

2.2 WATERMAIN PLANS

2.2.1. This design standard covers acceptable designs for water main construction. Local, State, and Federal regulations supersede the requirements of this standard. Design parameters not included in this standard or that deviate from this standard must be approved by the City of Mequon Water Utility Planning Engineer (Engineer) prior to final submission. An ‘owner letter’ will only be provided after Water Utility Planning Engineer has approved the water main drawings. The owner letter is required before the WDNR will accept the submittal of water main plans for their approval.

2.2.2. Design Plan Requirements

- A. Plan and profile drawings are required for all water main designs.
- B. Water main plan and profile drawings shall be 20, 40, or 50 scale.
- C. Each water main design shall be tied to an alignment that is the center of right-of-way, center of easement, or property line.
- D. Plan and profile sheet shall show the designed offset from the alignment to the water main at every 50 foot station and pipe deflection.
- E. State Plane Coordinate system, and USGS elevation datum shall be used for alignment and elevation information.

2.2.3. Watermain Location and Requirements

- A. Water main in public right-of-way
 - 1. Water main shall be located a minimum of six feet from pavement edge.
 - 2. Water main shall be located in the north and east half of the public right-of-way if required separations from other utilities, waterways, wetlands, drain field’s, and other conflicts can be met.
 - 3. The centerline of the water main shall not be closer than 20 feet from a building foundation.
- B. Water main in private easement
 - 1. The water main shall be located at the center of a 20 foot easement.
 - 2. The centerline of the water main shall not be closer than 20 feet from a building foundation.
- C. High points in a water main must be located at hydrants.

2.2.4. Hydrant Locations and Requirements

- A. The designed location of hydrants must take into account regulations, serviceability, cost, and the following guidelines.

B. Hydrant spacing shall conform to the following table:

Zoning	Maximum Hydrant Spacing
Commercial	300'
Residential	500'

- C. Hydrants in locations with curb shall be placed 2½ feet behind the back of curb.
- D. Hydrants in location without curb shall be placed 2 feet from the right-of-way.
- E. Hydrants shall be a minimum of 30 feet from any building wall.
- F. The centerline of the hydrant's 4½ inch nozzle shall be 18 to 24 inches above the center of pavement.

2.2.5. Watermain Valve Location and Requirements

- A. Each tee shall have two valves located 5 feet from the tee in the apparent downstream directions. The apparent downstream directions are the opposite of the high pressure or apparent normal source direction.
- B. Each cross shall have three valves located 5 feet from the cross in the apparent downstream directions.
- C. Unless otherwise approved valves shall be located 5 feet from hydrant tees or water main intersections. Valves may be moved a short distance to be placed outside of pavement.

2.2.6. Each watermain plan and profile sheet shall show the same information as the Sanitary sewer plan and profile sheet and include the following:

- A. Plan View
 - 1. Dimensions showing separation between the watermain and sanitary sewer and other utilities.
 - 2. Size of proposed watermain.
 - 3. An estimate of all material quantities to be used in the construction of the watermain totaled on the last page.
- B. Profile View
 - 1. Existing and proposed surface profiles over the proposed watermain.
 - 2. Material, slope, diameter, and length of watermain between grade breaks, and fittings.
 - 3. The sanitary sewer and its size (dashed).
 - 4. Culverts and their inverts and sizes (proposed and existing).
 - 5. Limits of gravel, spoil, and/or slurry backfill.

6. Stationing

CHAPTER 5

WATER DISTRIBUTION

5.0 GENERAL

- 5.0.1. Work performed and materials supplied shall conform to the latest edition of the Standard Specifications for Sewer and Water Construction in Wisconsin (Standard Specifications), and the City of Mequon's Standard Specifications for Land Development.
- 5.0.2. A full-time inspector shall be located at the job site during construction of the watermain and laterals. The contractor responsible for the construction of the sanitary sewers and laterals is also responsible for notifying the City per the notification policy of the City of Mequon. (See Appendix E)
- 5.0.3. All water main plans are required to be reviewed by the City and then submitted to MMSD for review and approval.

5.1 PIPE MATERIALS

5.1.1. Polyvinyl Chloride (PVC) Pipe

- A. Polyvinyl chloride (PVC) pipe must conform to AWWA C900 and C905 specifications with a class of DR-18. Pipe shall have push-on joints with flexible elastomeric ring gasket in accordance with AWWA D-1869.
- B. PVC pipe shall meet the requirements of Chapter 8.20.0 of Standard Specifications.
- C. PVC pipe shall be blue in color.

5.1.2. High Density Polyethylene (HDPE) Pipe

- A. Where specified by construction plans or Design Engineer, HDPE pipe shall be used.
- B. HDPE water main pipe shall conform to AWWA C-906 standards and shall have 3 equally spaced blue stripes or a solid blue color coded exterior surface.
- C. All HDPE water main pipe shall be Ductile Iron Pipe Size (DIPS) and shall have a DR-11 for sizes 4 inch through 6 inch and a DR-13.5 for sizes 8 inch and larger.
- D. Materials used for the manufacture of high density polyethylene pipe and fittings shall comply with all requirements ASTM D3350 and have a PPI recommended designation of PE3408. The molecular weight category shall be extra high (250,000 to 1,500,000) as per the Gel Permeation Chromatography

determination procedure with a typical value of 330,000.

5.1.3. Ductile Iron (DI) Pipe

- A. Where specified by construction plans or Design Engineer, DI pipe shall be used.
- B. Unless otherwise specified, all DI pipe shall be Class 52 conforming to AWWA C-515, ANSI A21.51, and Chapter 8.18.0 of Standard Specifications.
- C. All DI pipe shall be encased with a polyethylene film in accordance with Chapter 4.4.4 and Chapter 8.21.0 of Standard Specifications.

5.2 TRACER WIRE

- 5.2.1. All buried pipe shall include a 10 gauge solid, coated copper tracer to be installed and tucked along the side of the pipe.

5.3 BEDDING, COVER, & BACKFILL MATERIAL

- 5.3.1. Pipe Bedding, cover, and backfill materials shall conform to Chapter 8.43.0 of Standard Specifications; however, sand may typically be approved as an alternate for HDPE pipe bedding.
- 5.3.2. Bedding material shall consist of 3/8" Crushed Chips meeting the requirements of Chapter 8.43.2 of Standard Specifications.
- 5.3.3. Sand bedding material shall meet the requirements of Chapter 8.43.2 (c) of Standard Specifications
- 5.3.4. Aggregate Slurry Backfill shall be used above the pipe zone under pavement. Slurry shall meet the requirements of Chapter 8.43.8 of Standard Specifications. Aggregate slurry shall consist of No.1 and No.2 coarse aggregate, and Class C concrete mix with cement deleted.
- 5.3.5. Granular backfill material shall be used above the pipe zone under driveways, and sidewalks or as noted on the plans. Granular backfill material shall meet the requirements of Chapter 8.43.4 of Standard Specifications.
- 5.3.6. Graded Aggregate backfill material shall meet the requirements of Chapter 8.43.7 of Standard Specifications.
- 5.3.7. Spoil backfill shall meet the requirements of Chapter 8.43.5 of Standard Specifications. Suitable material shall be free of rubbish, trees, stumps, branches, frozen material, concrete or bituminous chunks. Spoil backfill can be used outside of pavement locations and where as designated on the plans by the Engineer.

5.4 DUCTILE IRON WATER MAIN FITTINGS

- 5.4.1. All water main fittings shall conform to AWWA C-110, C-153 DI compact fittings and Chapter 8.22 of Standard Specifications.
- 5.4.2. Ductile iron compact fittings shall be rated at 350 psi.
- 5.4.3. All fitting shall be mechanical joint, unless otherwise specified.
- 5.4.4. Mechanical joints shall be made with "CorBLUE" nuts and bolts, or approved corrosion resistant equivalents which conform to AWWA C-111.
- 5.4.5. All mechanical joints shall be restrained with EBBA Iron "Megalug" restraint devices for the particular type of pipe (PVC, HDPE, DI) or equal.
- 5.4.6. Restraining distances for all mechanical joints shall be determined by the design engineer in accordance with Chapter File 47A of Standard Specifications. Restraint harness shall be EBBA Iron series 2800 or approved equal.
- 5.4.7. All fittings shall be encased with two wraps of polyethylene film in accordance with Chapter 4.4.4 and Chapter 8.21.0 of Standard Specifications.

5.5 HDPE WATER MAIN FITTINGS

- 5.5.1. Mechanical joint (MJ) adapters shall be used for joining HDPE water main to a fitting, or valve to prevent pipe pull out. MJ adapters shall be restrained with EBBA Iron "Megalug" restraint devices for HDPE pipe.
- 5.5.2. All fabricated HDPE fitting must be individually approved by the engineer.
- 5.5.3. Electrofusion couplings shall be Friatec electrofusion couplings. Electrofusion couplings will only be allowed if approved by the Utility Engineer.
- 5.5.4. Stiffeners for pipe 4 inch and larger shall be Cascade brand drive-in stiffeners or approved equal.

5.6 TAPPING SLEEVES

- 5.6.1. All live taps shall be done with stainless steel tapping sleeves and mechanical joint flanged tapping valves.
- 5.6.2. Tapping sleeves shall be Smith-Blair series 317 or approved equal. Tapping sleeves shall have a stainless steel test plug. No dissimilar metals will be allowed.

5.7 WATER MAIN VALVES

5.7.1. Valves 4" to 12"

- A. Shall be resilient wedge seal (R/W), open to the left, conforming to the requirements of AWWA C-509, C-515 not allowed. Valves shall be Mueller Model A-2360 or approved equal.
- B. Valves shall have mechanical joints conforming to AWWA C-111 on both ends, except for tapping valves.
- C. Valves shall meet the requirements of Chapter 8.27.0 of Standard Specifications.

5.7.2. Valves 14" and Larger

- A. Shall be butterfly valves conforming to AWWA C-504 for Class 150B.
- B. Valves shall have mechanical joints conforming to AWWA C-111 on both ends.
- C. Valves shall have a Buna N Rubber seat that is bubble tight and a ductile iron disk with stainless steel seating surface. 304, 18-8 Stainless steel shafts with stainless steel disc pins.
- D. Operator shall be worm gear type for underground service, Limitorque 90° Worm Gear or equal.
- E. Butterfly valves shall meet the requirements of Chapter 8.28.0 of Standard Specifications.

5.7.3. Valve Boxes

- A. Valve Boxes shall be 5¼ inch diameter, three piece screw type box with a number six base. Covers shall be marked "WATER" and shall be Stay Put type, Clow series F-2494 or approved equal and meet the requirements of Chapter 8.29.0 of Standard Specifications
- B. All valve boxes shall be installed with a pre-manufactured valve box support designed for the size and type of valve and valve box.

5.8 FIRE HYDRANTS

5.8.1. Fire Hydrants shall conform to AWWA C-502 for Dry Barrel Fire Hydrants

5.8.2. Fire Hydrants shall meet the requirements of Chapter 8.26.0 of Standard Specifications.

5.8.3. Fire hydrants shall be Waterous, Clow, or Mueller Centurion break flange type.

5.8.4. Hydrants shall have one 4½ inch and two 2½ inch nozzles.

5.8.5. Hydrants shall open counter clockwise and be painted bright red.

- 5.8.6. Hydrant tees shall be Clow F012117 mechanical joint anchoring tees.
- 5.8.7. Hydrant Leads shall be 6-inch pvc pipe, meeting the requirements of AWWA C-900 and Section 2.1 of this specification.
- 5.8.8. Hydrant lengths shall be sized for the specific installation. No hydrant extensions will be allowed without prior approval. Hydrant nozzles shall be 18 inches to 21 inches above the center of paved roadway.
- 5.8.9. Each hydrant shall be installed with a hydrant marker that is bolted to the top of the hydrant, orange in color, and made of fiberglass.

5.9 WATER SERVICE LATERAL

5.9.1. Water services

- A. Service laterals shall be HDPE, PE 3408, SDR 9 (pressure rating 200 psi) pipe meeting the requirements of AWWA C-901 unless otherwise specified on plan or directed by the engineer.
- B. Residential service laterals shall be 2”in diameter. The City of Mequon reserves the right to approve a smaller diameter water lateral if project engineer submits design calculations showing a smaller diameter water service will meet the requirements of PSC 185.82 and the Department of Commerce (Comm82.40).
- C. Tapping saddles shall be stainless steel and used for all service taps. Tapping saddles on HDPE pipe shall be heat or electrofusion branch saddles or if mechanical shall be installed with a minimum of 3 Bellville spring washers per bolt.
- D. Corporation stops shall be Mueller B-25008, or approved equal and meet the requirements of Chapter 8.30.0 of Standard Specifications.
- E. Curb stops shall be Mueller B-25155, or approved equal and shall meet the requirements of Chapter 8.31.0 of Standard Specifications.
- F. Curb boxes shall be cast iron Mueller H-10300 with curb stop key extension, or approved equal and meet the requirements of Chapter 8.25.0 of Standard Specifications
- G. Pipe stiffeners must be used at all mechanical connections over 1”.

5.9.2. Water services 4 inch and larger

- A. Curb stops for 4 inch and larger services shall conform to the water main valve specification.
- B. Unless otherwise approved, the service tee shall be an anchor tee.
- C. Tapping sleeves for DI or PVC shall be all stainless steel, including a stainless steel test plug. Tapping saddles on HDPE pipe shall be heat or electrofusion branch saddles.

5.10 CASING PIPE

5.10.1. Steel casing pipe wall thickness shall meet the requirements of File No. 49 of Standard Specifications and conform to the following:

- A. All pipe shall conform to all applicable requirements of AWWA C200-86 and AWWA M11, and if fabricated shall be constructed of A36 steel with a minimum yield point of 36 ksi; or if manufactured shall conform to Grade B with a minimum yield point of 35 ksi.
- B. All casing pipe to be joined with 360 degree welds. It shall be mill primed and coated with bituminous based coating before installation. Where coating is damaged during installation, it shall be repaired and replaced by thorough brushing or scraping to sound material and applying two coats of the coating material.
- C. Water main installed in a casing pipe shall be restrained, wood blocking is not allowed.
- D. Casing Spacers: The casing spacers shall have a bolt on shell made in two sections. All metal components shall be Type 304 (18-8) Stainless Steel. It shall have an elastomeric liner to isolate the shell from the carrier pipe. It shall have runners attached to the shell and be designed to provide a minimum of .75 inches clearance between the carrier pipe's greatest outside diameter and the casing pipe's inside diameter. The chock runners shall be beveled with high abrasion resistance and a low friction coefficient. Acceptable manufacturers and models are: PSI S8G-2 and PSI S12G-2, Power Seal #4810, Cascade CCS series and Advance Products & Systems Model SSI, or approved equal.

5.11 INSULATION

5.11.1. Water main insulation shall meet the requirements of Chapter 8.50.0 of Standard Specifications.

5.11.2. Water main insulation for buried application shall be extruded polystyrene in 2" thickness overlapped at breaks or seams by a 1 foot minimum.

5.11.3. Water pipe insulation for station piping shall be closed cell polyethylene designated for the purpose or wrap and tape with minimum 4 layers of FoamSeal Owens Corning sill plate gasket insulation 1/4" x 3-1/2" wide available in 50' rolls at hardware stores, or equal.

7.3 WATER DISTRIBUTION SYSTEM RECORD DRAWINGS

- 7.3.1. Water main record drawings should include the following information:
- A. Title Block
 - B. General notes to include:
 - 1. Name of Development in upper right hand corner
 - 2. Main line size, and material
 - 3. Lateral location, size, material and curb stop elevation
 - 4. Watermain fitting, valve, and hydrant invert elevation
 - 5. Distance from ROW centerline to the watermain
 - 6. Distance along the main from a fitting, valve, grade break, hydrant lead, to the next fitting, valve, grade break, or hydrant lead.
- 7.3.2. A full-time inspector shall be located at the job site during construction of the watermain and laterals. The contractor responsible for the construction of the sanitary sewers and laterals is also responsible for notifying the City per the notification policy of the City of Mequon. (See Appendix E)
- 7.3.3. All water main plans are required to be reviewed and approved by the City

Water Utility Construction Standards

MARCH 2010

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1. WATER MAIN TRENCH

- 1.1. Trench width shall be in accordance with Chapter 4.2.1 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
- 1.2. Trench bottom must be construction to line and grade as specified by the Engineer. Contractor must conform to Chapters 4.3.2 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition when preparing trench.
- 1.3. All materials used for bedding, shall conform to Chapter 4.3.3 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition. Primary and secondary backfill should be installed to at least 90 percent Standard Proctor Density, or as specified by the Engineer.

2. DEWATERING

- 2.1. Dewater the ground as necessary to excavate the trench and install the water main. All pipe and appurtenances shall be laid in a dry condition prior to backfilling. Maintain groundwater level a minimum of 12 inches below pipe invert.
- 2.2. Measure the flow rate from the dewatering pumps at the beginning of the dewatering operation(s) and once a week thereafter. Keep a daily log of hours pumped.
- 2.3. A dewatering permit is required for all dewatering wells installed or operated for a single or aggregate pumping rate would exceed 70 gallons per minute (gpm). Contractor can obtain a permit from:

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
PRIVATE WATER SUPPLY SECTION
P.O. BOX 7921
MADISON, WI 53707

3. BACKFILL

- 3.1. Backfill requirements shall conform to Chapter 2.6.0 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
- 3.2. Pipe Bedding
 - 3.2.1. Backfill immediately after pipe is laid. Restrain pipe as necessary to prevent pipe movement during backfilling operations.
- 3.3. Backfill within Pipe Zone
 - 3.3.1. Backfill immediately after pipe is laid. Restrain pipe as necessary to prevent pipe movement during backfilling operations.
 - 3.3.2. Place material completely under pipe haunches and hand tamp along the pipe haunches with a shovel.

3.4. Backfill above Pipe Zone

- 3.4.1. Place in uniform depths. Initial layer shall be 24 inches and subsequent layers shall not exceed 18 inches before compaction. Complete compaction of each layer before placing material for the succeeding layer.
- 3.4.2. Compact each layer by mechanical means until it meets the requirements of Chapter 2.6.14 (b) of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
- 3.4.3. Any deficiency in quality and quantity of backfill material (caused by shrinkage of settlement) shall be supplied at no additional cost to the City.

4. PIPE INSTALLATION

4.1. General Requirements

- 4.1.1. Installation of PVC, HDPE, and DI, water main shall conform to Chapter 4.3.0 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
 - 4.1.1.1. PVC water main shall conform to Chapter 4.6.0 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
 - 4.1.1.2. DI water main shall conform to Chapter 4.4.0 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
 - 4.1.1.3. Directionally Drilled HDPE water main and services shall conform to Chapter 6.4.0 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
- 4.1.2. When installation operations are interrupted, or terminated at the end of the day, pipe ends shall be sealed temporarily to prevent the entry of water, debris, small animals, or similar types of contamination.
- 4.1.3. Wrap all ductile iron pipe and fittings according to Chapter 4.4.4 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.

4.2. Obstruction in Line or Grade

- 4.2.1. Whenever it becomes necessary to lay a water main over, under, or around a known obstruction, the adjustment procedure will conform to Chapter 4.3.10 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition

4.3. Existing Water Mains

- 4.3.1. The uncovering of existing water mains shall be in accordance with Chapter 4.2.2 "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
- 4.3.2. Before excavation of trenches is started, Contractor shall expose the end of the existing water main to which the new main is to be connected. This will permit adjustments in line and/or grade to avoid the use of an extra fitting.

- 4.3.3. The exposed end of the existing main must be protected and blocked by the Contractor to prevent blowing out of the plug or cap at the end of the main.
- 4.4. Clearance
 - 4.4.1. All acceptable clearances and exceptions are found in the Wisconsin Administrative Code Section NR811.67-811.70. Water mains passing through contaminated soils or groundwater must be approved on a case-by-case basis.
- 4.5. Tracer Wire
 - 4.5.1. Contractor to install insulated #10 gauge solid copper wire along PVC and HDPE pipe installations. Tracer wire shall conform to Chapter 2.11.0 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition. Open trench installations the wire should be laid along the main, attached with tape at 30 ft. intervals.
 - 4.5.2. Test tracer wire test connections can be made at stop boxes located back from the curb, at control point boxes where the wire is looped up from the line to the surface grade, or at service risers attached with a cable tie.
 - 4.5.3. The wires can be spliced together using the Western Union connection or the branch connection.
- 4.6. Pipe/Joint Deflection
 - 4.6.1. Pipe / Joint deflection shall conform to Chapter .

5. HYDRANT INSTALLATION

- 5.1. Hydrants shall conform to Chapter 4.8.0 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
 - 5.2. Hydrant Branch piping material meeting the requirements of Chapter 4.6.3 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
 - 5.3. Crushed stone as specified in Chapter 8.43.6 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition, shall be placed below the base to at least 6-inches above the drain hole in the hydrant stem.
- OR**
- 5.4. After each hydrant has been set, place around the base of the hydrant 1-inch clean washed stone, 3-feet in diameter around the hydrant and 1-foot above the drain holes. Filter fabric shall be placed above the washed stone
 - 5.5. Hydrants shall be solidly buttressed against the trench wall with the use of hardwood blocking.
 - 5.6. Hydrants shall be set on 8" concrete block and the centerline of the hydrant, when set, shall be vertical.

- 5.7. Wrap hydrant assembly according to Chapter 4.4.4, Polyethylene Wrap, (8 mil and taped securely to pipe) of “Standard Specification for Sewer & Water Construction in Wisconsin” latest edition, to the bottom of the breakaway flange.

6. VALVE INSTALLATION

- 6.1. All water main valves shall meet the requirements of Chapter 4.8.0 “Standard Specification for Sewer & Water Construction in Wisconsin” latest edition.
- 6.2. Gate and Resilient Wedge Valves
 - 6.2.1. Gate and resilient wedge valves shall conform to AWWA C-500 for gate valves and C-509 for resilient wedge valves.
 - 6.2.2. Valve shall be suitable for direct burial type installation on distribution mains.
 - 6.2.3. Valves shall be supported on an 8-inch concrete block.
 - 6.2.4. Install valve box adapter prior to setting the valve box.
 - 6.2.5. Wrap valves according to Chapter 4.4.4, Polyethylene Wrap, (8 mils) of “Standard Specification for Sewer & Water Construction in Wisconsin” latest edition
- 6.3. Butterfly Valves
 - 6.3.1. Butterfly valves shall conform to AWWA C-504.
 - 6.3.2. Butterfly valves shall be supported on an 8-inch concrete block
 - 6.3.3. Wrap valves according to Chapter 4.4.4, Polyethylene Wrap, (8 mils) of “Standard Specification for Sewer & Water Construction in Wisconsin” latest edition
- 6.4. Valve Box
 - 6.4.1. Maintain valve box centered and plumb over the operating nut of the valve.
 - 6.4.2. Approved bedding materials shall be tamped in place from a point above the main to a point 6-inches above the bottom of the valve box base to prevent the valve box from shifting.
 - 6.4.3. Set top of valve box flush with the existing surface to provide 12-inches of upward adjustment.
 - 6.4.4. Wrap gate valves according to Chapter 4.4.4, Polyethylene Wrap (8 mils) of “Standard Specification for Sewer & Water Construction in Wisconsin” latest edition

7. WATER MAIN FITTING INSTALLATION

- 7.1. Water main fittings shall conform to Chapter 4.7.0 of “Standard Specification for Sewer & Water Construction in Wisconsin” latest edition.
- 7.2. Install water main fittings in accordance with AWWA C600

- 7.3. Double wrap all water main fittings according to Chapter 4.4.4, Polyethylene Wrap, (8 mil and taped securely to pipe) of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition,

8. THRUST RESTRAINTS

- 8.1. Megalugs (Mechanical Joints)
 - 8.1.1. Megalugs shall be used at all bends, tees, reducers, and dead ends to restrain the required lengths of pipe against potential thrust forces in the pipeline.
 - 8.1.2. Retaining gland restraints shall be used in lieu of concrete block buttresses. Restraining distances for all mechanical joints shall be determined by the design engineer in accordance with suppliers recommendations and Chapter File 47A of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
- 8.2. Concrete Buttresses / Thrust Blocks
 - 8.2.1. Use of concrete buttresses shall be determined by the design engineer. Thrust blocks shall conform to File numbers 44, 44A, 45,46, and 47 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition and AWWA C-600-99.
 - 8.2.2. Concrete thrust blocks shall be used to anchor HDPE water that has been directionally drilled. Thrust blocks shall be designed by the design engineer, and installed according to manufacturer's recommendations.

9. TAPPING SLEEVE AND VALVE

- 9.1. Tapping sleeves and valves are required for connections other than those described in Sections # 550.2 and 550.3.
- 9.2. The outside diameter of the pipe being tapped, the size of the outlet pipe (branch or tap service line), and the working pressure should be specified to assure that the sleeve will be satisfactory.
- 9.3. Tapping sleeves shall not be placed closer than 4 ft. from the bell end of the pipe, fittings, or additional taps.
- 9.4. Tapping sleeves should be assembled and installed according to the instructions provided by the manufacturer.
- 9.5. Tapping sleeves for DI or PVC shall be all stainless steel, including a stainless steel test plug. Tapping saddles on HDPE pipe shall be heat or electrofusion branch saddles.

10. CASING PIPE

- 10.1. Steel casing pipe wall thickness shall conform to the following schedule:

CASING DIAMETER MINIMUM WALL THICKNESS

Casing Diameter (in.)	Casing Thickness (in.)
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6 – 12	0.188
14 – 18	0.250
20 – 30	0.3125
32 – 48	0.4375

All pipe shall conform to all applicable requirements of AWWA C200-86 and AWWA M11, and if fabricated shall be constructed of A36 steel with a minimum yield point of 36 ksi; or if manufactured shall conform to Grade B with a minimum yield point of 35 ksi. It may be shipped in random lengths between 18 and 22 feet and shall have one end cut square and one end beveled. All casing pipe is to be joined with 360 degree welds. It shall be mill primed and coated with bituminous based coating before installation. Where coating is damaged during installation, it shall be repaired and replaced by thorough brushing or scraping to sound material and applying two coats of the coating material.

- 10.2. Water main installed in a casing pipe shall be restrained.
- 10.3. Casing Spacers: The casing spacers shall have a bolt on shell made in two sections. All metal components shall be Type 304 (18-8) Stainless Steel. It shall have an elastomeric liner to isolate the shell from the carrier pipe. It shall have runners attached to the shell and be designed to provide a minimum of .75 inches clearance between the carrier pipe's greatest outside diameter and the casing pipe's inside diameter. The chock runners shall be beveled with high abrasion resistance and a low friction coefficient. Acceptable manufacturers and models are: PSI S8G-2 and PSI S12G-2, Power Seal #4810, Cascade CCS series and Advance Products & Systems Model SSI, or approved equal.

11. INSULATION

- 11.1. Water main insulation for buried application shall be extruded polystyrene in 2" thickness overlapped at breaks or seams by a 1 foot minimum.
- 11.2. Water pipe insulation for station piping shall be closed cell polyethylene designated for the purpose or wrap and tape with minimum 4 layers of FoamSealR Owens Corning sill plate gasket insulation 1/4" x 3-1/2" wide available in 50' rolls at hardware stores, or equal.

12. WATER SERVICES – LATERALS

- 12.1. General specifications for water service lateral piping are listed in this section. Specifications for tapping water main are listed in Section 13(ductile iron wm), Section 14 (PVC wm), and Section 14 (HDPE wm).
- 12.2. Water service piping and fittings
 - 12.2.1. Service laterals shall be 2 inch, HDPE, PE 3408, SDR 9 (pressure rating 200 psi) pipe meeting the requirements of AWWA C-901 unless otherwise specified on plan or directed by the engineer.
 - 12.2.2. Tapping saddles shall be stainless steel and used for all service taps. Tapping saddles on HDPE pipe shall be heat or electrofusion branch saddles or if mechanical shall be installed with a minimum of 3 Bellville spring washers per bolt.

- 12.2.3. Corporation stops shall be Mueller B-25008, or approved equal.
- 12.2.4. Curb stops shall be Mueller B-25155, or approved equal.
- 12.2.5. Curb boxes shall be cast iron Mueller H-10300 with curb stop key extension, or Approve equal.
- 12.2.6. Pipe stiffeners must be used at all mechanical connections over 1”.
- 12.3. Water services 4 inch and larger
 - 12.3.1. Curb stops for 4 inch and larger services shall conform to the water main valve specification.
 - 12.3.2. Unless otherwise approved, the service tee shall be an anchor tee.
- 12.4. Setting Water Service Box
 - 12.4.1. Water service box shall be centered over the curb stop and shall be brought to proper grade.
 - 12.4.2. The legs of the service box shall rest firmly upon a 2-inch by 6-inch by 8-inch hardwood board
 - 12.4.3. Clearance shall be provided so the service box does not rest upon the water service valve
 - 12.4.4. Where the bench does not affect a firm support for the service box blocking, such support shall be furnished by the use of a 2-inch by 6-inch plank placed across the building sanitary sewer trench and firmly supported in each bank.
 - 12.4.5. The service box shall be plumbed and braced so it will remain vertical throughout the backfilling.
 - 12.4.6. Sufficient excavation shall be made for the service box installation to insure proper setting and backfilling around the service box
 - 12.4.7. Tracer wire for service lateral?

13. WATER SERVICES - DUCTILE IRON MAIN

- 13.1. General
 - 13.1.1. All pipe services and connections are made in accordance with Chapter 5.5.0 of the *Standard Specifications for Sewer & Water Construction in Wisconsin* and *AWWA C600-93*.
 - 13.1.2. Water service connections are designated as either direct tapping, saddle tapping, or tapping sleeve and valves. Water service piping is designated as either tap service or branch service.

13.2. Direct taps may be used on all pressure classes and size ductile iron pipes:

Maximum Recommended Direct Tap Size for 3 through 24 inch Ductile Iron Pipe

Size (inches)	Pressure Class				
	150	200	250	300	350
3					¾
4					¾
6					1
8					1
10					1
12					1 ¼
14			1 ¼	1 ½	1 ½
16			1 ½	2	2
18			2	2	2
20			2	2	2
24		2	2	2	2

13.2.1. Corporation stops shall be threaded and conform to ANSI/AWWA C800-89.

13.2.2. Direct taps shall not be closer than 12 inches from the ends of the pipe, or fittings. Multiple taps in a single pipe shall be staggered around the circumference and at least 12 inches apart when measured along a straight line.

13.2.3. The following procedure may be followed when installing a direct tap on a polyethylene encased pipe:

13.2.3.1. Wrap two or three layers of polyethylene adhesive tape completely around the pipe to cover the area where the tapping machine and chain will be mounted.

13.2.3.2. The tapping machine shall be placed firmly on the pipe in accordance with recommendations of the machine manufacturer. Corporation stop installation should be done according to the manufacturers instructions for the tapping device.

13.2.3.3. Acceptable sealant tape may be applied to the threads of the corporation stop to prevent leakage at lower pressures and to reduce installation torque requirements.

13.2.3.4. If leakage at the threads occurs the connection should be tightened. If leakage persists the line shall be depressurized and the corporation stop reinstalled after the pipe hole threads have been cleaned.

13.3. Saddle Tapping for ductile iron pipe requires that the following conditions are met:

13.3.1. Saddle tapping may be used on all class and size pipes; however, the outlet line must be a maximum 2 inch diameter. (Tap service line).

13.3.2. Saddle sleeve edges shall not be placed closer than 12 inches from the bell end of the pipe, fittings, or additional taps

13.3.3. The following procedure should be followed when installing a saddle tap:

13.3.3.1. The service clamp or saddle shall be evenly tightened on the pipe. The inlet side of the corporation stop shall be screwed into the saddle threads and the stop valve shall then be opened.

13.3.3.2. The drilling machine shall be attached to the corporation stop's outlet threads.

13.3.3.3. After the hole has been cut, the cutter shall then be withdrawn, the corporation stop closed, and the drilling machine removed from the pipe. If leakage occurs, the corp stop should be tightened.

13.4. Tap Service Piping

13.4.1. Tap service piping shall include all pipe 2 inches in diameter or smaller.

13.4.2. The components of a tap service are the: service tee or corporation stop, pipe, curb stop with a peened end tail piece that extends beyond the curb stop to the lot line, and service box.

13.4.3. The standard water service shall have a minimum internal diameter that is in accordance with the Wisconsin Administration Code, and with the curb stop located as specified by the Engineer.

13.4.4. Pipe from the service tee to curb stop shall be of one continuous length unless fittings are specified by the Engineer.

13.5. Branch Service Piping

13.5.1. Branch service piping shall include all water piping 3 inches in diameter or larger.

13.5.2. The components of a branch service are: a tapping sleeve and valve or a 3-way branch, a valve, a valve box and extension of pipe extending to the lot line at which point the end will be plugged or capped.

13.6. Service Connection to Water Main

13.6.1. The minimum distance between a corporation stop and any mechanical fitting is a distance of 1 foot.

13.6.2. The minimum distance from any fitting, or another tap on either side of the main to a tapping valve is a distance of 4 feet.

13.7. Alignment, Position, and Grade

13.7.1. The minimum vertical clearance between the water service and a building sanitary sewer shall be **12 inches** if the water service is above, and **18 inches** if the water service is below.

13.7.2. Water service piping crossing above or below conduits or other structures shall have a minimum clearance of **3 inches**.

- 13.7.3. Tap service lines shall have a minimum horizontal separation of **18 inches** from a parallel building sewer line.
- 13.7.4. Branch service lines shall have a minimum horizontal separation of **24 inches** from a parallel building sewer line.
- 13.7.5. Water service piping shall have a minimum cover of **6 ft.** from the established street grade. The curb stop of the tap water service or the gate valve of the branch service shall have a minimum cover of **6 ft.** and a maximum cover of **6½ ft.** from the established street grade.

14. WATER SERVICES - PVC MAIN

14.1. General Requirements

- 14.1.1. All pipe services and connections are made in accordance with Chapter 5.5.0 of the *Standard Specifications for Sewer & Water Construction in Wisconsin* and *AWWA C605-94*.
- 14.1.2. Water service connections are designated as either direct tapping, saddle tapping, or tapping sleeve and valves. Water service piping is designated as either tap service or branch service.

14.2. Direct Tapping services on PVC main requires that the following conditions are met:

- 14.2.1. Taps shall be 1 inch or smaller. (Tap service line).
- 14.2.2. Nominal pipe sizes shall be limited to 6 inches through 12 inches.
- 14.2.3. Corporation stops shall be threaded and conform to ANSI/AWWA C800
- 14.2.4. Direct taps shall not be made closer than 24 inches from pipe ends, or fittings. Multiple taps in a single pipe shall be staggered around the circumference and at least 18 inches apart when measured along the axis of the pipe.
- 14.2.5. The following procedure should be followed when installing a direct tap:
 - 14.2.5.1. All tapping should be done in accordance with instructions of the machine manufacturer.
 - 14.2.5.2. Two spiral wraps of three-mail PTFE tape shall be applied clockwise to the inlet threads on the closed corporation stop.
 - 14.2.5.3. The insertion shall be completed using torque wrench and tightening to 27 ft-lbs.
 - 14.2.5.4. At correct insertion the corporation stop should have one to three threads visible. If leakage occurs a torque wrench can be used to tighten the stop to 35 ft-lbs.
 - 14.2.5.5. If leakage persists the line shall be depressurized and the corporation stop reinstalled after the pipe hole threads have been cleaned.

14.3. Saddle Tapping: Saddle tapping requires that the following conditions are met:

- 14.3.1. Saddle tapping may be used on all class and size pipes; however, the outlet line must be a maximum 2 inch diameter. (Tap service line).
- 14.3.2. All service clamps or saddles used on PVC shall be manufactured specifically for PVC. The clamp bearing area shall be a minimum 2 inch width for taps up to 1 inch, and a minimum 3 inch width for taps 1¼ inches to 2 inches.
- 14.3.3. Saddle sleeves shall not be placed closer than 1 ft. from the bell end of the pipe, fittings, or additional taps
- 14.3.4. The following procedure should be followed when installing a saddle tap:
 - 14.3.4.1. The service clamp or saddle shall be evenly tightened on the pipe. The inlet side of the main stop or corporation stop shall be screwed into the saddle threads. The main-stop valve shall then be opened.
 - 14.3.4.2. All tapping should be done in accordance with instructions of the machine manufacturer.
 - 14.3.4.3. After the hole has been cut, the cutter shall then be withdrawn, the corp stop closed, and the drilling machine removed from the pipe. If leakage occurs, the corp stop should be tightened.
- 14.4. Tapping Sleeves and Valves Tapping sleeves and valves are required for connections other than those described in Section 350.2 and 350.3.
 - 14.4.1. The outside diameter of the pipe being tapped, the size of the outlet pipe (branch or tap service line), and the working pressure should be specified to assure that the sleeve will be satisfactory.
 - 14.4.2. Tapping sleeves shall not be placed closer than 4 ft. from the bell end of the pipe, fittings, or additional taps.
 - 14.4.3. Tapping sleeves should be well supported, independent of the pipe during tapping The support used should be left in place.
 - 14.4.4. Tapping sleeves should be assembled and installed according to the instructions provided by the manufacturer.
- 14.5. Tap Service Piping
 - 14.5.1. Tap service piping shall include all pipe 2 inches in diameter or smaller.
 - 14.5.2. The components of a tap service are the: service tee or corporation stop, pipe, curb stop with a peened end tail piece that extends beyond the curb stop to the lot line, and service box.
 - 14.5.3. The standard water service shall have a minimum internal diameter that is in accordance with the Wisconsin Administration Code, and with the curb stop located as specified by the Engineer.

- 14.5.4. Pipe from the service tee to curb stop shall be of one continuous length unless fittings are specified by the Engineer.
- 14.6. Branch Service Piping
 - 14.6.1. Branch service piping shall include all water piping 3 inches in diameter or larger.
 - 14.6.2. The components of a branch service are: a tapping sleeve and valve or a 3-way branch, a valve, a valve box and extension of pipe extending to the lot line at which point the end will be plugged or capped.
- 14.7. Service Connection to Water Main
 - 14.7.1. The minimum distance between a saddled corporation stop and a mechanical fitting is a distance of 1 foot. (Does not apply to a direct tap.)
 - 14.7.2. The minimum distance from any fitting, or another tap on either side of the main to a tapping valve is a distance of 4 feet.
- 14.8. Alignment, Position, and Grade
 - 14.8.1. The minimum vertical clearance between the water service and a building sanitary sewer shall be **12 inches** if the water service is above, and **18 inches** if the water service is below.
 - 14.8.2. Water service piping crossing above or below conduits or other structures shall have a minimum clearance of **3 inches**.
 - 14.8.3. Tap service lines shall have a minimum horizontal separation of **18 inches** from a parallel building sewer line.
 - 14.8.4. Branch service lines shall have a minimum horizontal separation of **24 inches** from a parallel building sewer line.
 - 14.8.5. Water service piping shall have a minimum cover of **6 ft.** from the established street grade. The curb stop of the tap water service or the gate valve of the branch service shall have a minimum cover of **6 ft.** and a maximum cover of **6½ ft.** from the established street grade.

15. TESTING & DISINFECTION

- 15.1. General Requirements
 - 15.1.1. Hydrostatic testing should be made in accordance with Chapter 4.15.0 "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
 - 15.1.2. Disinfection testing should be made in accordance with Chapter 4.16.0 "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
- 15.2. Hydrostatic Testing
 - 15.2.1. Pressure and leakage testing shall be in accordance with the latest edition of A.W.W.A. Standard C600.

- 15.2.2. Pressure testing of the installed pipe shall be completed under Owner's supervision.
- 15.2.3. Following examination of exposed parts of the system ("wet-hand" test); the test pressure will be increased to 150 psi read at the point of lowest elevation on the main for duration of one hour. There should be no noticeable pressure drop in the test section.
- 15.2.4. If it is found unnecessary to add water during the duration of the pressure test, the Engineer may waive the leakage test.
- 15.2.5. If leakage test is not waived, test shall be in accordance with Chapter 4.15.3 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.

15.3. Disinfection Testing

- 15.3.1. All new, cleaned or repaired water mains shall be disinfected in accordance with A.W.W.A. Standard C651 and Wisconsin Administrative Code NR 811.07 (3).
- 15.3.2. The new water main can remain disconnected from the existing main until disinfection and final bacteriological tests have been completed. The water required for hydrostatic testing, disinfection, and flushing would be supplied through a temporary connection controlled by a control valve at a hydrant that is separated from the existing water system.
- 15.3.3. If approved by the City, the new water main can be connected to the existing main during construction for disinfection purposes. Contractor will submit to the City, backflow protection procedure to keep contaminated water from entering the existing main .

15.3.4. Methods of Chlorination

- 15.3.4.1. Tablet - Hypochlorite tablets can be used during construction in accordance with Chapter 4.3.12 of "Standard Specification for Sewer & Water Construction in Wisconsin" latest edition.
- 15.3.4.2. Continuous feed - This method consists of placing calcium hypochlorite granules in the main during construction, completely filling the main to remove all air pockets, flushing the completed main to remove particulates, and filling the main with potable water. Chlorine concentration should be tested at regular intervals downstream of where the water is added to verify the minimum free chlorine residual does not drop below 25 mg/l.
- 15.3.4.3. Slug - The procedure is similar to the continuous-feed method except the dose of chlorine fed at a constant rate increases the concentration to 100mg/L. The chlorinated water slowly flows through the pipe for at least 3 hours, exposing all interior surfaces to the high concentration. Valves and hydrants should be treated with this water also. During the 3 hour period, the water should have a residual of 50 mg/L free chlorine or more.

15.3.5. Flushing

- 15.3.5.1. The flushing velocity in mains shall be greater than 2.5 ft/s. The following table gives the flow rates required to produce the flushing velocity in some typical pipe sizes:

Required flow and openings to flush pipelines (40 psi residual pressure in main)*

Pipe Diameter (inches)	Flow required to produce 2.5 ft/s in main (gpm)	Tap Size (inches)			Number of 2-1/2 inch hydrant outlets
		1	1-1/2	2	
4	100	1	--	--	1
6	200	--	1	--	1
8	400	--	2	1	1
10	600	--	3	2	1
12	900	--	--	3	2
16	1,600	--	--	4	2

*With a 40 psi pressure in the main and the hydrant flowing to atmosphere, a 2½ hydrant outlet will discharge approximately 1000 gpm; and a 4½ hydrant outlet will discharge approximately 2500 gpm

15.3.6. Bacteriological Test (5)

- 15.3.6.1. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken 24 hours apart, shall be collected from the main. A set is made up from groups of samples collected every 1,200 feet of new main, groups of samples taken at each branch, and a group of samples taken at the end of the line.
- 15.3.6.2. All samples shall be collected in sterile bottles treated with sodium thiosulfate as required by the *Standard Methods for the Examination of Water and Wastewater*. A suggested combination blowoff and sampling tap is useful for mains up to 8 inches in diameter. A corporation cock may be installed on the main with a copper-tube gooseneck assembly. No hose or hydrant shall be used to collect samples.
- 15.3.6.3. All samples shall be tested for bacteriological quality in accordance with *Standard Methods for the Examination of Water and Wastewater*, and shall be void of coli form organisms.
- 15.3.6.4. If trench water or excessive quantities of dirt and debris have entered the new main during construction, bacteriological samples may be taken at marked intervals of 200 feet. Any water left in the main for 16 hours or more must be tested for bacterial contamination.

Meter Standards & Private Fire Protection Systems

MARCH 2010

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1. SCOPE

This design standard covers acceptable designs for water main construction. Local, State, and Federal regulations supersede the requirements of this standard. Design parameters not included in this standard or that deviate from this standard must be approved by the City of Mequon Water Utility Planning Engineer (Engineer) prior to final submittal for permit approval.

2. METER SET DESIGN REQUIREMENTS

- 2.1. Meter size calculations, provided to the Water Utility Engineer, are required prior to meter delivery.
- 2.2. Meter sizing for new construction will be based on fixture counts and maximum design flow calculated from the plumbing code. The design maximum flow will be less than the upper limit of the typical operating range of the meter size selected as specified by AWWA standards. Pressure and flow requirements for the new construction's plumbing fixture will be accounted for in sizing the water lateral and internal plumbing.
- 2.3. Meter sizing for existing buildings converting from a private well without an existing service lateral will be based on fixture counts and maximum design flow calculated from the plumbing code. The design maximum flow will be less than the upper limit of the typical operating range of the meter size selected as specified by AWWA standards. Pressure and flow requirements for the existing building's plumbing fixtures will be accounted for in sizing the water lateral. If pressure and flow requirements are not met by adjusting the service lateral size, increasing meter size will be considered at the request of the building owner.
- 2.4. All meter sets shall be located within 3 feet of the service piping entrance to the building and within 4 feet of the floor.
- 2.5. Meter sets shall have minimum of 3 feet clearance around the meter set except the exterior wall the meter set may be mounted to.
- 2.6. Meter sets shall be accessible without using any tools or damaging any surrounding material.
- 2.7. There shall be no valves or tees in the service piping or connected to the service piping prior to meter inlet valve.
- 2.8. Meter set outlet valves shall be full port valves.
- 2.9. Meters will be delivered to the site by the Water Utility and installed by the plumber.
- 2.10. Water to a plumbing system may be turned on by the plumber for one hour to wet test the plumbing system without a meter installed. The curb stop and meter inlet valve must remain in the off position until the meter is installed, except for the wet test. No pipe or meter jumper shall remain in the meter set prior to meter installation.
- 2.11. A meter will be delivered to the site only after Water Utility confirms all applicable standards and rules have been met. The Water Utility will give notice that the plumbing system may be turned on.
 - 2.11.1. Although all standards and rules apply to every service connection, the following are key requirements specifically investigated at the time of meter delivery.

- 2.11.1.1. A service application must be signed.
- 2.11.1.2. Prior to activation of water service, the water system must be inspected by the activator and all cross-connections must be eliminated.
- 2.11.1.3. Curb stop and box must be accessible, operable, and adjusted to the correct elevation.
- 2.11.1.4. The Water Utility must own the water main the service is connected to, or the privately owned water main must meet requirements of this specification.

3. METER SET

- 3.1. Meters 1 inch and smaller.
 - 3.1.1. Meter sets shall have a Mueller Mark II Oriseal Curb Valve H-15172, or approved equal, as the meter inlet valve.
 - 3.1.2. Swivels shall be used on the inlet and outlet of the meter horn.
 - 3.1.3. A meter horn with a meter spread of 7½ inches shall be installed for meters less than 1 inch, and 11 inches for 1 inch meters.
- 3.2. Meters 1½ inch and larger
 - 3.2.1. A meter by-pass shall be provided for all meters 1½ inch and larger with a single full port valve on the by-pass and two isolation valves on the meter run.
 - 3.2.2. Meter sets for 1½ inch and larger meters shall have a plug test port designed into the meter set piping equal to the outlet size of the meter. The test port shall be a tee with a NPT threaded plug.
 - 3.2.3. For meters 1½ inch and larger, contact Water Services for the correct meter spread prior to constructing
 - 3.2.4. A strainer shall be installed between the meter inlet valve and the meter.
 - 3.2.5. The meter and strainer shall be installed using flanged joints.

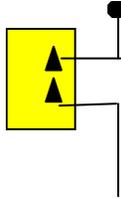
4. INTERNAL PRIVATE FIRE PROTECTION

- 4.1. At a minimum, double check backflow protection must be provided for all private fire protection.
- 4.2. The fire line may tee off upstream from the meter for domestic water supply. A double detector check meter assembly is required whenever the fire line is upstream of the meter for domestic water supply.
- 4.3. Private fire protection rate {shall/shall not} apply if the fire protection line is downstream of the meter for domestic water supply.
- 4.4. Written testing notice of the backflow prevention device must be provided to the Water Utility each calendar year not to exceed 15 months.

5. EXTERNAL PRIVATE FIRE PROTECTION

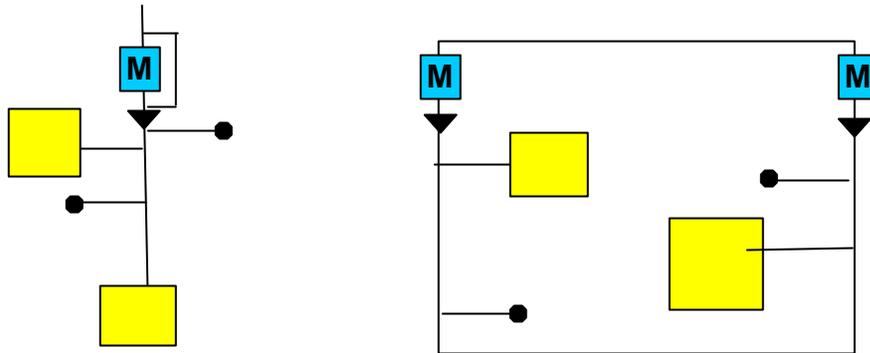
5.1. Privately owned external fire system must conform to one of the following categories:

5.1.1. Building Division



5.1.1.1. At a minimum, double check backflow protection must be provided. A double detector check meter assembly is also required.

5.1.2. Common Private Fire / Service



5.1.2.1. (Need new Diagrams)

5.1.2.2. At a minimum, single check backflow protection must be provided for external fire protection systems.

5.1.2.3. The large meter on a compound meters must be designed to handle internal and external fire demands.

5.1.2.4. Private systems with only one connection to the Water Service system must have a by-pass equal to the meter run.

5.2. Written testing notice of the backflow prevention device, system maintenance, and flushing gallons must be provided to the Water Utility each calendar year.