

WATER MAIN DEVELOPMENT SPECIFICATIONS
CITY OF BROOKFIELD, WI
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15.01 WATER MAIN CONSTRUCTION

Water main shall be installed at the grades indicated on the plans with a 6' minimum depth of cover. Water main pipe shall be AWWA C900 PVC, Class 235 (DR18). Tracer wire shall be installed above all water mains and laterals (see tracer wire section in special conditions, construction notes, and City Standard Details).

Joint deflections required for horizontal and vertical breaks indicated on the plans shall be limited to two (2) degrees or less. If a larger deflection is required, it shall be made gradually over two or more joints. No bending or curvature of the pipe shall be permitted.

The trench section shall be according to the City of Brookfield Standard Detail No. UTY-2.

Compaction of the backfill shall be accomplished by mechanical compaction of the trench in accordance with Section 2.6.14(b) of the Standard Specifications.

Density tests on backfill materials will be as specified or as directed by the Engineer. The Contractor will provide for all compaction testing. The Contractor shall re-compact all areas represented by failed density tests. The Contractor shall correct settlement resulting from the consolidation of backfill.

The Contractor shall remove all excavated material from the public right-of-way and/or easement areas.

15.02 HORIZONTAL DIRECTIONAL DRILLING (HDD)

Horizontal Directional Drilling (HDD) of water main shall be per Chapter 6.4.0 of the Standard Specifications. Directionally drilled water main shall be PVC or HDPE per the City of Brookfield Water Main Material Specifications.

Contractor shall submit their proposed pipe material and a boring pit layout plan to the Engineer for review and approval prior to construction.

15.03 ADJUST HYDRANT

This special provision describes adjusting (up or down), protecting, and maintaining accessibility for the duration of this project, to all existing hydrants specified on the plans to be adjusted and/or as directed by the Engineer.

All materials necessary to cut down the hydrant or hydrant extensions necessary to raise the hydrant to proposed elevations shall be compatible with the manufacturer of each type of hydrant and shall meet City specifications.

Setting Hydrants: Locate as shown or as directed and in a manner to provide complete accessibility, also in such a manner that the possibility of damage from vehicles or injury

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to pedestrians will be minimized. Align the pumper nozzle per the owner's direction. Set to the established grade according to the City of Brookfield Standard Detail No. WAT-1. The Contractor shall verify the proposed grade elevations prior to adjusting the hydrant.

Throughout the duration of the project, the Contractor must ensure that all at all times, all hydrants remain accessible for operation by City forces. Exercise caution working adjacent to hydrants to avoid damage and ensure accessibility.

Upon completion of the contract, the City will inspect all hydrants to ensure they are clean, properly aligned, set at the correct grades, and accessible. The Contractor shall be responsible to make identified repairs and adjustments.

15.04 GATE VALVES AND BOXES

Gate valves, boxes and valve adaptors shall be installed in accordance to section 4.8 of the Standard Specifications, the City of Brookfield Standard Detail No. WAT-3 and No. WAT-4 and shall meet the requirements listed in the City of Brookfield Water Main Material Specifications.

Valve boxes shall be set to finished grade and shall have a minimum of 12-inches adjustment up and down. All valves and boxes shall be fully operable and plumb. This shall be checked by City Inspector and contractor prior to acceptance. Deviations both vertical and horizontal from center of operating nut in excess of 1-inch shall not be acceptable.

Only the City of Brookfield shall be allowed to operate existing valves during construction unless otherwise approved by the Engineer.

15.05 TRACER WIRE AND ACCESS TERMINALS

Tracer wire shall meet the requirements listed in the City of Brookfield Water Main Material Specifications. Non-wet bury insulated wire will not be accepted.

Tracer wire shall be taped to the top of all PVC and HDPE pipe. The tracer wire shall be wrapped around the pipe at the beginning and at the end of the pipe installation and shall extend along the entire length of pipe in a continuous fashion.

Tracer wire shall be brought to the surface at each curb stop location according to the City of Brookfield Standard Detail No. WAT-11, the wire shall terminate at the surface and shall attach to the curb stop lid. Curb stop lids shall meet the requirements listed in the City of Brookfield Water Main Material Specifications

Splices must be made utilizing a 3-way, direct bury, water proof tracer wire connector meeting the requirements listed in the City of Brookfield Water Main Material Specifications. Soldering wires together is not allowed.

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Tracer wire access terminals are required at each hydrant location as shown on the City of Brookfield Standard Detail No. WAT-1. Tracer wire access terminals shall meet the requirements listed in the City of Brookfield Water Main Material Specifications.

15.06 PIPE FITTINGS AND POLYETHYLENE WRAP

Pipe fittings, bolts and polyethylene wrap shall meet the requirements listed in the Detailed Specification Section 9.0.

Polyethylene wrap shall be used for corrosion protection on all ductile iron water main fittings in accordance with Section 4.4.4 of the Standard Specifications.

15.07 WATER SERVICE LATERALS

All residential water service laterals shall be installed according to the City of Brookfield Standard Detail No. WAT-11.

All water services shall be installed perpendicular to new water main unless otherwise approved by engineer. Corporation stops shall not be installed under a driveway unless otherwise directed by the Engineer.

The Engineer reserves the right to require that the water service be insulated with Polystyrene Insulation where minimum cover is not available or where crossing over or under an existing or future storm sewer.

A meter box cover shall be installed over any curb stop box that is installed in pavement such as a roadway, driveway, sidewalk, etc. The meter box cover shall meet the requirements listed in the Detailed Specification Section 9.0. Each meter box cover shall be installed to match the surrounding pavement grade.

15.08 WATER MAIN OFFSETS AND/OR LOWERING

Water main shall be lowered, as necessary via open cut, in locations shown in the plans and as directed by the Engineer to match adequate vertical separation between storm and sanitary crossings. Offsets shall be installed in accordance to the City of Brookfield Standard Detail No. WAT-8.

Contractor shall protect & support all storm sewer crossings. Contractor shall be responsible for replacing any storm sewer and/or culver damaged as part of construction. Storm sewer and/or sanitary flows shall be maintained by Contractor throughout the duration of the project.

15.09 WATER MAIN TESTING

All tests are required in accordance with the Standard Specifications and Wisconsin Department of Natural Resources (WDNR).

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Water Main pressure testing shall not be performed until 7 days have passed since the last buttress was poured. If earlier testing is desired, the Contractor may, at his option and cost substitute Class "A" Concrete or high early strength concrete for the Class "F" concrete specified for buttresses. Should either option be selected, the testing may be performed no sooner than 48 hours after the last buttress was poured. Concrete tickets showing the mix design and any additives shall be submitted to the Engineer.

Disinfect all newly installed Water Mains, appurtenances, and services in accordance to AWWA C651. Flush system within 24 hours after disinfection is completed. The stem of all low end hydrants shall be removed during flushing operations as directed by the Engineer. After final flushing obtain 2 sets of samples taken a minimum of 24 hours apart. Each sample set shall include one sample for every 1200 feet of main and one sample of each dead-end. Ensure that 1 sample is obtained from each branch of the main. Rechlorinate if any sample tests positive for coliform.

All flushing water from hydrostatic testing, cleaning, and disinfection shall be monitored and sampled following treatment at the end of the pipe (if applicable) or prior to entering any pipe, ditch, channel, or swale. The Contractor shall provide all equipment necessary to adequately treat the flushing water coming out of the pipe. The Contractor shall follow all monitoring and sampling protocols as described in Section 3.3 of the WPDES Permit No. WI-B057681-05-0 found on the WDNR website.

Required monitoring and sampling includes the flow rate of water flushed, total suspended solids, PH monitoring, total residual chlorine, and total phosphorus. The PH and chlorine monitoring may be completed by the Contractor in the field. All field sampling equipment shall be calibrated and provided by the Contractor. All samples shall be obtained from a Contractor provided sample tap affixed to a hydrant. Flow meters are available for use at the City. Total suspended solids and phosphorous testing shall be completed in a lab certified or registered under Ch. NR 149, Wis. Adm. Code. All sampling and monitoring results shall be provided to the City. The City will report all results to WDNR. The Contractor shall be responsible for any fines or actions imposed by WDNR for any monitoring or sampling results deemed to be non-compliant with the required parameters.

The Contractor shall take all necessary safe water samples and be responsible for testing of samples and providing test results to the City. The Contractor shall also be responsible for all monitoring, sampling, and testing required per the WPDES General Permit. All costs associated with monitoring, sampling, and testing shall be considered incidental.

15.10 CONNECTION TO EXISTING WATER SYSTEM

The new water main shall be physically isolated from the existing water system until successful completion of the pressure test and receipt of two (2) consecutive safe water samples, taken a minimum of 24 hours apart. No flushing is allowed between samples.

Contractor shall verify location and elevations of existing water main at all water main connections.

15.11 SALVAGING REMOVED WATER MAIN APPURTENANCES

All existing water main appurtenances removed as part of this project including, but not limited to, hydrants, flushing hydrants, valves, air vents, plugs, tees, crosses, reducers, bends or other miscellaneous fittings shall be salvaged and delivered to the City of Brookfield Water Utility unless otherwise directed by the Engineer. Any water main appurtenances that the Engineer determines is not worth salvaging shall become the property of the Contractor and shall be removed from the project. All costs associated with salvaging and delivery of removed appurtenances shall be considered incidental.

15.12 FINAL PROJECT CHECK OUT/PUNCH LIST

As part of the final project check out, the Contractor shall:

- a.) Insure continuity of the tracer wire for all water mains and services installed by a method acceptable to the Engineer. The Contractor shall be responsible to make all required repairs to the tracer wire to insure continuity.
- b.) The Contractor shall walk the job with the Engineer or the Engineer's representative and insure that all valves are in the open position.
- c.) The Contractor shall walk the job with the Engineer or the Engineer's representative and insure all curb stops are operable.
- d.) The Contractor shall flush stones and debris from the new water main that may lodge in the seat of fire hydrants. This shall be done by removing hydrant heads at select low points along the water main route (hydrants are to be selected by the Contractor with the approval of the Engineer) and flushing the main. This flushing is in addition to the flushing/chlorination process and safe water sample required prior to connecting the new water main to the existing water system.
- e.) Insure all required water main testing has been completed and approved.
- f.) Insure all areas are properly restored.
- g.) The Contractor shall complete, sign, and submit a copy of the water main construction checklist. A copy of the water main construction checklist can be obtained from the Engineer.

15.13 CITY OF BROOKFIELD WATER MAIN MATERIAL SPECIFICATIONS

MATERIALS

1. Water Main Pipe
PVC shall be C-900, Class 235 (DR18) for 6" through 12" sizes.

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PVC shall be C-905, Class 235 (DR18) for sizes larger than 12”.

PVC for **DIRECTIONAL DRILL** shall be Restrained joint Polyvinyl Chloride (PVC) Pipe AWWA C-900, Class 235 (DR18) for 8” through 12”, with cast-iron pipe (C.I.) outside diameters as well as related couplings that are intended for use in pressure-rated potable water delivery and underground fire protection piping systems utilized with Horizontal Direction Drilling applications. Pipe shall be North American Specialty Products C900/RJ™ Certa-Lok® Restrained Joint Piping System or approved equal.

HDPE shall be AWWA C-906, DR 11, ductile iron pipe size (DIPS), high-density polyethylene (HDPE) water pipe for use as a fluid pressure conduit.

Ductile Iron shall be Class 350 (cement lined), AWWA C-151 slip joint pipe with compression type push-on rubber gaskets conforming to AWWA C-111 (unless an alternate joint is specified in the Special Conditions).

2. Joints

PVC pipe shall have push-on bell joints with rubber gasket. Exception shall be restrained joint pipe as described in (1) above

HDPE pipe shall be joined by means of a zero leak-rate heat fusion or electrofusion butt joint and approved mechanical joints, meeting the specifications and requirements of AWWA C-906.

Ductile Iron shall be slip joint pipe with compression type push-on rubber gaskets conforming to AWWA C-111 (unless an alternate joint is specified in the Special Conditions).

Restrained Joints for PVC or Ductile pipe shall be “Megalug” mechanical joint restraint by EBBA Iron or approved equal. The mechanical joint restraint must be the appropriate restraint for ductile iron or PVC pipe, whichever is specified.

PVC bell joint restraints shall be Series 1600 Bell Restraint Harness for C900 PVC pipe by EBAA Iron or approved equal. The restraint harness shall be coated with a bitumastic coating for corrosion control following installation.

3. Fittings

Shall be Ductile Iron with mechanical joints conforming to Chapter 8.22.0 of the Standard Specifications, A.W.W.A. C-110 and C-111 with the exception of the manufacturer's design dimensions and thicknesses. Compact Ductile Iron fittings are allowed in accordance with Chapter 8.22.2 of the Standard Specifications.

HDPE connections to dissimilar materials (PVC or DIP) shall be made with HDPE mechanical joint adaptors or internal stainless steel stiffeners and mega lugs.

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HDPE mechanical joint adapters shall conform to AWWA C-906 for connections to dissimilar materials (PVC or ductile iron). A butt fused HDPE mechanical joint adapter with a stainless steel internal stiffener shall be used. The DR for any polyethylene fitting shall be 9 unless otherwise specified.

3.1. Mechanical Joint Bolts

Shall be 3/4" T-Head bolts manufactured from corrosion-resistant, high-strength low-alloy steel in accordance with ANSI/AWWA C111/A21.11 that have a baked-on ceramic-filled fluorocarbon resin. Bolts shall be stainless steel, Cor-Blue, or approved equal. Never seize shall be applied to all stainless steel bolts prior to assembly.

3.2 Polyethylene Encasement

Required for all fittings and associated accessories. Shall conform to SWWA C-105 or SNSI A21.5. Film shall be Class "C" – Black, with a minimum nominal thickness of 0.008 inches (8 mils).

Tape for securing the encasement shall be a thermoplastic material with a minimum thickness of 8 mils and a minimum width of one inch.

4. Services

Residential:

1-1/4" – 2" CTS C-901 SDR-9 HDPE Water Tube. On HDPE services, solid stainless steel insert sleeves should be included with the curb stop and corporation stop. Joints shall be with pack joint compression fittings as manufactured by Mueller, McDonald and Ford.

Commercial/ Multifamily:

2" CTS C-901 SDR-9 HDPE Water Tube. On HDPE services, solid stainless steel insert sleeves should be included with the curb stop and corporation stop. Joints shall be with pack joint compression fittings as manufactured by Mueller, McDonald and Ford.

6" PVC C-900, Class 235 (DR 18) shall also include a water service gate valve following the requirements for "Gate Valves AWWA Spec. C509" of these material specifications.

5. Corporation Stops

For HDPE Water Tube

1" x 1-1/4", 1-1/2", 1-1/2" x 2" & 2"

Shall be:	Mueller	H-15008
	McDonald	4701BQ
	Ford	F1000

All corporation stops shall be No-Lead.

6. Ground Key Stop Valve (Curb Stops)

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1 ¼" x 1" x 1 ¼"

Shall be:	Mueller	P-15155
	McDonald	6104Q
	Ford	B44-455M

1 ½" and 2"

Shall be:	McDonald	6104Q
	Ford	B44-666M (1 ½")
	Ford	B44-777M (2")

All with 2" Minneapolis thread.

All curb stops shall be No-Lead.

7. Service Box (Curb Boxes)

For 1"

Shall be:	McDonald	5614TW or equal
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For 1-1/2" and 2" Ball Valve

Shall be:	McDonald	5615TW or equal
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Pipe for extending over depth boxes:
1.25-inch cast iron steel pipe

Curb box repair coupling for extending over depth boxes:
1.25-inch curb box repair coupling (with male iron pipe threads)

Curb stop nut extensions are not allowed.

8. Meter Box Cover (for curb boxes installed in pavement)

Shall be:	Ford Type A1
	McDonald Type 74M1A
	Approved Equal

9. Service Saddles

Stainless steel clamp with rubber gasket and integral service outlet.
Cascade Waterworks (CSC2 for 4"-10", CS22 for 12" & 16"), Smith-Blair (372 for 4"-12"), Power Seal or equal.

Service saddle required for all services 1-1/4" and larger (except saddle not required for 1-1/4" service if 1" x 1-1/4" corporation stop is used).

NOTE: For HDPE pipe, an electrofusion saddle with CC outlet threads is required. Saddle shall be manufactured by Strongbridge or approved equal.

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10. Gate Valves - A.W.W.A. Spec. C509

Shall be resilient wedge type for 12" and smaller valves
Clow F-6100, SS Bolts
Mueller 2362-20, SS Bolts
Kennedy Ken-seal, SS Bolts
M&H, SS Bolts

All gate valves shall be furnished with a gate valve adaptor with gasket as manufactured by Adaptor, Inc. If a valve extension stem is required, the length shall be such that the top of the extension is within 10 feet of finished grade.

NOTE: Any R.W.G. valve used for cutting in must use a cutting tool that will develop a hole not less 1/2" smaller than the valve. (Any test plugs included on valves shall be replaced with stainless steel plugs.)

11. Butterfly Valves - A.W.W.A. Spec. C504

Shall be for 16" and larger, Clow, Pratt Groundhog, M&H 450 or Mueller Lineseal III. All butterfly valves shall have SS nuts and bolts.

All butterfly valves shall be furnished with a butterfly valve adaptor with gasket as manufactured by Adaptor, Inc.

12. Valve Boxes and Lids

Shall be: Tyler 6860
Star Pipe Products VB-006
Approved equal

13. Flush Valve Assembly

The following shall be required only if specifically included on the plans:

Plug & Air Vent for ends of mains and laterals - see File #43 Standard Specifications

14. Air Release Assembly

For high points in mains, see File #42 Standard Specifications.

15. Hydrants

Shall have: bronze on bronze seat
bronze upper valve plate
break away flange
oil or grease reservoir
coated elbow
meets or exceeds A.W.W.A. C502 with a 5-1/2" valve, two 2-1/2" hose nozzles and one pumper nozzle with stainless steel bolts underground,

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and shall be: Clow Medallion, Kennedy Guardian (with reservoir), or American Flow Control Waterous Pacer.

All parts used to modify hydrant must be from the original equipment manufacturer.

The bars on all hydrants shall be 3/4" diameter.

Hydrant shall include a fiberglass hydrant marker as manufactured by Vait Products, Clearwater MN, Senior Hydrant Marker with Red and White Reflective, Model No. LRSB-85000

16. Check Valve
Valmatic 1800 series globe style, 125 lb. class, with cast iron body, bronze plug and stainless steel spring.
17. Pressure Switch
Mercoid DA-31, 5-150 PSIG
18. Pressure Gauges
Tertrice 800FLB liquid filled food grade oil 3 1/2" 0-160 psi
19. Ball Valves
Nibco 590 Series ball valves, except for 1/4" valves which shall be Nibco 580 Series ball valves.
20. Meter Yoke
Ford Meter Box Co. Straight Line Yoke. Yoke to match owner's 5/8, 5/8 x 3/4 or 3/4 inch meter. Verify meter size.
21. Sampling Faucets
Chicago Faucet No. 4, chrome plated brass, 1/2 inch smooth end.
22. Tracer Wire
Tracer wire for open cut shall be High Strength Copper Clad 10 AWG with color blue for water main as manufactured by Copperhead Industries or equal.

Tracer wire for directional drilling shall be Solo Shot Extra-High Strength Copper Clad 10 AWG with color blue for water main as manufactured by Copperhead Industries or equal.
23. Tracer Wire Connectors
Shall be a 3-way, direct bury, water proof connector Part Number 3W8-01 as manufactured by Copperhead Industries or equal.
24. Tracer Wire Access Box
Shall be Copperhead SnakePit Single-terminal Lid or equal with blue lid.

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25. Sediment Inlet Protection
Shall be Type C or D per City of Brookfield Standard Detail Plate No. 018. A 9-inch minimum diameter sediment log staked around the perimeter of the inlet may be used if the inlet is not comparable with a Type C or D.
26. Tapping Sleeves
Tapping sleeves shall have a stainless steel body with removable bolts. The outlet, body, flange, bolts, nuts and test plugs shall be 18-8 type 304 stainless steel. All welds are fully passivated to restore stainless characteristics. Flange shall conform to AWWA Standard C207, "Steel Pipe Flanges for Waterworks Service-Sizes 4 In. Through 144 In.", Class D ANSI 150 lb. with drilling recessed to accept standard tapping valves per MSS-SP 60. Bolt holes straddle pipe centerline. Shell gasket must seal the full circumference of the pipe. Flanged gasket shall be full faced, cut from 1/8 inch thick cloth inserted rubber sheet, bolt holes pre-punched, conforming to the requirements of ANSI B16.21.
- Approved stainless steel tapping sleeve manufacturers/models:
Ford FTSS
JCM 432
Power Seal 3490
Smith-Blair
27. Casing Spacers (for Jack and Bore applications)
Casing Spacers for Jack and Bore applications (carrier pipe support) shall be stainless steel as manufactured by Cascade Water Works or approved equal.
28. Bedding, Cover, and Backfill Materials
Trench bedding, cover, and backfill materials shall be according to the City of Brookfield Standard Detail No. UTY-2.