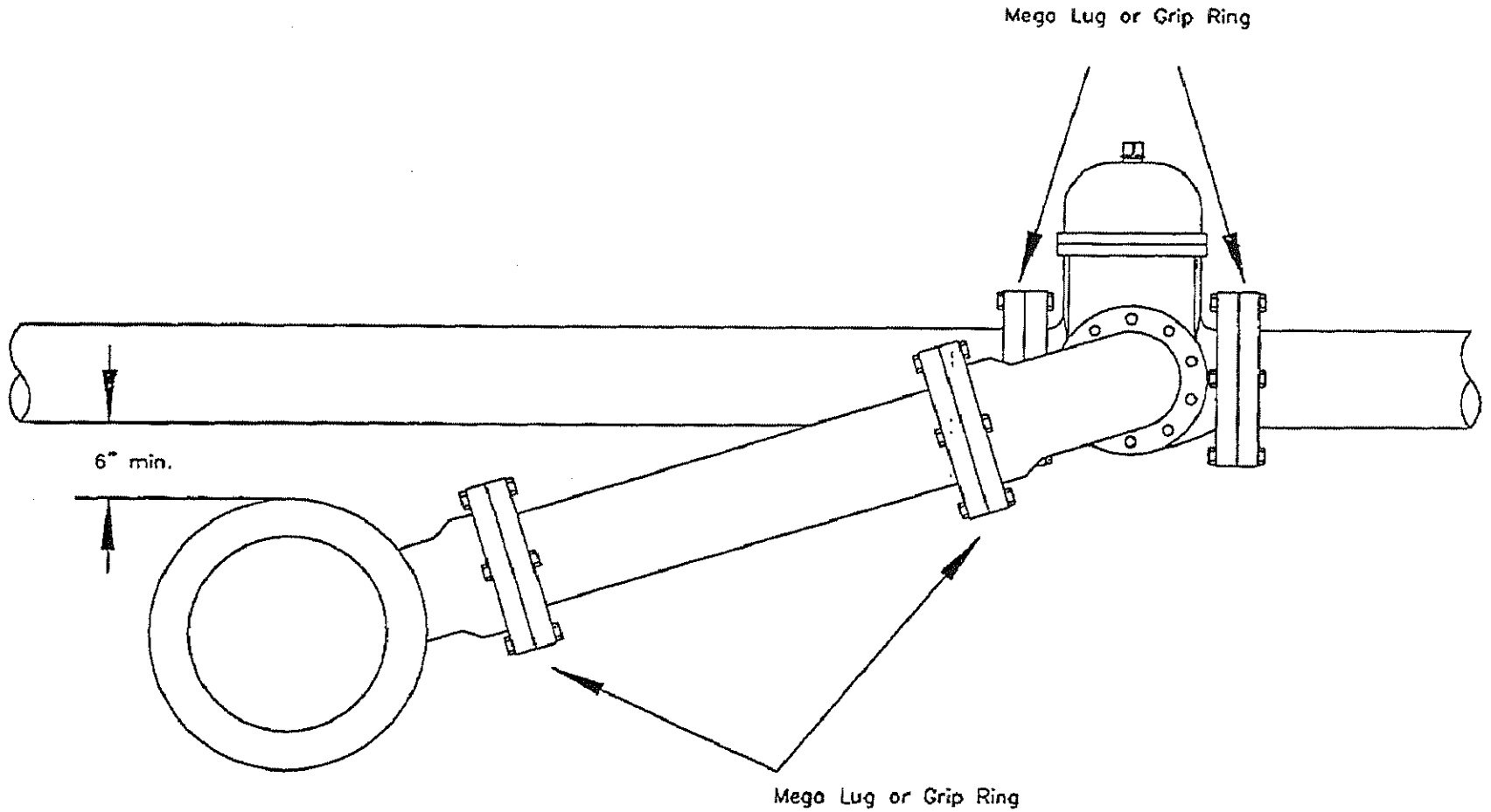
joints restrained by a mega-lug flange or grip ring.



City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
HYDRANT GUARD POST INSTALLATION ON LIMITED SPACE HYDRANT		NO:	**15**



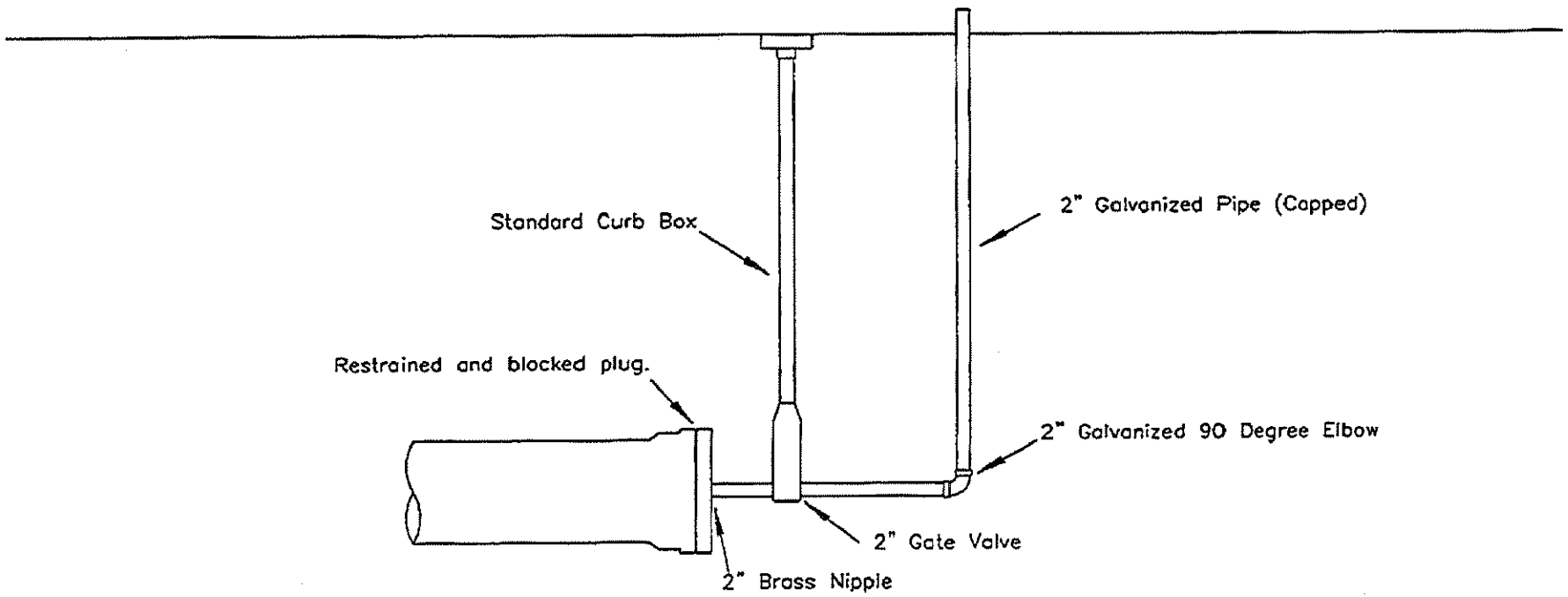
City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
TWO PIPE INTERCONNECT WITHOUT A CROSS - PLAN VIEW	NO: **16**		



Note:

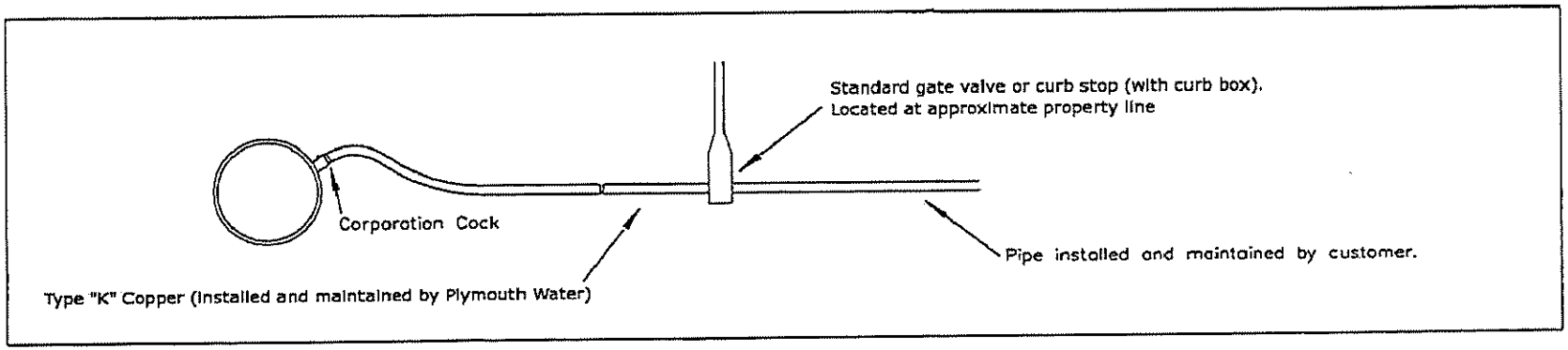
Proposed main may pass over existing main if existing main is deep enough to provide five feet of coverage over proposed main

City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
TWO PIPE INTERCONNECT WITHOUT A CROSS - SECTION VIEW		NO:	17

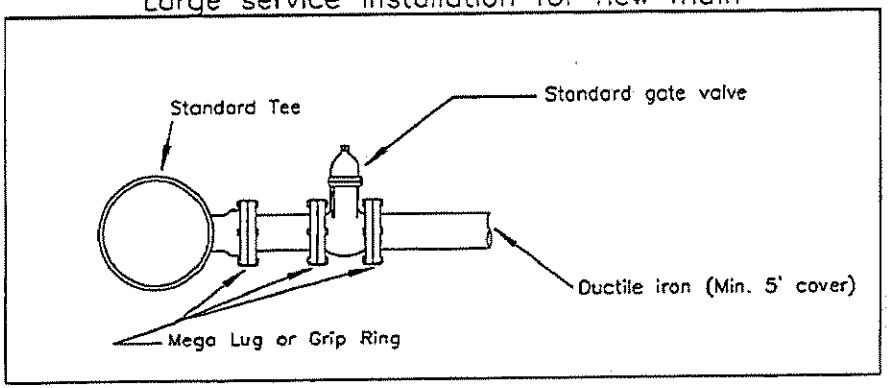


City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
TEMPORARY BLOW-OFF INSTALLATION DETAIL		NO:	**18**

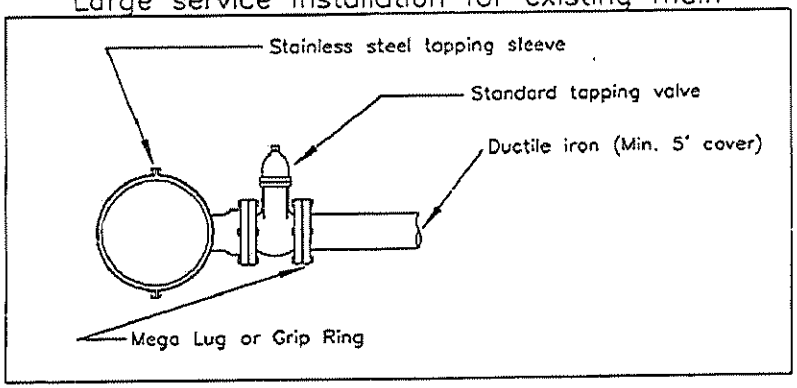
Small service installation for existing and new main (1" and less)



Large service installation for new main

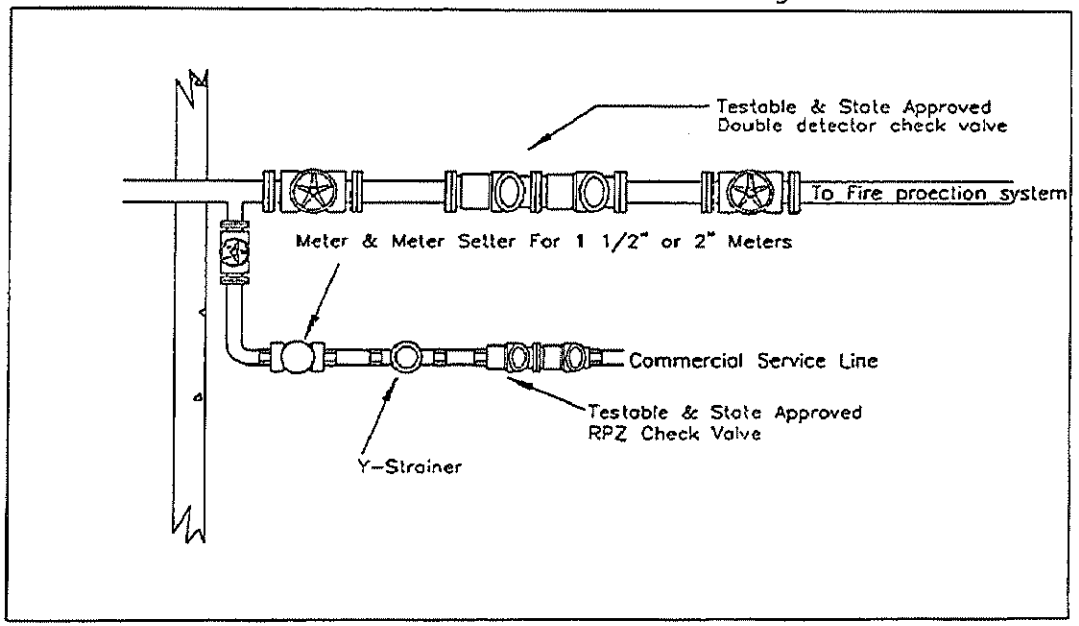


Large service installation for existing main

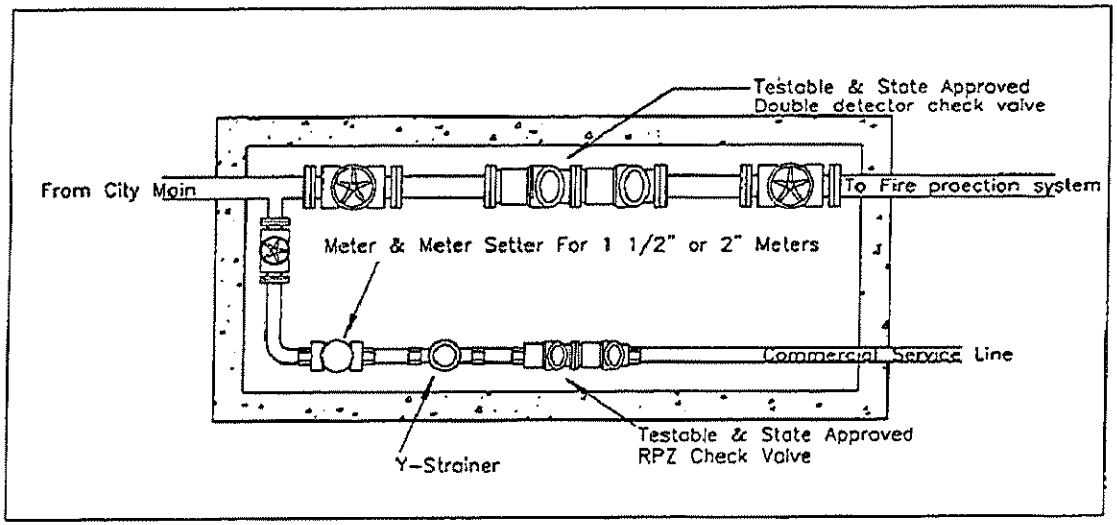


City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
SMALL & LARGE SERVICE INSTALLATION DETAILS		NO:	19

Check Valves in Building



Check Valves in Pit



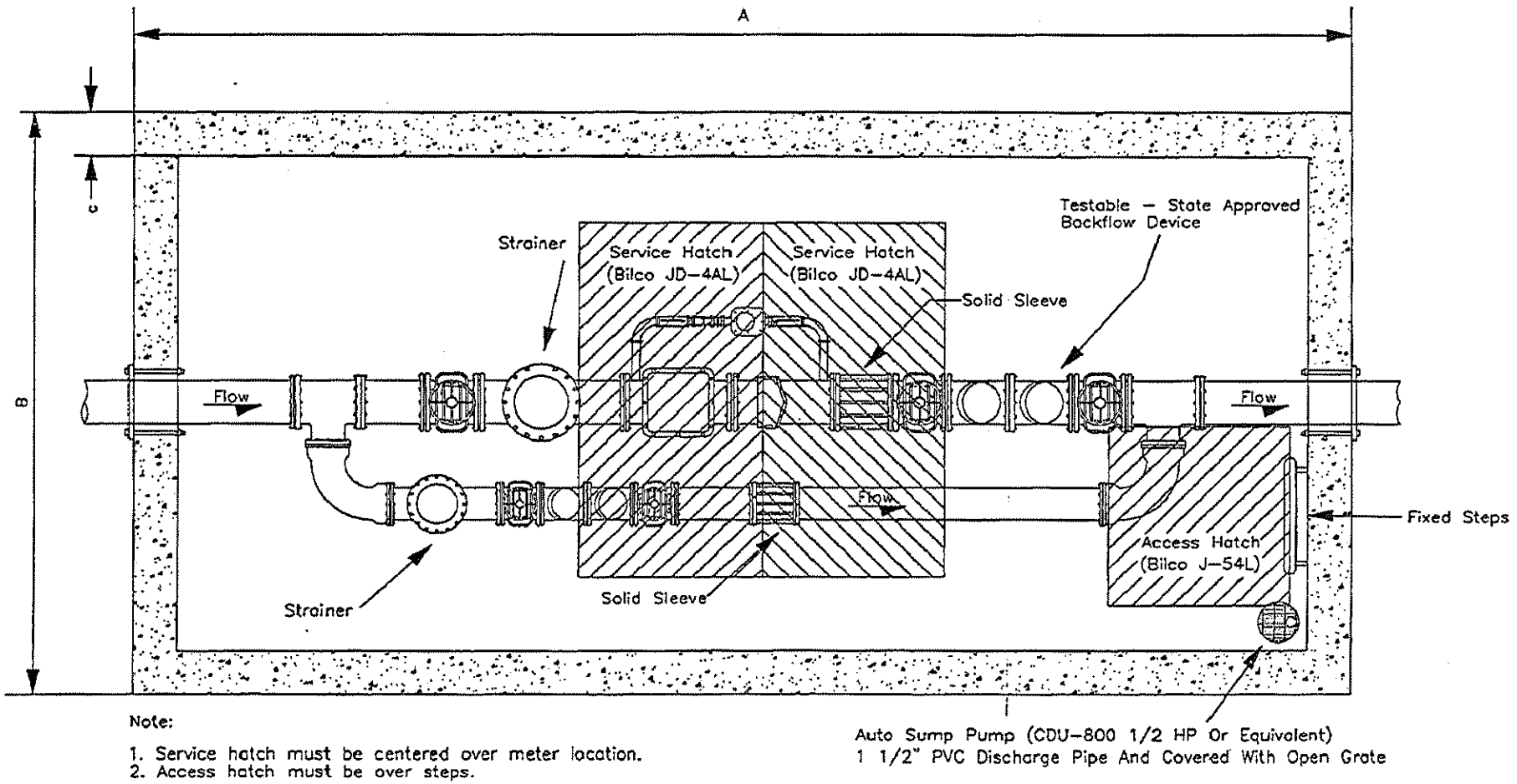
Note: All meters & backflow devices must be installed in a horizontal position

City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

FIRE & COMMERCIAL SERVICE INSTALLATION DETAILS

NO: 20



Note:

1. Service hatch must be centered over meter location.
2. Access hatch must be over steps.

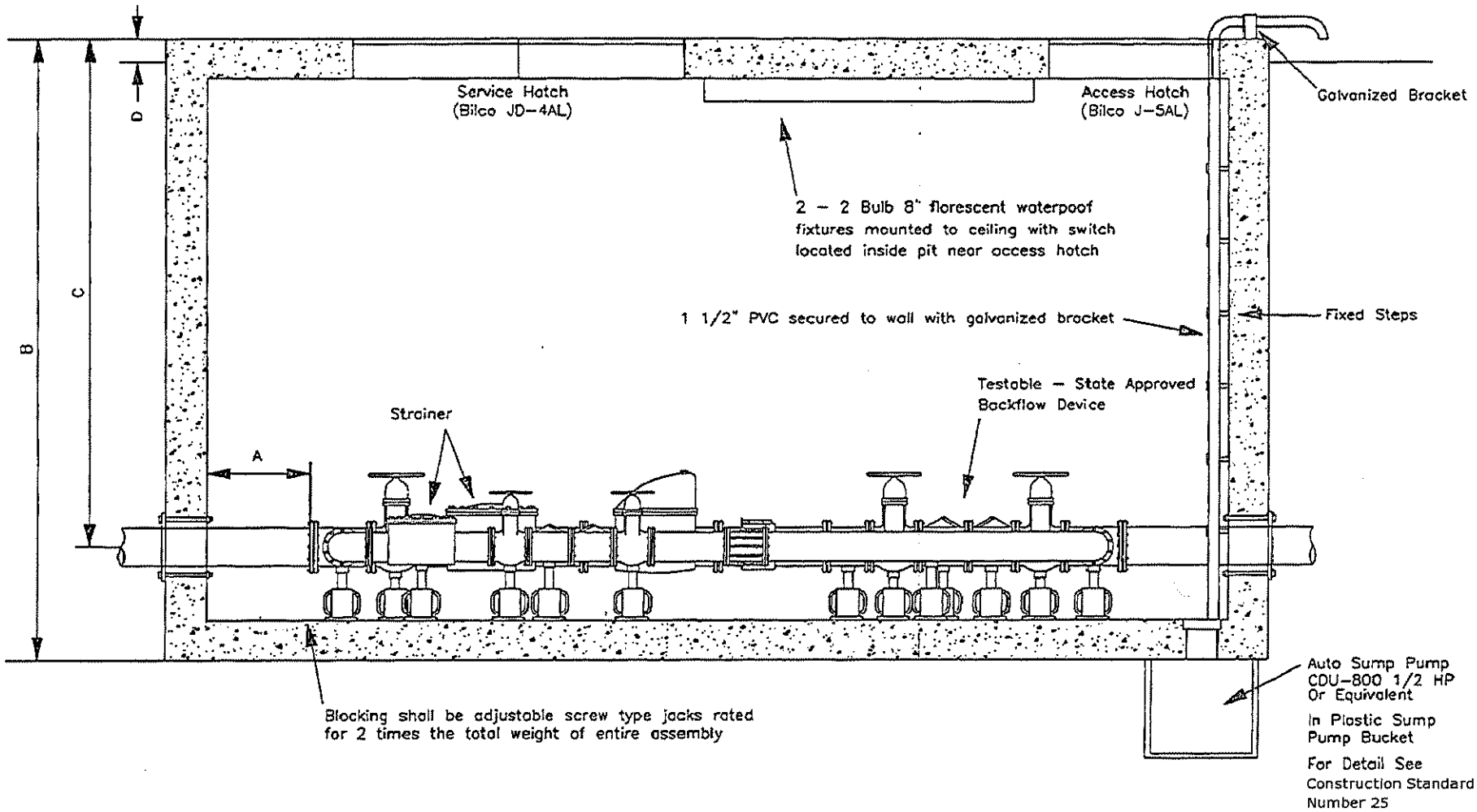
Meter Vault Dimensions			
Pipe Size	A	B	C
4"	16' - 0"	11' - 4"	0' - 8"
6"	21' - 0"	11' - 4"	0' - 8"
8"	21' - 0"	11' - 4"	0' - 8"
10"or <	24' - 0"	11' - 4"	0' - 8"

City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

STANDARD METER VAULT DIMENSIONS FOR 4" SERVICE OR LARGER - PLAN VIEW

NO: 21



Note:

1. Service hatch must be centered over meter location.
2. Access hatch must be over steps.
3. If lids are in heavy traffic area they must be Bilco H-20

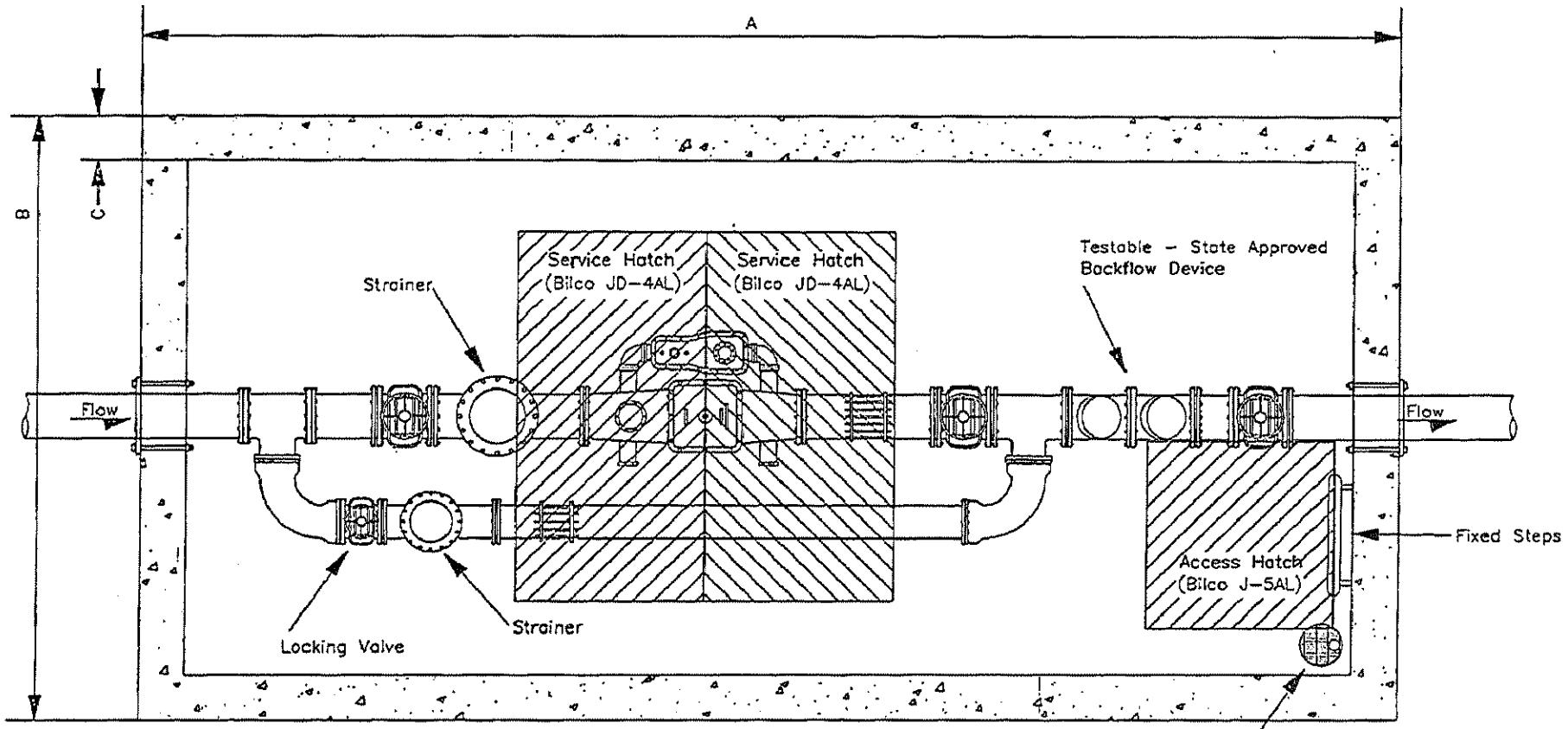
Meter Vault Dimensions				
Pipe Size	A	B	C	D
4"	2' - 0"	7' - 10"	5' - 9"	0' - 3"
6"	2' - 0"	7' - 10"	5' - 9"	0' - 3"
8"	2' - 0"	7' - 10"	5' - 9"	0' - 3"
10"or <	2' - 0"	7' - 10"	5' - 9"	0' - 3"

City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPVD BY:			

STANDARD METER VAULT DIMENSIONS FOR 4" SERVICE OR LARGER - SECTION VIEW

NO: 22



Note:

1. Service hatch must be centered over meter location.
2. Access hatch must be over steps.
3. If lids are in heavy traffic area they must be Bilco H-20

Auto Sump Pump (CDU-800 1/2 HP Or Equivalent)
1 1/2" PVC Discharge Pipe And Covered With Open Grate

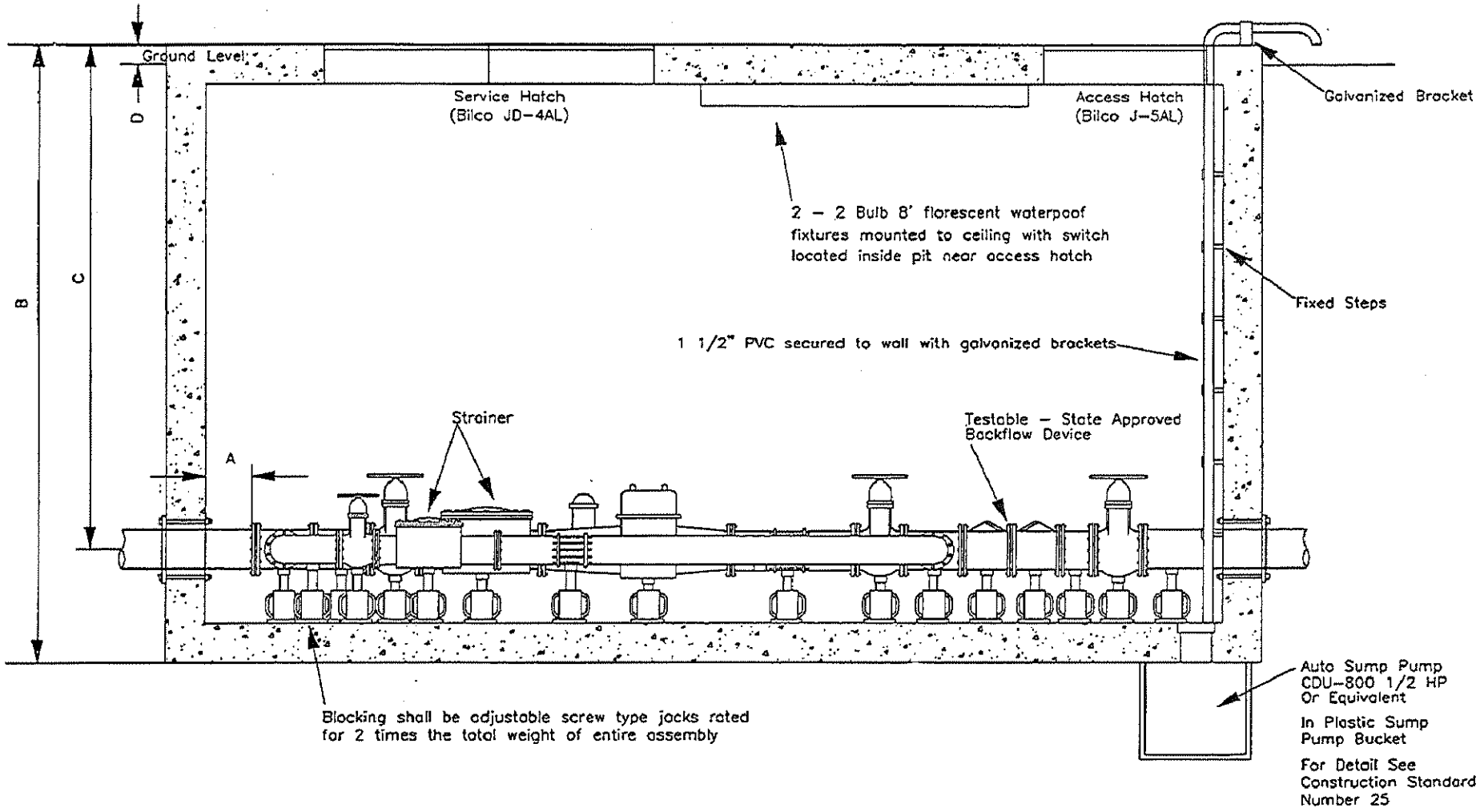
Meter Vault Dimensions			
Pipe Size	A	B	C
3"	15' - 0"	11' - 4"	0' - 8"
4"	16' - 0"	11' - 4"	0' - 8"

City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

STANDARD METER VAULT DIMENSION FOR 3" & 4" SERVICES - PLAN VIEW

NO: 23



Note:

1. Service hatch must be centered over meter location.
2. Access hatch must be over steps.
3. If lids are in heavy traffic area they must be Bilco H-20

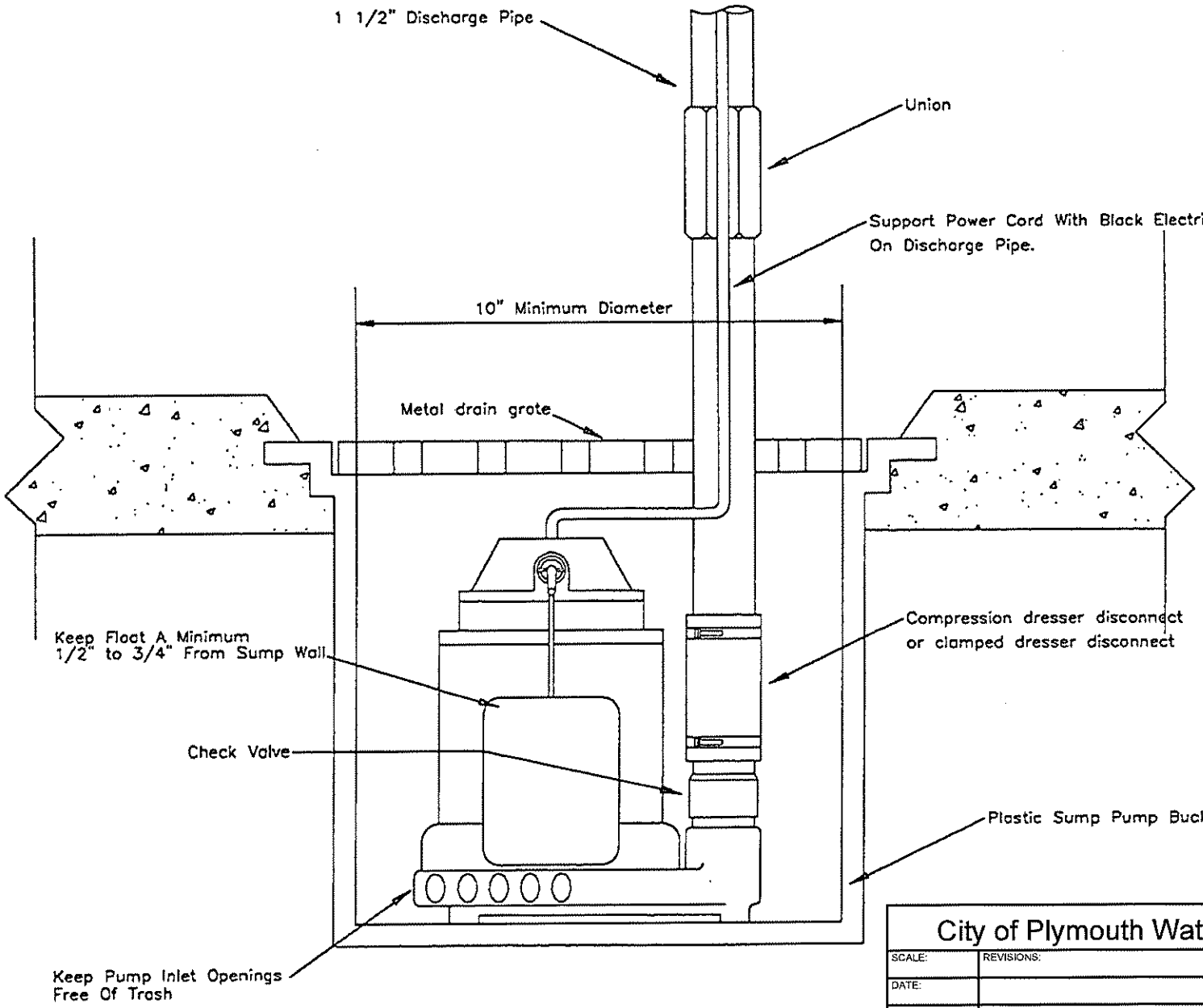
Meter Vault Dimensions				
Pipe Size	A	B	C	D
3"	2' – 0"	7' – 10"	5' – 9"	0' – 3"
4"	2' – 0"	7' – 10"	5' – 9"	0' – 3"

City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPVD BY:			

STANDARD METER VAULT DIMENSIONS FOR 3" & 4" SERVICES - SECTION VIEW

NO: 24



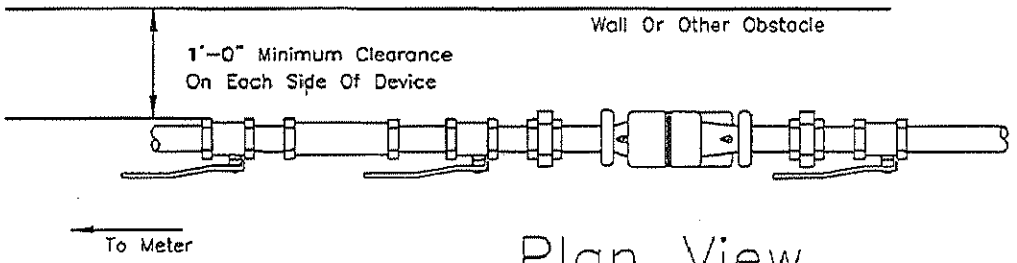
Note: Automatic sump pump must be a CDU-800 1/2 hp or Equivalent

City of Plymouth Water Department

SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			

SUMP PUMP DETAIL

NO: 25



Plan View

Notes:

Assembly shall be horizontally installed complete with clearance shown.

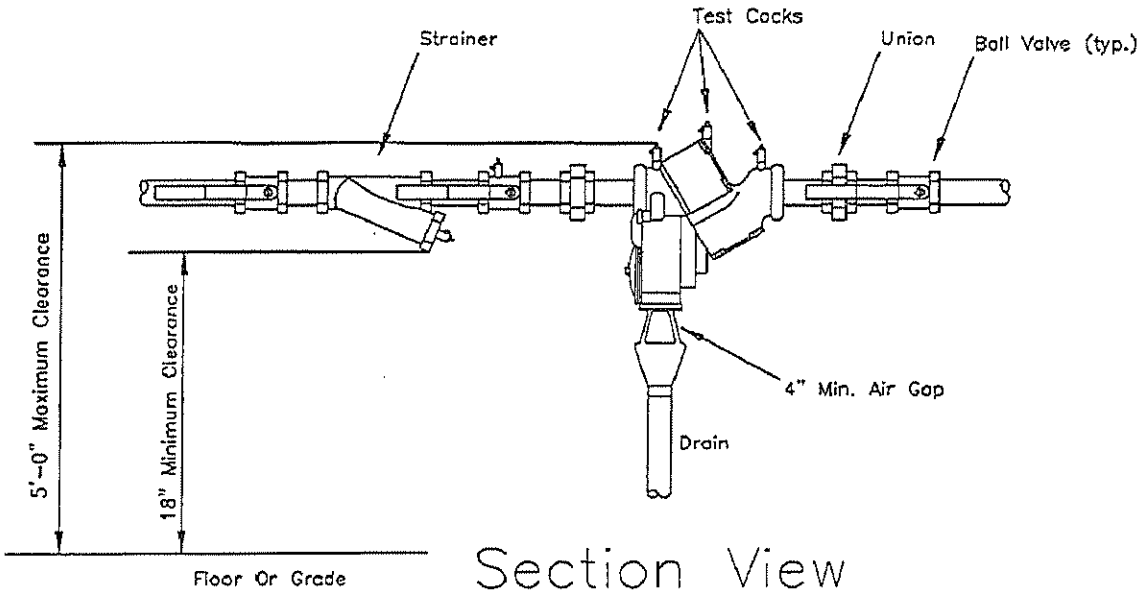
Assembly cannot be installed underground.

Outdoor installations shall be provided with weather proof enclosures and adequate freeze protection.

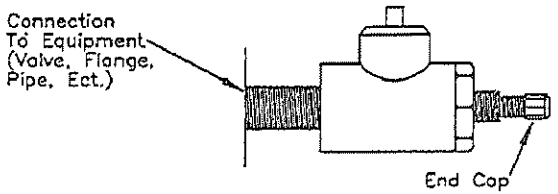
Drain line shall be installed in accordance with standard plumbing codes.

Ball valve shall be resilent seat, 1/4 turn, full port, bronze.

Provided test cocks with water tight test adapters and end caps.

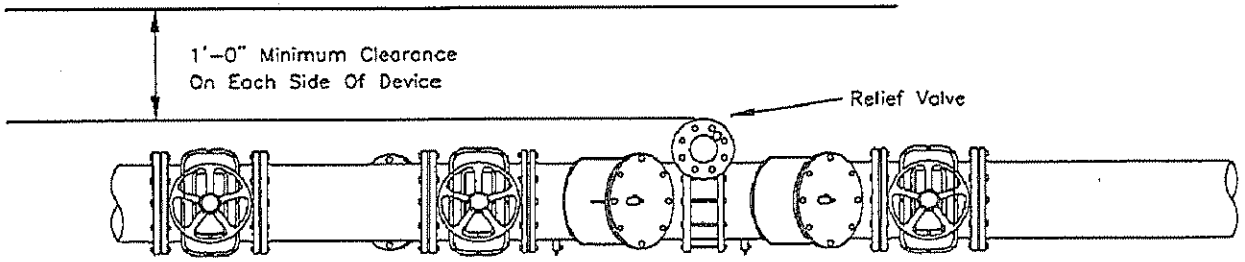


Section View



Test Cock

City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
¾" - 2" REDUCED PRESSURE BACK FLOW PREVENTER DETAIL		NO:	26



Plan View

Notes:

Assembly shall be horizontally installed complete with clearance shown.

Assembly cannot be installed underground.

Outdoor installations shall be provided with weather proof enclosures and adequate freeze protection.

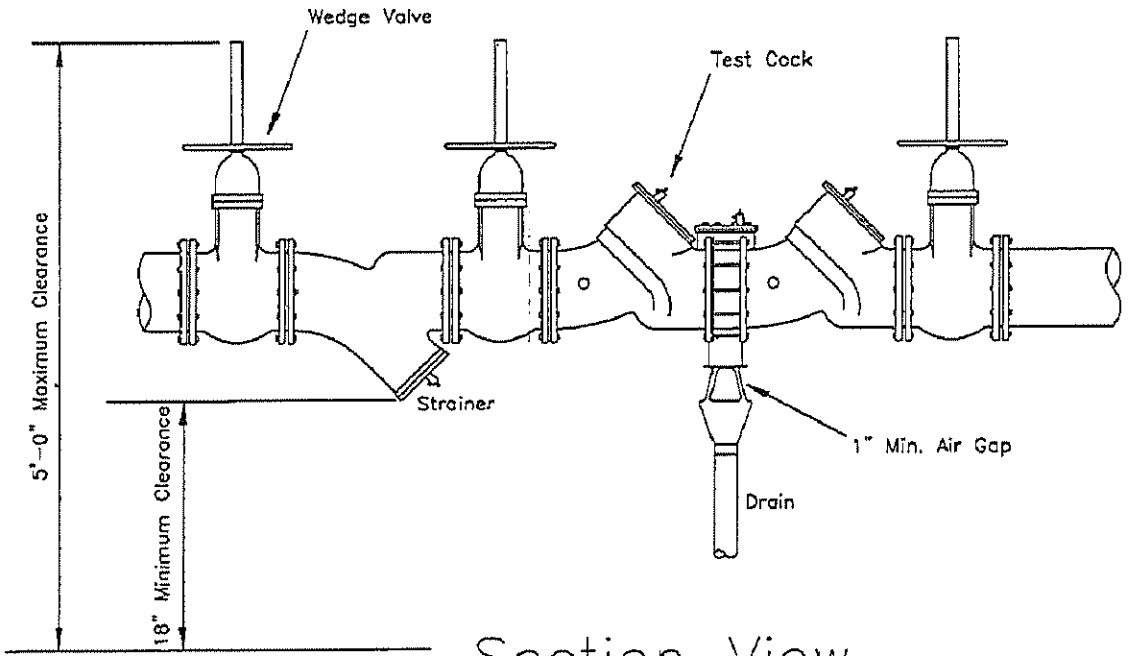
Drain line shall be installed in accordance with standard plumbing codes.

Shut-off valve shall be resilient seat OS&Y, wedge type

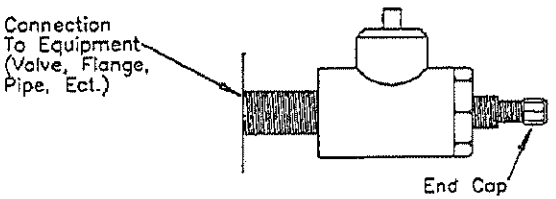
All devices shall be epoxy coated.

Provided test cocks with water tight test adapters and end caps.

Assembly must be properly supported.

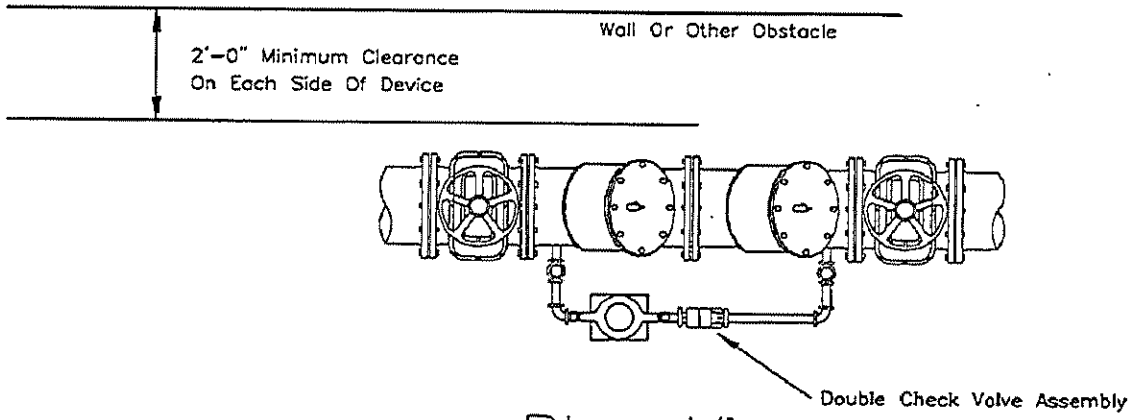


Section View



Test Cock

City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
2 1/2" - 10" REDUCED PRESSURE BACK FLOW PREVENTER DETAIL		NO:	**27**



Plan View

Notes:

Assembly shall be horizontally installed complete with clearance shown.

Outdoor installations shall be provided with weather proof enclosures and adequate freeze protection.

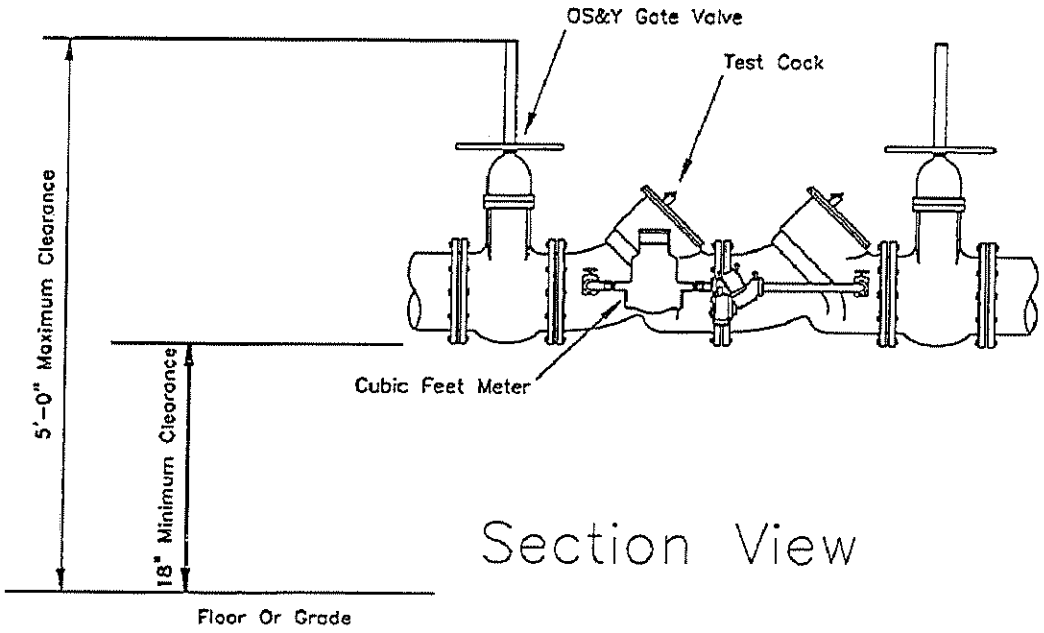
The only acceptable meter type set by Mishawaka Utilities Water Department is one that registers in cubic feet.

Shut-off valve shall be resilent seat OS&Y. wedge type

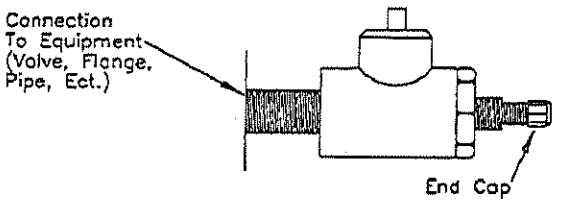
All devices shall be epoxy coated.

Provided test cocks with water tight test adapters and end caps.

Assembly must be properly supported.

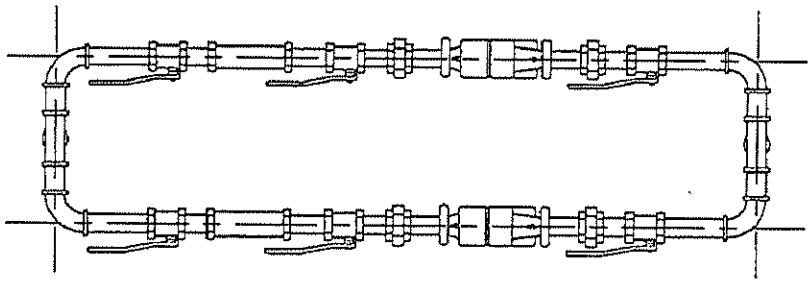


Section View

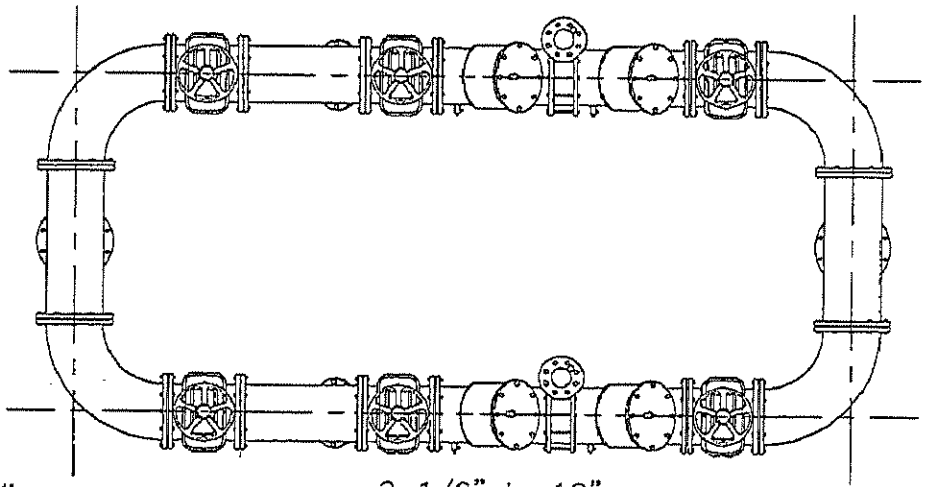


Test Cock

City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
4" - 10" DOUBLE DETECTOR CHECK VALVE DETAIL		NO:	28

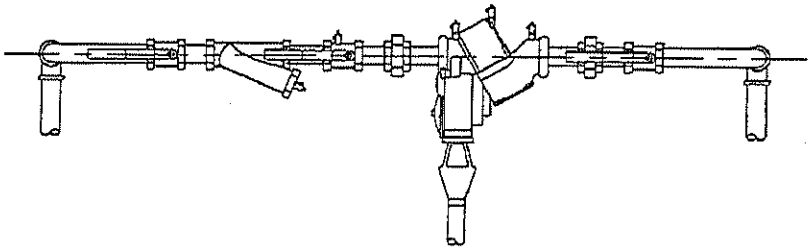


3/4" to 2"

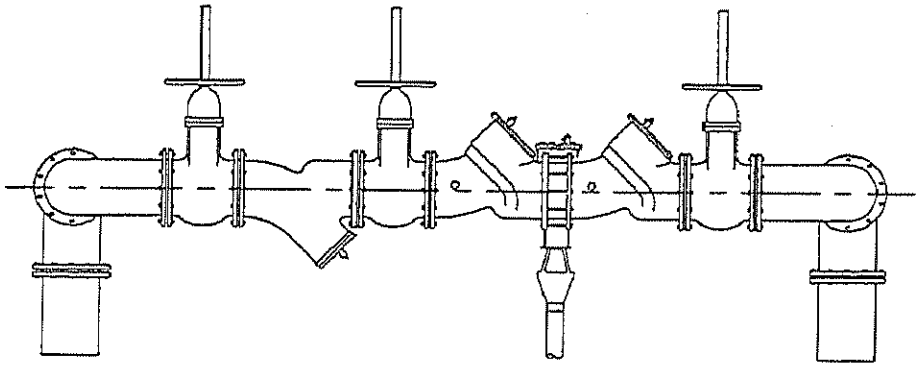


2 1/2" to 10"

Plan View



3/4" to 2"



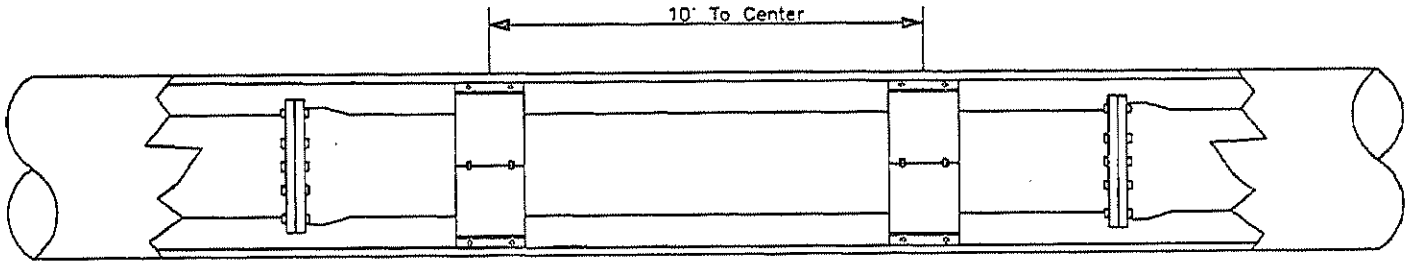
2 1/2" to 10"

Section View

Notes:

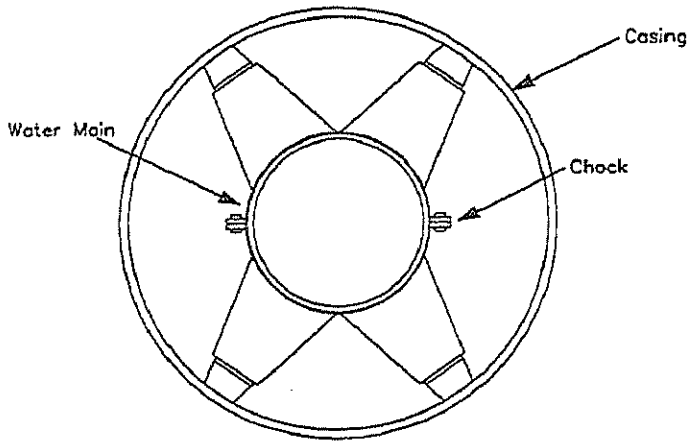
1. Minimum required distance for servicing or repair of assembly devises. OS&Y valves may be rotated a maximum of 45 degrees from vertical
2. Relief drains can be inter connected. Drain size as required for device size.
3. Isolation valves are required.
4. See construction standard drawings 26, 27, & 28 for devise and piping clearances.
5. Assembly device must be installed horizontally.

City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPVD BY:			
DOUBLE INSTALLATION BACK FLOW PREVENTER DETAIL		NO:	**29**

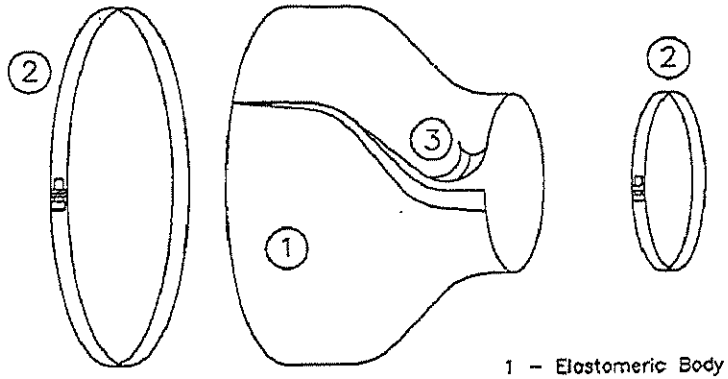


Plan View

NOTE:
One chock shall be placed not more than 2 feet from each end of the casing. Subsequent chocks shall be placed at 10 foot intervals within the casing pipe.



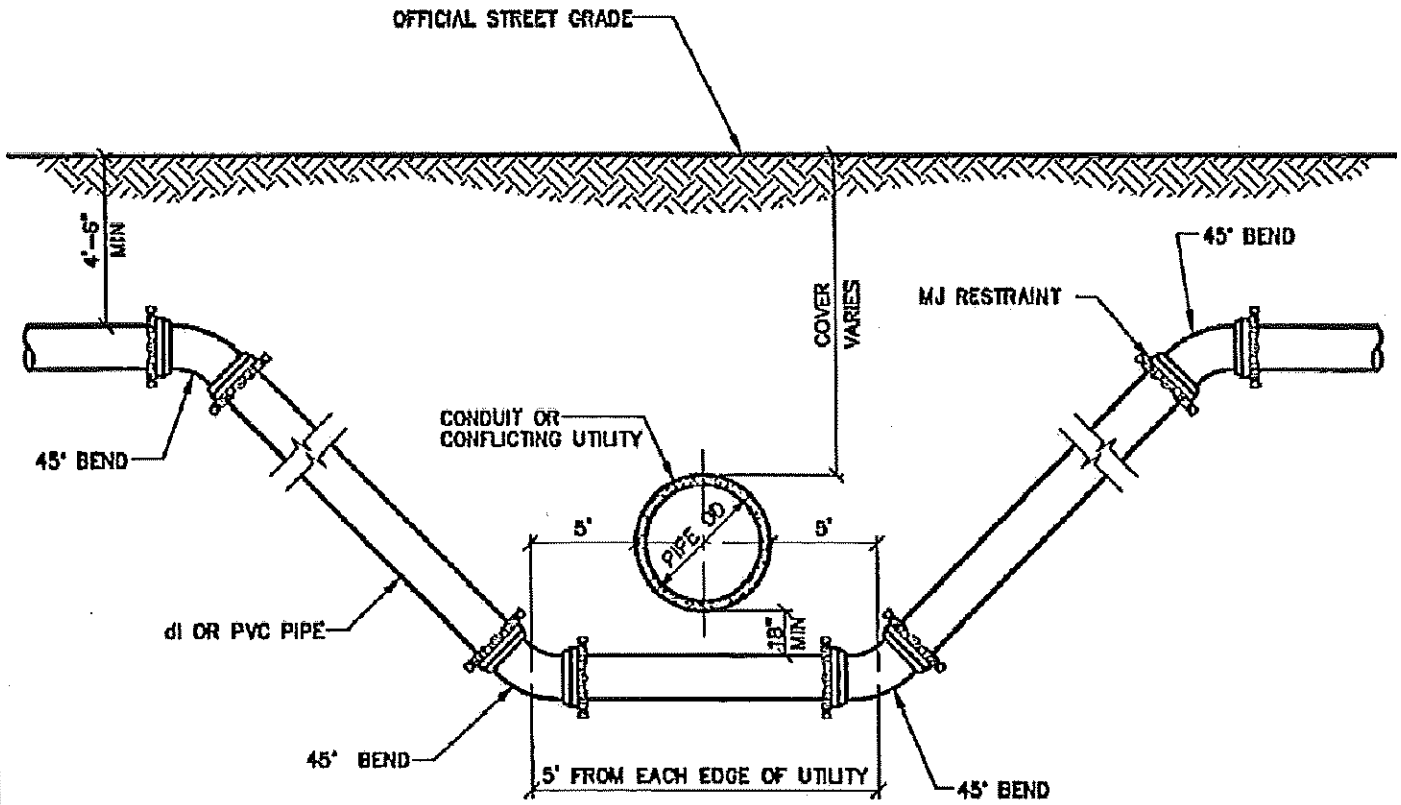
Section View



End Seal

1 – Elastomeric Body
2 – Stainless Steel Clamps
3 – Hook & Look Seal

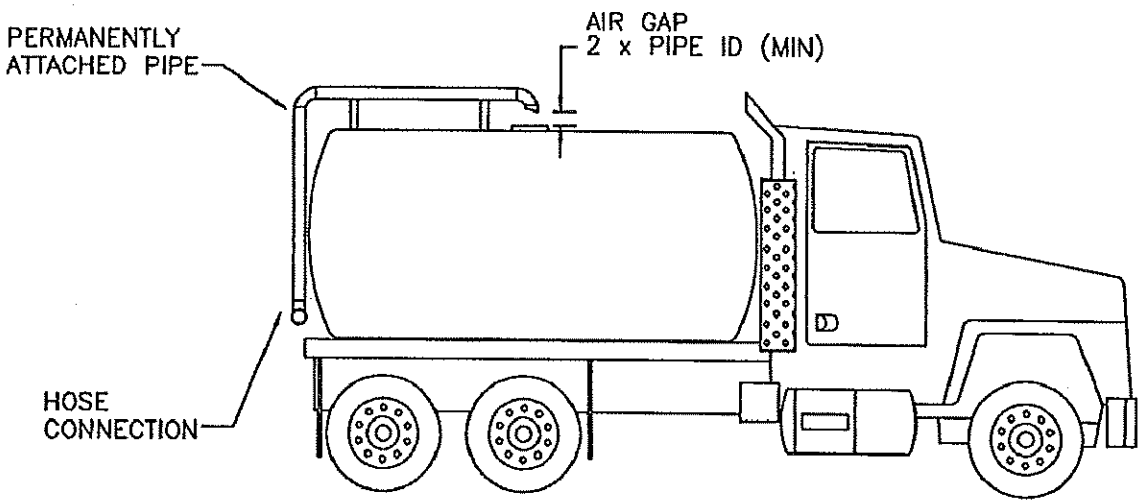
City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
CASING CHECKS AND END SEAL DETAILS		NO:	**30**



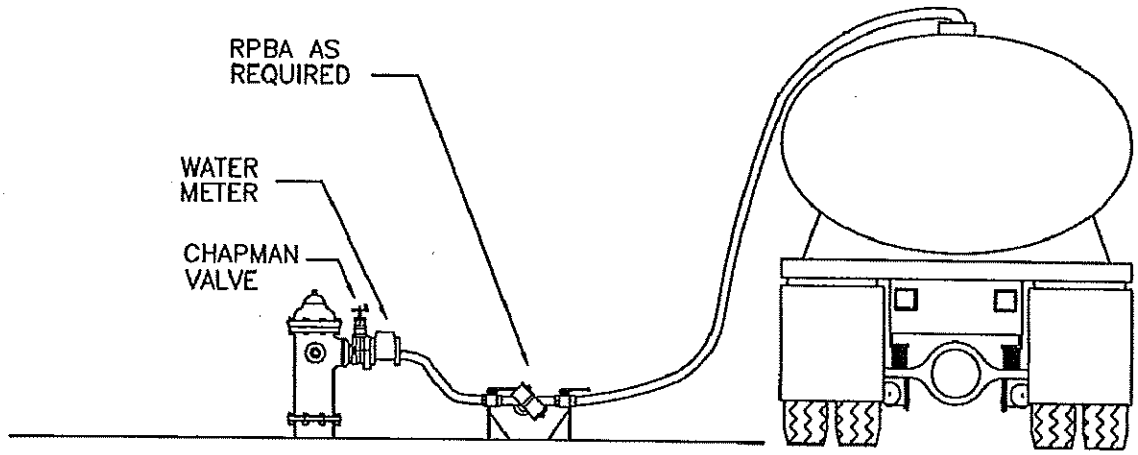
NOTES:

1. LENGTH OF EXTENSION OF PIPE AND RESTRAINED JOINTS SHALL BE IN ACCORDANCE WITH THESE ENGINEERING STANDARDS.
2. CATHODIC PROTECTION SHALL BE AS REQUIRED IN ACCORDANCE WITH THESE ENGINEERING STANDARDS.
3. A BORED CROSSING MAY BE REQD BY THE ENGINEER.

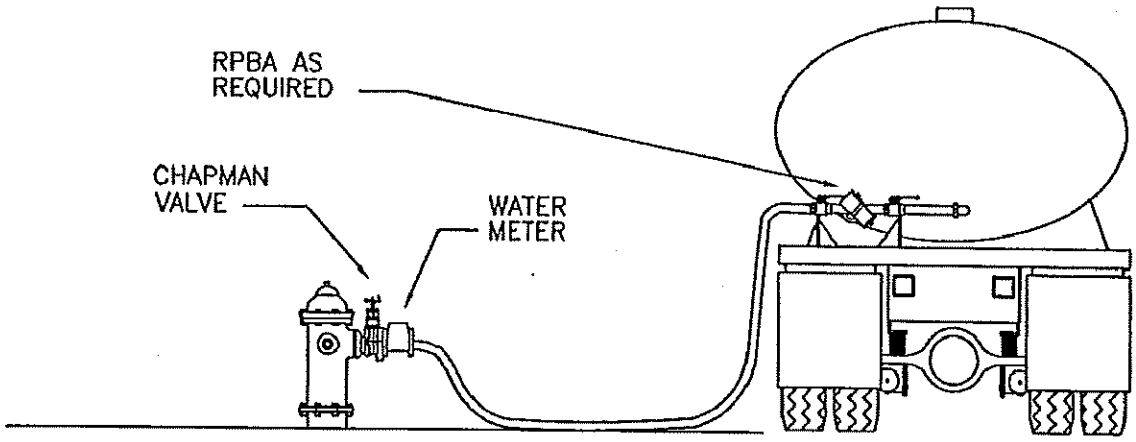
City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPV'D BY:			
OPEN CUT CROSSING UNDER CONFLICTING UTILITY		NO:	31



WITH AIR GAP



WITH PORTABLE ASSEMBLY



WITH TRUCK MOUNTED ASSEMBLY

City of Plymouth Water Department			
SCALE:	REVISIONS:	BY:	DATE:
DATE:			
DWG BY:			
APPVD BY:			
MINIMUM PROTECTION DETAIL FOR BULK TANKERS		NO:	**32**

APPENDIX "B"

WORKSHEETS

&

FORMS

WATER DISTRIBUTION LEAKAGE TEST

ALLOWABLE LEAKAGE AT 150 PSI

Pipe Length	6" Diameter	8" Diameter	10" Diameter	12" Diameter	16" Diameter
50	0.03	0.04	0.05	0.06	0.07
100	0.06	0.07	0.09	0.11	0.11
150	0.08	0.11	0.14	0.17	0.22
200	0.11	0.15	0.18	0.22	0.29
250	0.14	0.18	0.23	0.28	0.37
300	0.17	0.22	0.28	0.33	0.44
350	0.19	0.26	0.32	0.39	0.51
400	0.22	0.29	0.37	0.44	0.59
450	0.25	0.33	0.41	0.50	0.66
500	0.28	0.37	0.46	0.55	0.74
550	0.30	0.40	0.51	0.61	0.81
600	0.33	0.44	0.55	0.66	0.88
650	0.36	0.48	0.60	0.72	0.96
700	0.39	0.51	0.64	0.77	1.03
750	0.41	0.55	0.69	0.83	1.10
800	0.44	0.59	0.74	0.88	1.18
850	0.47	0.63	0.78	0.94	1.25
900	0.50	0.66	0.83	0.99	1.32
950	0.52	0.70	0.87	1.05	1.40
1000	0.55	0.74	0.92	1.10	1.47

$$L = \frac{S\ D\ (\ P\ )\ \Lambda\ 1/2}{133{,}200}$$

S = Length of pipe to be tested (feet): _____

D = Nominal pipe diameter (inches): _____

P = Average test pressure (PSI): _____

L = Allowable leakage (gallons per hour): _____

COPY

RESOLUTION 2013-562

RESOLUTION OF THE BOARD OF PUBLIC WORKS AND SAFETY TO AMEND WATER PROJECT CONSTRUCTION STANDARDS FOR THE PLYMOUTH WATER DEPARTMENT

WHEREAS, Utilities Superintendent Donnie Davidson has drafted amendments to the City's Construction Standards for the Design and Details of Water Projects, which address the Demolition of Buildings and Retiring Water Service, as well as Private Water Wells Inside City Limits (Water Service Area); and,

WHEREAS, the purpose and intent of this resolution is to adopt the amendments to the City's Construction Standards for the Design and Details of Water Projects as drafted by the Utilities Superintendent.

NOW, THEREFORE, BE IT RESOLVED by the Board of Public Works and Safety as follows:

Section 1. The amendments to the cover and table of contents of the City's Construction Standards for the Design and Details of Water Projects, to the cover and table of contents to Section 3, entitled General Rules and Requirements, and to the body of Section 3, entitled General Rules and Requirements, all of which are attached hereto, are hereby adopted.

Section 2. The Utilities Superintendent is directed to incorporate the adopted amendments into the whole of the City's Construction Standards for the Design and Details of Water Projects, and to make the amended document available to the public pursuant to the Water Department's usual procedures.

PASSED AND ADOPTED this 28th day of May, 2013.

Mark Senter, Presiding Officer

ATTEST:

Toni L. Hutchings, IAMC/CMC/CPFA
Clerk-Treasurer