MANITOWOC PUBLIC UTILITIES

CONSTRUCTION SPECIFICATIONS

for the

MPU

WATER DISTRIBUTION SYSTEM

Revised July 2015

INTRODUCTION

The purpose of these Specifications is to establish basic water distribution system standards. In the interest of providing the best possible service with the least possible cost, the Manitowoc Public Utilities Water Department (MPU) requests mutual cooperation between all parties involved. Both the written and drawing sections of the Specifications are meant to better communicate the current requirements of the MPU.

Construction of domestic water pipelines and appurtenances shall be in accordance with the requirements of these Specifications.

These Specifications are not intended to cover all situations. More detailed specifications may be required for some projects. These detailed Specifications shall be prepared on an as-needed basis.

The Specifications shall also include by reference the following:

- State of Wisconsin Public Service Commission, Chapter PCS 185, Standards for Water Public Utility Service.
- Chapter NR 114 Wisconsin Administrative Code Specification Requirements.
- Department of Natural Resources, Chapter NR 809 - SAFE DRINKING WATER, Chapter NR 810 - REQUIREMENTS FOR THE OPERATION AND MAINTENANCE OF PUBLIC WATER SYSTEMS, and Chapter NR 811 - REQUIREMENTS FOR THE OPERATION AND DESIGN OF COMMUNITY WATER SYSTEMS.
- Standard Specifications for Sewer and Water Construction in Wisconsin-latest edition.
- City of Manitowoc Plumbing Code.
- City of Manitowoc Municipal Code – Chapter 29, Construction Site Erosion Control.
- Manitowoc Public Utility Water Utility Rules.

Customers, suppliers, developers, contractors and engineers are advised to obtain prior approval of any proposed work so that specific requirements are understood.

All materials shall be purchased and/or approved by the Water Distribution Manager.

Robert Michaelson, P.E.
Water Systems Manager

MATERIALS

1.01 General: The MPU will furnish all materials unless specifically noted on the plans or contract documents, with the exception of water service piping. The Contractor shall provide all water service piping. All materials shall be picked up by the Contractor from the MPU material storage areas, unless other arrangements have been approved. Any materials damaged or lost during the course of construction will be replaced at Contractor's expense.

1.02 Ductile Iron Pipe: All ductile iron pipe shall conform to the latest edition of AWWA C-150 and C-151.

a. Class: The minimum ANSI class for all pipe shall be Class 52.

b. Pressure Rating: 350 psi

c. Coatings/Linings: All ductile iron pipe shall have an asphaltic coating at least 1 mil thick, with the interior having a cement mortar lining in accordance with the latest edition of AWWA C-104.

d. Gaskets: All gaskets shall be in conformance with the latest edition of AWWA C-111. Areas of soil contamination (petroleum or petroleum by-products) shall require the use of nitrile gaskets if the pipe will be above groundwater, and fluorocarbon gaskets if the main will be below groundwater.

e. Joints: All underground joints shall be push-on. Exceptions include pipe joints with fittings and valves shall be mechanical joint, and river crossings shall be ball and socket joints. Other joint types may be used as conditions require, with approval of the Water Systems Manager. Specifications for these joints will be developed for each special use.

f. Wrapping: All ductile iron pipe shall be encased with polyethylene in accordance with the latest edition of AWWA C-105.

1.03 Polyvinyl Chloride (PVC) Pipe: All PVC pipe shall conform to the latest edition of AWWA C-900 (4"-12" diameters) and C-905 (14"-36" diameters).

a. Prohibited Use: PVC pipe is not to be used in areas of soil contamination (petroleum or petroleum by-products).

b. Pressure Rating: The pipe shall have a minimum pressure class of 235 PSI and a dimension ratio of 18 (i.e. DR 18).

c. Gaskets: All gaskets shall be elastomeric, meeting the requirements of ASTM F477.

d. Joints: All joints shall be push-on and conform with ASTM D3139. Other joint types may be used as conditions require, with approval of the Water Systems Manager. Specifications for these joints will be developed for each special use.

1.04 Fittings: All fittings shall be ductile iron and shall conform to the latest edition of AWWA C-110 (ductile iron or gray iron) or AWWA C-153 (ductile iron compact fittings). The fittings shall be mechanical joint with mortar lining. Fittings shall be installed with

COR BLUE Bolts.

1.05 Hydrants: Fire hydrants shall be Waterous Pacer WB-67, conforming to AWWA C-502.

a. Hydrants shall have a six inch (6") mechanical joint connection, a break-away flange at ground level, a sixteen inch (16") break-away section above ground, with two (2) 2½ inch and one (1) 4½ inch National Standard Thread hose connections.

b. All fire hydrants shall be painted RED.

1.06 Mechanical Joint Restaints: All mechanical joint restraints shall be EBAA Iron Inc. MEGALUG Series 1100 or equal. All bolts shall be COR-BLUE.

1.07 Valves:

a. Valves four (4") inch thru twelve (12") inch in diameter shall be resilient wedge gate valves. Valves larger than twelve (12") inch in diameter shall be butterfly valves unless otherwise specified.

b. Resilient Wedge Gate Valves (R/W): Resilient wedge type gate valves shall be in accordance with the latest edition of AWWA C-509 and shall be supplied with external epoxy coating and mechanical joints. Unless otherwise specified, gate valves shall be American Flow Control Series 2500 Resilient Wedge Gate Valves, Clow series F6100, or equal.

c. Butterfly Valves: Butterfly valves shall be in accordance with the latest edition of AWWA C-504 for buried services and provided with O-ring shaft seals and rubber seats. The minimum class shall be Class 150B of short-bodied mechanical joint configuration. Butterfly valves shall be equipped with manual operators with an operator nut. Unless otherwise specified, butterfly valves shall be Mueller series B-3211-20 or equal.

d. Valve Features:

i. Valves to have non-rising stem.

ii. Provided with an arrow externally cast on the operating nut showing direction of closing.

iii. All gate valves 6" and larger shall be designed for an input torque of 400 foot-pounds without distortion of any kind.

iv. All bonnet bolts shall be 304 stainless steel.

v. 2" square operating nut.

vi. The operating nut attaching nut or bolt shall be 304 stainless steel.

1.08 Valve Boxes: Valve boxes shall be three (3) piece screw type made of plastic or cast iron construction and have a minimum shaft diameter of 5 ¼ inch. Plastic boxes shall have a cast iron ring to hold iron cap and be suitable for magnetic detection. Valve boxes, caps, bases, and adaptors shall be incidental to the installation of the valve.

a. Valve Box Caps: Valve box caps shall be made of heavy cast iron construction,

shall fit snugly within valve box top section, and have the structural capability to withstand nominal truck traffic loads. "Water" shall be clearly printed on the cap.

b. Valve Box Bases: Oversized valve box bases shall be used on all valves.

c. Valve Box Adaptor: Valve box adaptor shall be installed on all valves to ensure the valve box will be centered and remain centered over the valve operating nut. Unless otherwise specified, the valve box adaptor shall be Adaptor style, as manufactured by Adaptor Inc., or equal.

d. Manholes: Generally, manholes shall not be used for valve installation. However, for river crossings and other specific uses, they may be used as necessary.

1.09 Water Services:

a. All water laterals shall be a minimum of 1" in diameter for Type "K" Copper or a minimum of 1¼" Polyethylene (PE) Pressure Pipe and Tubing, CTS (Copper Tubing Size) rated for 200 PSI. A larger diameter may be required.

b. Type "K" Copper Tubing service laterals, 1" to 2" in size, shall conform to ASTM B88 – Standard Specification for Seamless Copper Water Tube, suitable for underground installation, in sizes and length specified on the design plans.

c. Polyethylene (PE 3408) Pressure Pipe and Tubing, CTS (Copper Tubing Size) rated for 200 PSI service laterals, 1¼" to 2" in size, shall conform to ANSI/AWWA C901 – Latest Revision in sizes and length specified on the design plans. Polyethylene tubing shall conform to the outside diameter dimensions of Type K Copper. The PE tubing shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other defects. It shall be uniform in color, opacity, density and other physical properties. Surfaces of the product shall be free from scratches, gouges, bloom and color imperfections. The PE tubing shall be permanently identified as PE 3408 water service tubing and the markings shall also include manufacturer's brand name or trademark and production record code, nominal size, NSF logo, pressure class (PC 200), AWWA designation number (AWWA C901-02) and date of manufacture. DR 9 200 PSI tubing (CTS-OD) will be color coded with a blue stripe and marked with the word "Tubing" and the dimension ratio. A stainless steel stiffener is required on the inside of the PE tubing at all connections.

d. All service laterals 4" and larger required for fire protection shall be rated for a Pressure Class 200 PSI and use either Polyvinyl Chloride (PVC) (DR-14) conforming to ANSI/AWWA C900 – Latest Revision or Ductile Iron Pipe (Class 52).

1.010 Service Saddles: On all PVC pipe, service saddles shall be provided. On all ductile iron pipe, service saddles shall be provided for a tap lager than one (1") inch. All service saddles for taps two (2") inch diameter and less shall have a single stainless steel band, AWWA tapered threads and a ductile iron body, similar to Ford 202 S 7.50 x CC 6. All larger taps shall use a solid stainless steel tapping sleeve with flanged outlet for the tapping valve.

1.011 Corporation Stops: Corporation stops shall be bronze, with the inlet AWWA tapered

threads, compression type outlet similar to Ford F-1000 up to one (1") inch and Ford FB-1000 for 1 ½ and two (2") inch taps. Larger taps shall use a resilient wedge tapping valve with flanged inlet, mechanical joint outlet and epoxy coating.

1.012 Curb Stops: Curb stops shall be bronze, compression type similar to Ford Z44-444M with threaded top, or equal. For services larger than two (2") inch, the tapping valve shall have a valve box to the surface and serve as the curb stop.

1.013 Curb Boxes:

a. Approved Manufacturers: Ford, Mueller, AY McDonald

b. Extension type curb box with arch pattern base for ½" through 2" curb valves and stops.

c. 72" when fully extended, Cast iron box, Upper section 1", 27" long stationary rod

d. Curb boxes on copper water services shall have a 2-hole cast iron cap.

e. Curb boxes on PE (plastic) water services shall have a cast iron cap with brass pentagon plug, with tracer wire attachment point.

1.014 Tracer Wire: The tracer wire shall be a minimum of twelve (12) gauge solid core copper electric wire with blue PVC coating and rated for wet conditions. Stranded tracer wire is unacceptable.

a. If a tracer wire box is specified to be provided, the tracer wire access box casting shall conform to ASTM specification A-48 Class 30.

1.015 Tapping Sleeves:

a. Approved Manufacturers: Smith-Blair, Rockwell, Romac Ford, Cascade

b. Body: Full circumference band. Type 304 stainless steel

c. Flange: AWWA C207 Class D ANSI 150 lb drilling. Fusion bonded Flexi-Blue coated finish or stainless steel.

d. Test Plug: Provide ¾" NPT stainless steel per ASTM A 240, type 304, with standard square head for pressure testing before tap is made.

e. Gasket: Nitrile (Buna N) compounded to resist oil, hydrocarbon fluids and water. Temperatures up to180F.

f. Bolts and Nuts: Type 304 stainless steel heavy hex nuts, stud bolts & washers. Nuts and stud shall have factory applied anti galling coating

1.016 Tapping Saddles:

a. Approved Manufacturers: Ford, Rockwell, Cascade

b. Body: All type 304 Stainless Steel double bolts

c. Gasket: Grade 60 Buna N compounded to resist oil, acids, hydrocarbon fluids, and water.

d. Bolts and Nuts: Type 304 stainless steel heavy hex nuts, stud bolts & washers.

Nuts and studs shall have factory applied anti galling coating.

1.017 Pipe Repair Clamps:

a. Approved Manufacturers: Romac, Ford, Smith Blair, Cascade

b. Body: All Stainless Steel

2. CONSTRUCTION OF WATER MAIN AND APPURTENANCES

2.01 Location of Existing Water Mains: Before excavation of trenches is begun, the Contractor shall uncover the end of existing water main to which the new main is to be connected. This will permit adjustments in line and grade to avoid the use of extra fittings. The exposed end of an existing main must be protected and blocked by the Contractor to prevent the blowing out of the plug or cap at the end of the main.

2.02 Excavation:

a. For water main construction, the width of the trench shall be such as to leave a clear space of not less than six (6) inches nor more than twelve (12) inches between the earth wall or the supporting sheeting or bracing where such is used and the sides of the pipe. The trench width established by this pipe clearance, measured at the spring line, shall be applicable to that portion of the trench from one (1) foot above the top of the pipe to the bottom of the trench.

b. On streets opened to traffic, on restricted easements and in such other locations as noted by the Engineer, the width of the trench at the ground surface shall be limited to the outside diameter of the pipe plus two (2) feet, plus the amount necessary for sheeting or bracing. The Engineer reserves the right to limit the extent of excavation depending on the nature of the soil and other conditions.

c. In general, the minimum depth of installation shall be six feet (6'). In no circumstances shall main be installed less than five (5') feet unless otherwise approved by the Engineer.

d. Surplus material shall be considered to include vegetation from the trench line, excavated rock or cobbles and boulders larger than six (6) inches in diameter, and all other material from excavation not needed or suitable for backfilling trenches. Unless otherwise specified, surplus material shall be the property of the Contractor, and shall be disposed of at no additional cost to the Utility.

e. Unsuitable Soils: If, in the opinion of the Engineer, an artificial foundation is necessary because of the nature of the excavated material, the Contractor shall excavate to a point a minimum of six (6) inches below the bottom of the pipe. Any work involved in forming a satisfactory foundation at depths of six (6) inches or less below the bottom of pipe will be considered as incidental to the work. Excavate to such depth as directed by the Engineer. Refill this portion of the trench with select fill and mechanically compact the select fill prior to laying the pipe. Limit the width of the trench excavation to the outside diameter of the pipe plus two (2) feet, plus the amount necessary for sheeting and/or bracing.

2.03 Handling of Pipe, Fittings, Etc.: The Contractor shall have sufficient and adequate equipment on the site of work for unloading and lowering pipe and fittings into the trench. Extreme care shall be exercised by the Contractor in handling all pipe, fittings, and special castings so as to prevent breakage and coating damage. Any significant damage to coating or lining shall be repaired or replaced by the

Contractor before installation. Under no circumstances shall pipe or fittings be dropped into the trench or so handled as to receive hard blows or jolts. All mud or concentration of dirt shall be removed prior to installation.

2.04 Field Inspection of Materials: All materials used in the construction of water mains must pass field MPU inspection before installation.

2.05 Direction of Laying: Unless otherwise ordered, pipe shall be laid with the bell ends facing the direction of installation. When the grade exceeds two (2') feet of rise per one hundred (100') feet of trench, the bells shall face upgrade and the pipe shall be laid uphill.

2.06 Joining Pipe:

a. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. MPU may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During the laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.

b. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. Precautions shall be taken to prevent foreign materials from entering the joint space and the joint recess shall be carefully checked for foreign material before the gasket is installed.

c. The pipe shall be secured in place with bedding material, placed by hand or equally careful means, keeping the bell end open.

2.07 Bedding of Ductile Iron Pipe: If not in the roadway, and unless otherwise specified, no special or imported bedding material will be required, however, the pipe shall be laid on an even undisturbed bottom and in accordance with the manufacturer's recommendations. The weight of the pipe shall not rest on the pipe bell. The bedding material immediately below the bell shall be carefully excavated so as to allow the full length of the pipe to lay evenly on the bottom of the trench. Under no circumstances will the pipe be laid on soft spoil piles in the trench. Backfill shall be tamped in layers to adequately support and protect the pipe.

Initial backfilling shall be done in six (6") inch stages to a point twelve (12") inches over the top of pipe with sand or crushed stone. Each stage shall be compacted to 95% Standard Proctor Density. Care should be taken to prevent movement of pipe during backfill.

2.08 Bedding of PVC Pipe: The trench bottom shall be relatively smooth and free of rocks and debris, and the trench bottom shall be leveled with crushed stone or coarse sand. The material shall be compacted to a minimum 90% Standard Proctor Density. The pipe shall be uniformly supported for the entire length except at the joint. For unstable soil, use crushed stone for bedding material.

Initial backfilling shall be done in six (6") inch stages to a point twelve (12") inches

over the top of pipe with sand or crushed stone. Each stage shall be compacted to 95% Standard Proctor Density. Care should be taken to prevent movement of pipe during backfill.

2.09 Tie-in of new main to an existing main: When tying-in a new main to an existing main, a tee is to be cut into the existing main. A valve and the new main are to be connected to the tee branch. After all services have been connected to the new main, the old main is to be cut and plugged as close to the new tee as possible.

2.010 Protection of Open Pipe: At all times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug or other means. This provision shall apply during the noon hour as well as overnight. If there is water in the trench, the seal shall remain in place until the water level in the trench is pumped out to the Owner's satisfaction. No pipe shall be laid in water or when trench conditions are unsuitable. The interior and exterior of all pipe and fittings shall be clean and free from all foreign material before being installed. The Contractor shall provide the necessary means to wipe, brush, swab or air blast or remove any foreign material from the interior of the pipe and fittings.

2.011 Installation of Push-On Joint Pipe: The water main shall be joined by means of a compression type push-on rubber gasket. The bell and spigot of each pipe shall be wiped clean and dry. The gasket shall be inserted, large round end first, into the gasket seat inside of the bell. A thin film of food grade NSF 60/61 lubricant shall be applied to the inside surface of that portion of the gasket which comes in contact with the entering pipe. The only type of lubricant used shall be that recommended by the pipe manufacturer. Extreme care shall be exercised when lowering the pipe into place to avoid foreign material from adhering to the spigot, bell, or gasket. The entering pipe shall be placed in approximate alignment with the receiving bell and inserted until it just makes contact with the gasket. Sufficient pressure shall be accomplished by use of a leverage bar or other approved method for pipe twelve (12") inches in diameter or smaller. A jack and two (2) choker-slings, or other approved method, shall be used on pipe larger then twelve (12") inches in diameter.

Whenever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, the amount of deflection shall not exceed that recommended by the manufacturer. All deflecting shall be done after the joint is pushed home.

2.012 Installation of Mechanical Joint Pipe: Where specified the water main shall be joined by means of a mechanical joint assembly.

The last eight (8") inches of the outside of the spigot and inside of the bell shall be thoroughly cleaned of all foreign matter and painted with a soap solution. The cast iron gland shall then be slipped on the spigot end with the lip extension toward the socket or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland.

Nuts and bolts used in the joint assembly shall be "Cor-Blue" or an approved equal. The entire section of the pipe shall be pushed forward to send the spigot end in the bell. Care shall be taken to locate the gasket evenly around the entire joint. All

nuts shall be tightened with a suitable wrench. Care should be taken not to exceed torque limits on the bolts.

Nuts shall be tightened alternately in order to produce an equal pressure on all parts of the gland. After a joint is assembled and securely tightened, the nuts and bolts shall be completely coated. Whenever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, the amount of deflection shall not exceed that recommended by the manufacturer..

All nuts and bolts must comply with AWWA C111/A21.11. - Latest Revision. Bolts shall be of sufficient length such that a minimum of ½" of threads are exposed beyond the end of the nut when tightened. Tighten the bolts to the normal range of bolt torque in accordance with AWWA C600 – Latest Revision.

2.013 Polyethylene Encasement: Wrap all below ground metal in accordance with AWWA C105, including: ductile iron pipe, fittings, valves and valve boxes, corporations, curb stops and curb boxes (their entire length), all portions of hydrants below grade, copper water services, and all metal restraining devices.

2.014 Installation of Tracer Wire: For all pipe materials and services, a twelve (12) gauge, solid coated copper wire tracer wire is to be installed with the pipe. The wire is to be placed on the top of the pipe and taped in place.

Tracer wire shall be run along pipe from hydrant to hydrant. Wire shall be taped to each length of pipe at a minimum of two points. A maximum of one splice will be allowed between each hydrant. **All tracer wire ends must be grounded.**

Run tracer wire along polyethylene (plastic) laterals to and up/down all curb boxes and along remaining lateral length into property. Copper laterals do not require tracer wire, but the tracer wire shall be attached to the copper lateral by connecting to the thaw wire type copper tube nut at outlet end of corporation stop, or using a bronze ground clamp.

For transmission water mains, or other placed when there is not a practical location to bring the tracer wire to the surface, a valve box top section may be used at approximately 500' intervals for access to the tracer wire. The valve box top section should be filled with sand to a maximum of one foot from the top. The tracer wire should not be spliced. Bring the tracer wire to the surface with a minimum of 18" of excess wire at each valve box.

Wire splices shall be soldered with a self-flux 50-50 rosin core solder and tightly wrapped with electrical tape so no copper wire is exposed.

After the Contractor has completed all the underground installation on the project, the Contractor shall test the electrical continuity of all the tracer wire installations on the project with the Engineer. The Contractor shall be responsible for any costs of any repairs that may be required.

2.015 Final Backfilling: The Contractor shall be responsible for proper compaction using mechanical compaction. Water jetting is not permitted, unless otherwise approved by the Engineer.

Final backfilling shall be completed by returning excavated material into the trench. However, the final backfill may not contain large stones, frozen clumps or logs. If excavated material is unacceptable by MPU, granular material compacted to 95% Standard Proctor Density shall be placed in twelve (12") inch stages to the top of the trench. In lieu of granular material for final backfilling, a "0" bag slurry or road gravel may be used. Slurry is considered a cement-free 50:50 mix of sand and gravel, with water to make it flowable.

The final twelve (12) inches shall be ¾" crushed aggregate with no greater than 25% fines, unless otherwise specified.

All trenches within pavement areas shall be compacted to ninety-five (95%) percent modified proctor density. All other trenches shall be compacted to ninety (90%) percent standard proctor density.

2.016 Surplus Excavated Material: All excavated material not needed or not suitable for backfill purposes shall be disposed of by the Contractor, at his expense.

2.017 Underground Casing: The Contractor shall furnish all materials required to jack casing under highways or railroads. The casing shall be steel as sized on the drawings with a minimum yield strength of 35,000 PSI. The casing shall have a bituminous coating on the inside.

The Contractor is responsible for providing adequate notice to railroad and highway authorities before jacking starts. The ends of the casing shall be sealed with concrete.

2.018 Drawings: Only approved drawings shall be used for the construction of actual improvements.

2.019 Modifications to Drawings: Field conditions often require adjustments to locations and/or grade of pipeline and appurtenances. Adjustments may be made in the field with MPU approval. At the conclusion of the work, the Contractor is to submit a set of drawings showing all adjustments made.

2.020 VALVES

a. Installation: All valves and their installation shall conform to all appropriate requirements of Part IV of the Standard Specifications for Sewer and Water Construction in Wisconsin. Prior to installation, inspect all valves for cracks, handling damages, direction of opening, number of turns to open, freedom of operation and cleanliness of valve ports, especially seating surfaces. Check all nuts and bolts on the valve bonnet and packing gland to be tightened to manufacturer's specifications, before the valve is lowered into the ditch.

   All perpendicular valve joints shall be made with an approved MEGALUG® restraining device.

   To prevent foreign material from entering the valve and causing damage, always install valves in the closed position. Adjust valves following installation so they will work easily and properly.

All valves shall be wrapped with polyethylene wrap.

Any valve nut that needs to be placed deeper than seven feet (7.0') below finished grade, the Contractor shall install a valve extension on the nut. The top of the valve nut extension shall be between 4' and 6' from the finished grade.

A three-piece valve box and valve box adapter is required for every valve. The valve box shall not transmit shock or stress to the valve and shall be centered over the operating nut of the valve.

The valve box cover shall be set ½" below the binder grade for asphalt and shall be flush with the surface of the final asphalt lift or concrete pavements. No ramping will be allowed. Reset any valve boxes that have shifted at any time throughout construction until formal acceptance of the project by the Water Utility so they are plumb and centered over the valve at final acceptance; thus, allowing the proper operation and functionality of every valve.

b. Operation: Only MPU crews shall operate valves. If needed, this shall be arranged through the MPU inspector.

2.021 FIRE HYDRANTS

a. General: All hydrants and their installation shall conform to all appropriate requirements of Part IV of the Standard Specifications for Sewer and Water Construction in Wisconsin.

The Water Utility Inspector shall be present when all hydrants are set, when any hydrant extension is installed and when hydrants are disassembled for adjustment or maintenance. The Water Utility Inspector shall inspect the hydrant setting before backfilling. The Contractor shall be responsible for the proper operation of all hydrants on the project until the Water Utility formally accepts the water mains and the warranty period has expired.

b. Location: Install hydrants at the locations and grade shown on the drawings. The Water Utility Inspector must authorize in writing any variation from the locations or grades shown on the drawings.

An anchoring tee shall be used to attach the hydrant lead to all water mains. The auxiliary valve shall be directly attached to the anchoring tee.

c. Installation: An anchoring tee shall be used to attach the hydrant lead to all water mains. The auxiliary valve shall be directly attached to the anchoring tee.

Install a 4-IN x 8-IN x 16-IN solid concrete masonry unit, laid flat, in the excavation to provide a firm base for the hydrant. Set the hydrant in a truly vertical position and securely brace it until backfilling is complete. With the three-nozzle hydrant, the small nozzles shall be parallel with the curb and the pumper nozzle shall be perpendicular to the curb. The hydrant nozzle elevations shall be located 18" to 24" above finished grade or top of curb. Break away flange and break away shaft coupling shall be positioned just

above finished grade.

Restrain the full length of all hydrant leads from the tee on the water main to the hydrant, including the hydrant valve and any associated fittings, with mechanical joint restraints – MEGALUG® Series 1100 or equal. Install the required MEGALUG® restraints and concrete thrust blocking to fully secure the hydrant. A concrete thrust block shall be used to restrain both the tee and the hydrant.

The space around the lower portion of the hydrant from below the hydrant to six inches above the drain holes shall be backfilled with a minimum of one cubic yard of #2 washed stone. When placing the stone, special care shall be taken to have the drain holes open for drainage. Cover the washed stone with six (6)-mil polyethylene or suitable geotextile fabric to prevent loose dirt from filling in the voids in the stones. Place a wooden block or a brick under the hydrant lead to prevent the hydrant from leaning after being set. Fill the remainder of the excavation with the excavated material and compact it evenly in 12-inch lifts, so that the pressure of the backfill on the stem is equally distributed.

All ductile iron pipe and fittings shall be wrapped with polyethylene wrap. The wrap shall also be cut at the drain holes.

d. Operating: Only MPU crews shall operate hydrants and flush mains. This shall be arranged through the MPU inspector.

2.022 SERVICES

a. General: The Contractor shall provide all water service piping and/or tubing. The service shall include the corporation stop, stop box, service line, shut-off valves and meter. The MPU shall make all taps on water mains and provide all materials, except for the service line and shut-off valves, at the expense of the applicant. The Contractor shall provide all excavation, backfilling materials, road and other repairs. In general, no tap smaller than one (1") inch shall be made unless approved by MPU.

Services shall terminate at the property line.

Unions and/or couplings may not be used unless approved by MPU.

b. Installation: All services connected to PVC water main shall require a tapping saddle. All services 1¼" and larger connected to Ductile Iron Pipe shall require a tapping saddle. A direct tap for 1" services connected to Ductile Iron Pipe will be allowed with a proper tap machine. A tapping saddle for 1" services would also be allowed on Ductile Iron Pipe.

A minimum of 6' of cover shall be maintained on all water laterals, including any area crossing a drainage ditch. Services with inadequate cover, or within 24" of a crossing storm sewer, shall be insulated.

The corporation stop shall be tapped at a 45° angle on the upper half of the main and located on the side of main to which the service is to be extended. A 'gooseneck' shall be installed to minimize the potential for pulling the service

line from the corporation stop. Lay service laterals perpendicular to the water main.

All copper service lines shall have sand for bedding and cover material.

c. PE Services: Polyethylene (PE) Pressure Pipe and Tubing shall include a straight coupling and a one foot (1') section of PE pipe or tubing beyond straight coupling and tape the end of pipe. Prior to installation, all Polyethylene (PE) Pressure Pipe and Tubing shall be inspected for cuts, punctures or excessive abrasion which may have resulted from shipping, storage or handling damage. If tubing is cut to a depth greater than 10% of its wall thickness or kinked, the damaged portion shall be removed, discarded and replaced. Pipe cutters designed for cutting plastic pipes are recommended. Avoid dragging pipe over rough terrain or having it come in contact with sharp objects which may cut or puncture the product. Never allow PE pipe to come in contact with fire, excessive heat or chemicals harmful to the pipe.

   Trench bottoms shall be free of rocks or sharp objects. The bedding and cover for PE pipe shall be sand, crushed stone chips or crushed stone screening conforming to the requirements in Section 8.43.2 and 8.43.3 of the current Standard Specifications for Sewer and Water Construction in Wisconsin. Backfill shall be uniform and free of rocks, sharp or heavy objects. PE pipe or tubing may be curved to avoid obstacles; however bends in PE pipe/tubing should not occur closer than 10 diameters from any fitting or valve. Minimum radius of curvature for any bends shall be no less than 30 diameters or the coil radius when bending with the coil. Bending of coiled pipe against the coil shall not go beyond straight. PE pipe expands and contracts when exposed to temperature changes. Allowances for this should be made during installation. Normally PE pipe will "snake" itself in the trench enough to provide sufficient slack. An extra six inches (6") per 100 feet of pipe per 45° F temperature change will compensate for thermal contraction in normal underground installations.

   To aid in fitting installation, the pipe may be softened by immersing in hot water. Do not heat the pipe with other types of heat sources. Do not use any lubricants other than water. The use of pipe joint compounds, pipe sealing compounds, pipe dope and detergent type lubricants is not acceptable.

   CAUTION: Potable water service PE pipe or tubing installation is prohibited in areas of known chemical contamination of the soil or where there is a high risk of potential chemical spills. PE pipe should not be used in areas known to be contaminated with organic solvents or petroleum distillates.

   PE pipe or tubing should not be used in soil near hazardous waste disposal sites or underground chemical or petroleum storage tanks.

   A stainless steel stiffener is required on the inside of the PE tubing at all connections.

Following installation of service lateral, open the corporation stop and the curb stop and flush out the service lateral. Once flushed out, close the curb stop and peen over the end of a copper service lateral or tape the end of the PE tubing.

Any existing water lateral to be removed shall be removed at the water main.

d. Large Services: An anchoring tee shall be used to attach all 6" and 8" service laterals to all water mains. The auxiliary valve shall be directly attached to the anchoring tee.

e. Curb Box Setting: All curb boxes shall be installed in the approximate middle of each lot. They shall be set to final grade. If they are installed in the sidewalk or driveway, a curb box receptacle shall be supplied by the MPU at applicant's cost and must be used.

f. Wrapping: Copper service lines shall be wrapped and taped in polyethylene from the water main to the curb stop, entirely covering any exposed copper. The curb stop and curb box shall also be wrapped and taped in polyethylene.

g. Installation of Tracer Wire on Services: Run tracer wire along polyethylene (plastic) laterals to and up/down all curb boxes and along remaining lateral length into property. Copper laterals do not require tracer wire.

Wire splices shall be soldered with a self-flux 50-50 rosin core solder and tightly wrapped with electrical tape so no copper wire is exposed.

After the Contractor has completed all the underground installation on the project, the Contractor shall test the electrical continuity of all the tracer wire installations on the project with the Engineer. The Contractor shall be responsible for any costs of any repairs that may be required.

2.023 THRUST DEVICES

a. General: A thrust device shall be provided on valves, fittings, dead ends and fine hydrants.

b. Materials: For ductile iron pipe, the devices may be mechanical joint restraints, concrete to transmit load to undisturbed soil, steel rod typing the pipe together or when undisturbed soil is not available, as mass of concrete may be used to offset loads. For PVC pipe, only one of the concrete methods may be used. In no case should soft wood be used.

c. Concrete Thrust Devices: Concrete thrust devices shall be made of Class E concrete as described in Chapter 6.35.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin.

d. Size: Thrust blocks shall be designed to have sufficient bearing area and shall be so placed as to safely transmit to the surrounding earth, the maximum forces which may occur in the pipeline at that point. The MPU will approve all thrust device sizes and placement.

e. Installation of Concrete Thrust Devices: Concrete thrust blocks shall be placed between fitting and trench wall or trench bottom, as may be applicable. The

bearing faces of the concrete thrust block shall be placed against freshly cut and undisturbed trench wall or bottom of sound material. Formwork shall be constructed whenever necessary to confine the concrete to the prescribed dimension for the block. Form lumber shall be removed prior to testing.

f. Upward Thrust: At vertical bends were upward thrust will occur, concrete thrust blocks utilizing reinforced steel bar collars shall be installed below the bend. As an alternate, the fitting may be buried in concrete.

g. Curing: Concrete thrust blocks shall be allowed to cure for at least forty eight (48) hours prior to pressure tests on the pipelines.

h. Mechanical Joint Restraints: Mechanical joint restraints meeting the applicable requirements of ANSI/AWWA C110/A21.10 may be used in lieu of concrete backing. Components of dissimilar metal shall be protected against corrosion by encasement of the entire assembly with 10-mil thick, loose polyethylene film in accordance with AWWA C105. Mechanical joint restraints shall be MEGALUG or equal.

i. Excavation, Bedding and Backfill: Excavation, bedding and backfill for thrust devices shall be in accordance with Section 3, “Construction of Water Main and Appurtenances”, of these specifications.

j. Field Tests: After completion of the installation of the thrust device and before acceptance thereof, the Contractor shall perform such tests as may be necessary to assure proper functioning of the thrust device. Defects disclosed by such testing shall be repaired to the satisfaction of the MPU representative, AND AT THE EXPENSE OF THE CONTRACTOR.

2.024 HYDROSTATIC TESTS

a. General: All new mains shall be tested, under the supervision of the MPU representative, by the Contractor, and shall successfully pass the pressure and leakage tests.

b. Pressure Test: After the test connections are made, air is removed and the main filled with water, the test section shall be subjected to water pressure normal to the area. After examination of exposed parts of the system, the test pressure will be increased to 150 pounds per square inch. The main shall be examined and if any defects are found, the Contractor shall immediately make the necessary repairs at his expense. The pressure test shall be repeated until no defects can be found. THE DURATION OF THE FINAL PRESSURE TEST SHALL BE ONE (1) HOUR AND THE PRESSURE SHALL NOT VARY BY MORE THAN +/-5 PSI.

c. Leakage Test: The leakage test shall be conducted simultaneously with the pressure test and at the same pressure as the pressure test.

Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section of it, necessary to maintain the specified leakage test pressure after the main has been filled with water and the air expelled.

Leakage shall not exceed the number of gallons per hour as determined by the following formula for rubber-sealed joints:

From AWWA C600-05:

For PVC or DIP pipe,

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

where,

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

In case the section under test contains joints of various diameters, the allowable leakage will be the sum of the computed leakage for each size joint.

Should any test section fail to meet the leakage test, the Contractor shall immediately make the necessary repairs at his own expense. THE DURATION OF THE FINAL LEAKAGE TEST SHALL BE ONE (1) CONTINUOUS HOUR.

2.025 DISINFECTION AND FLUSHING OF MAINS AND APPURTENANCES

a. General: After pressure testing and prior to acceptance of work, the entire main including, but not limited to, valves, fittings, fire hydrants, service lines, and other appurtenances shall be disinfected in accordance with the latest edition of Department of Natural Resources NR809, NR811, AWWA C-601, and AWWA C-651 specifications.

b. Applications of Chlorine: Either the “continuous flow” method or placing of HTH tablets method shall be used. HTH tablets shall be installed during the pipe installation process by gluing tablets inside each pipe joint and each fire hydrant. The “continuous flow” method shall incorporate all materials required to inject a solution of 50 mg/L chlorine throughout the portion to be disinfected. In no case, regardless of application method, shall the disinfection solution be less than 50 mg/L.

c. Tablet Method: Because the preliminary flushing step must be eliminated to use tablets, this method shall be used only when scrupulous cleanliness has been exercised. It shall not be used if trench water or foreign material has entered the main or if water is below 5 degrees C (41 degrees F).

    i. Fillings and Contact: The main to be filled (tablet method) shall be filled with water at a velocity less than one (1’) foot per second. This water

shall remain in the main for twenty four (24) hours.

d. Chlorine Residual: The chlorine residual shall not be less than twenty five (25) mg/l after twenty four (24) hours for either method used.

e. Rechlorination: In the event the chlorine residual is less than required, the distribution system being disinfected shall be rechlorinated using the "continuous flow" method by and AT THE EXPENSE OF THE CONTRACTOR. Rechlorination will be preceded by flushing as required by these specifications.

f. Flushing: After disinfection in accordance with the latest edition of AWWA C-601 and C-651, the main shall be flushed with a flushing velocity of not less than 2.5 fps and sustained for a period of time not less than twice the minimum theoretical time necessary to flush the entire length of the main. If so directed by the MPU representative, portions of certain appurtenances may be required to be temporarily reconfigured for flushing purposes. In the event of possible adverse effects of flushing on system operation, flushing shall be conducted during the hours of least demand or as directed by the MPU representative. The MPU shall not be responsible for loss or damage to grading and landscaping resulting from the flushing operations.

g. Safe Bacteriological Sample: In accordance with NR809.10(4), at least one bacteriologically safe sample shall be obtained before waterworks are placed into service. When new distribution systems or extensions on a number of streets are installed, bacteriological samples shall be taken at representative locations to establish that all of the improvements are free of contamination.

h. Sampling Instructions (by MPU staff only):

   i. Avoid plastic, swing, goose-neck, leaky, chrome and outside faucets.

   ii. Remove any faucet aerator, gasket, screen or hose and run the water until cold.

   iii. Sterilize the faucet using a propane or butane torch. Hold the flame beneath the faucet opening for 20 seconds. Move the flame continuously to prevent damage to the faucet. Plastic or chrome faucets will melt when heated.

   iv. Run the cold water at medium force for at least 5 minutes before collecting samples. Do not change the flow rate or wash or wipe the tap before collecting the sample.

   v. Remove the security seal, and then remove the sample bottle cap without touching the inside of the cap or bottle. Hold onto the cap while sampling.

   vi. Fill bottle to within one inch of the top or to the fill line. Replace cap securely. Write name on the side of the bottle.

   vii. Send the water sample and this completed form to the MPU Water laboratory, which is certified under the Safe Drinking Water Act for the

viii. testing of total coliform and fecal coliform/E. Coli bacteria by an enzyme substrate method. MPU will report the results electronically to the Department.

3. INSULATION

3.1 General: Water mains shall be insulated over the watermain wherever the depth of cover is less than five (5') feet. Water mains shall be insulated under the watermain wherever the watermain crosses a storm sewer, gas main, or other similar conductor of cold temperature.

3.2 Materials: Insulation shall be with polystyrene boards with a minimum thickness of four (4") inches. If only two (2") inch material is available, multiple layers shall be used.

3.3 Placement: Prior to placement of these polystyrene boards, bedding material shall be placed to a height of six (6") inches over the top of the pipe, leveled and compacted. The insulating boards shall be placed on the cover material with the long side parallel to the centerline of the water main for a minimum width of O.D. + twenty four (24") inches. The boards shall be placed in a staggered arrangement so as to eliminate continuous transverse joints. If two (2) or more layers of insulation boards are used, each layer should be placed so as to cover the joints of the layer immediately below.

The first lift of backfill material shall consist of six (6") inches of bedding material which shall be end or side dumped onto the insulation board and spread in such a manner that construction equipment does not operate directly on the insulation. This layer shall be compacted with equipment that exerts a contract stress of 70 to 80 PSI. Once this layer has been compacted to the specified density, the remaining layers of backfill may be constructed utilizing conventional procedures.

4. ABANDONMENT OF EXISTING FACTILITIES

4.1 Water Main: Unless otherwise indicated on drawings, where water mains are abandoned, they shall be disconnected and left in place. All appropriate valves shall be closed and the valve box removed. If the valve is in a manhole, the top ring of the manhole shall be removed and the manhole shall be filled with a slurry of granular material. The end of the pipe shall be plugged with concrete.

4.2 Valves: When only a valve is abandoned in place, it shall be left in an open position, and the valve box or manhole abandoned as in Section 10.1. If the valve is broken closed, it shall not be abandoned in place, but must be removed.

All existing water valve manholes are to have the top ring removed and the manhole filled with "0" bag slurry. If construction warrants, the manhole could be removed completely and the hole backfilled as appropriate.

Existing valves and valve manholes shall not be abandoned until existing mains are abandoned.

4.3. Services: When services are permanently abandoned, they must be shut-off at the corporation stop and disconnected. If the service is to be reused, it may be shut-off at the curb stop. (Peening shut the end of the service and closing the curb stop is not an acceptable method to permanently abandon a service.)

Curb boxes shall be removed or cut-off and abandoned below grade.

4.4. Reuse of Service: Old lead and galvanized steel services shall not be reused. A new service may not be created through the Siamese connection of two (2) or more existing services with a wye or tee.

4.5. Hydrants: All existing hydrants that are to be abandoned are to be disconnected at the lead elbow, removed and transported to the Manitowoc Public Utilities storage facilities. The hole is to be backfilled as appropriate.

5. BARRICADES, WARNING SIGNS AND FLAGMEN

5.1 General: Erecting and maintaining traffic signs, barricades, lights and signals, flagging and guidance of traffic is the responsibility of the Contractor. It shall be carried forth in accordance with the latest revision of "Manual of Uniform Traffic Control Devices". Sign sizes smaller than the standard sizes described in the manual shall not be used.

6. TRAFFIC

6.1 General: If it is necessary to close down sections of the street for short periods while installing water main and appurtenances, the Contractor shall request permission from the City of Manitowoc, Department of Engineering, or the Police Department. If approved, the Contractor shall provide all detour signs and alternate route signs for the convenience of the public. No driveway shall remain inaccessible at the end of any working day unless agreed to by the property owner.

7. PERMITS, APPROVALS, EASEMENTS AND LOCATIONS

7.1 General: All permits, approvals and easements shall be acquired by MPU before construction begins. Any specific requirements of these documents shall be made known to the Contractor.

7.2 Locations: Locations for all utilities shall be the responsibility of the Contractor.

7.3 Staking: Staking of the route for construction shall be the responsibility of the MPU. However, any measurements required for field adjustments shall be the responsibility of the Contractor.

7.3.1 Field Checking: The Contractor shall have available a transit, as necessary, to check elevations and alignments. If it is found that the installation does not correspond to the approved drawings, THE CONTRACTOR SHALL MAKE THE NECESSARY ADJUSTMENTS AT HIS COST.

8. RESTORATION

8.1 General: After completion of all water main work, the street, sidewalk and/or lawn shall be restored to original condition or better.

8.2 Paving: Temporary repairs to streets and sidewalks may be made with crushed stone or cold or not mix bituminous materials as approved by the City of Manitowoc, Department of Engineering.

Final repairs to bituminous and concrete streets shall be done by the City of Manitowoc and billed to the MPU unless otherwise specified.

Final repairs to sidewalks and driveways shall be by the MPU or Contractor in accordance with City requirements.

Street signs and other improvements, if disturbed, shall be restored to original condition.

8.3 Lawns/Vegetated Areas: Lawns and/or vegetated areas shall be restored to a condition as good or better than when the job began. Seed or sod may be used depending on the circumstances. Trees and shrubs may be dug-up and replanted after construction or may be replaced. If sod is specified, or used by the Contractor, the pricing and/or payment shall include 14-days of watering by the Contractor (or sub-contractor) to ensure the sod takes root.

8.4 Drainage: Grading for drainage shall be as for the original conditions. Culverts shall be carefully removed and replaced when the job is completed.

9. EROSION CONTROL

9.1 General: Erosion control shall be in accordance with Wisconsin Construction Site Best Management Practice handbook and **City of Manitowoc Municipal Code, Chapter 29 – Soil Erosion Control.** Should there be a discrepancy between this standard specification and the above referenced Municipal Code, the Municipal Code shall govern.

9.2 Installation: Erosion control shall be installed by the Contractor prior to the start of construction. Erosion control shall include, but not be limited to, silt fence around the perimeter of the project, inlet protection and/or diversion, stabilization of disturbed areas (sod, erosion, mat, etc.), tracking pads, and reducing runoff velocities (i.e. straw bales in ditches). **Unless otherwise noted, the cost of soil erosion control shall**

be incidental to the installation of watermain.

The Contractor shall furnish and install an Erosion Control Blanket over sloped areas that are steeper than 3:1, or as directed by the Water Systems Manager. The erosion control blanket shall be a Type S-150 (North American Green), or equal. The erosion control blanket shall be installed in accordance with the manufacturer's instructions. All costs for furnishing and installing the erosion control blanket shall be incidental to Topsoil/Seeding/Mulching.

9.3 Maintenance: All erosion and sediment control practices shall be checked for stability and operation following every runoff-producing rainfall, but in no case less than once every week. Any needed repairs shall be made immediately to maintain all practices as designed.

Sediment shall be removed from behind the silt fence when it becomes six (6") inches in depth at the fence. The silt fence shall be monitored weekly and repaired as necessary to maintain a barrier.

Inlet control measures (i.e. geotextile or filter fabric over catch basins) shall be monitored weekly and removed when the control measure becomes more than 50% clogged with debris.

Straw bales, or similar means or reducing the velocity of concentrated runoff, shall be placed in small swales, ditches, or diversions to prevent erosion and catch sediment. These measures shall be monitored weekly and repaired as necessary.

9.4 Responsibility/Contact: The Contractor shall provide a list of persons that shall serve as the contacts for erosion and maintenance. The list shall provide the name and phone number for personnel to be contacted in the event that the erosion control measures need to be installed, maintained, or repaired.

10. CATHODIC PROTECTION

10.1 Spacing and size of magnesium anodes will be as specified in Contract Documents. Each anode shall be placed in a horizontal position parallel with the pipe, with centerline axis of the anode at least 6 inches below the bottom of the water pipe. The centerline axis of the anode shall also be placed at least 2 feet from the exterior wall of the water pipe. Care shall be taken to ensure that the cloth bag is not damaged and no backfill lost during installation. Each anode shall be centered in the cloth bag. It may be necessary to re-center the anode in the cloth bag by rolling it on the ground prior to installation. Each prepackaged anode shall be lowered into the trench using a sling or rope. The anode shall not be lowered, transported, handled or lifted by the lead wire. The anode lead wire shall be long enough to reach from the pipe to the anode without a splice. The anode lead wire shall be attached to the pipe using the thermite weld process.

10.2 Anodes that are installed at cathodic protection test stations are not to be directly connected to the water pipe or fitting. When the anode lead wire is not long enough to reach the test station terminal board with sufficient slack, the lead wire may be lengthened by splicing on an additional length of lead wire. Splice shall be made using an approved splice connector suitable for buried applications.

10.3 To connect anode lead wire to ductile iron pipes that are encased in a polyethylene tube, the Contractor shall first cut back the polyethylene tubing to expose the pipe. The Contractor shall make an "X" shaped cut in the polyethylene and temporarily fold back the polyethylene at the point where the anode lead wire will be connected to the pipe.

10.4 Using a mechanical grinder, remove the minimum area of coating from pipe or fitting surface required for placement of weld mold, creating a bright, shiny surface. Prepare the anode lead wire and pipe surface for thermite welding by assuring that they are dry. Wire and pipe surface shall be free of dirt, grease and other foreign products. Remove insulation at end to be welded in a manner that will avoid damage to wire. Install adapter sleeves for anode lead wire as recommended by thermite weld manufacturer prior to welding. Hold wire at an approximate 30 degree angle to pipe surface when welding.

10.5 When weld has cooled, remove weld slag and test weld for strength by striking a sharp blow to the weld with a hammer while pulling firmly on the wire. Re-weld unsound welds and retest weld. Thoroughly clean mold and mold covers after completion of each weld to remove all excess slag. After soundness of weld has been verified, thoroughly clean with a stiff wire brush and brush with an approved bitumastic coating over entire weld area. Lift wire away from pipe and apply bitumastic coating completely around and underneath the wire. Push wire back down on the pipe. Apply a protective bitumastic coating where any original pipe coatings have been disturbed.

10.6 After the anode lead wire is connected to the pipe, the Contractor shall repair the polyethylene tubing using polyethylene compatible adhesive tape. The polyethylene tubing shall be folded back against the pipe and the repair tape shall be applied on anode lead wire. The repair tape shall completely cover the area of the polyethylene tubing that was cut and shall completely cover all exposed ductile iron pipe.

10.7 Extra anode lead wire for each anode shall be coiled. The wire shall have sufficient slack to allow for pipe and anode movement and to protect against undue stress during backfilling. Prior to backfilling the anode, water shall be applied to the anode to moisten its pre-packed backfill.

10.8 The area immediately surrounding the anode shall be backfilled with native soil. Cushion sand shall be backfilled around the water pipe or fitting so that the sand covers the pipe or fitting to a minimum depth of 12 inches on top, and along both sides of the pipe or fitting. The excavation shall be backfilled in stages using select granular backfill (water) material free from stone, rocks, roots, organic material, trash or other

debris, and carefully tamped to ensure that no voids exist around the bag and that the bag and wire are not damaged.

10.9 Anodes on Copper Water Services on PVC or non-metallic Water Mains

10.9.1 One 5 pound anode shall be connected to new copper water services on PVC or non-metallic water mains, For copper services 1 inch diameter and less, anode lead wire shall be attached to thaw wire type copper tube nut at outlet end of corporation stop. For copper services larger than 1 inch diameter, anode lead wire is to be attached to copper service using bronze ground clamp.

10.10. Anodes on Existing Ductile and Cast Iron Water Mains

10.10.1 Magnesium anodes shall be installed at every pipe joint or every other pipe joint, as designated in the Contract Documents or directed by the Project Manager, on existing cast and ductile iron water main pipe to cathodically protect both pipes on either side of the joint. Two or more anodes will be installed at pipe joint locations, with one or more anodes connected to each pipe on either side of the joint. Pipe joints shall be located by the Contractor utilizing field notes from the original pipe installation records. A test pit shall be excavated to verify the location of the first pipe joint. The Contractor shall layout the location of remaining joints to be excavated using the record field notes. At each excavated joint, an area shall be excavated that is large enough to expose top and one or both sides of existing water main pipe and safely install both anodes in one operation. Basic general size of the area to be excavated will be as noted in Contract Documents and will be dependent on the depth and location of the water main.

10.10.2 Magnesium anodes are not required to be installed on existing water main fittings or valves encountered in an excavation, unless otherwise required in the Contract Documents or directed by the Project Manager.

10.11 Anodes on Existing Ductile and Cast Iron Hydrant Branches and Water Services

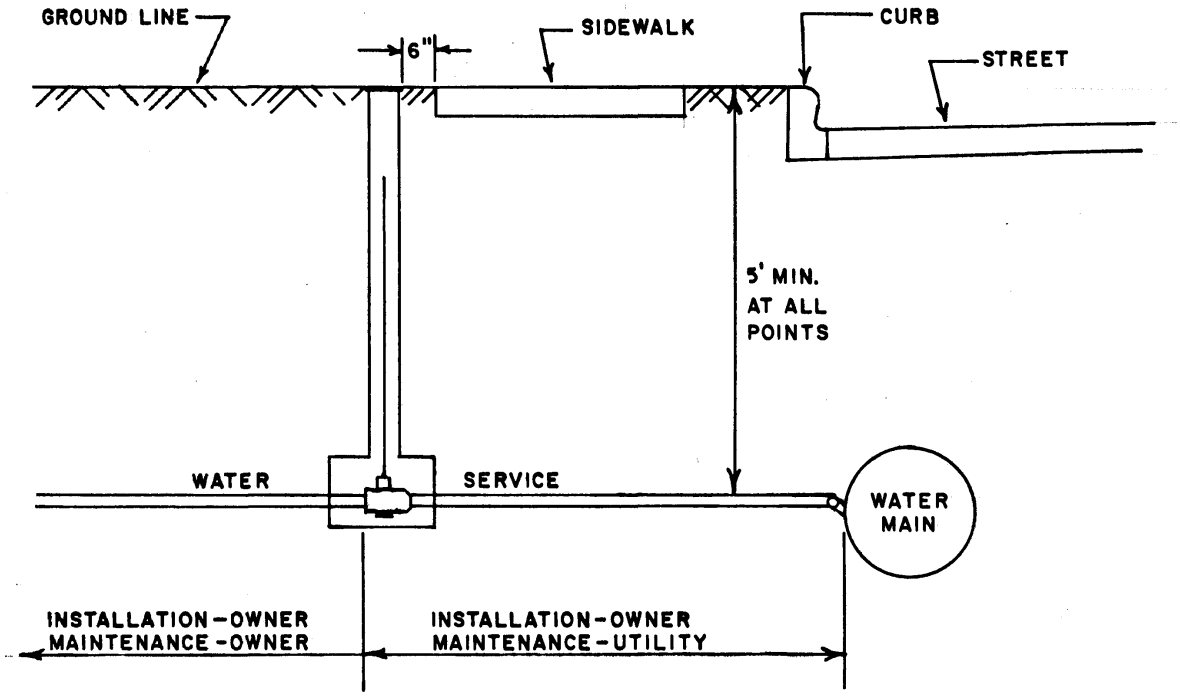
10.11.1 Hydrant branches shall be excavated along the branch pipe with the branch gate valve centered in the trench. One 17 pound anode shall be attached to the branch pipe between the water main and the gate valve and one 17 pound anode on the branch pipe between the gate valve and the hydrant.

10.11.2 Water services 4 inch diameter and larger shall be excavated along the service pipe with the curb shut off valve centered in the excavation. One anode shall be connected to the service pipe between the water main and the curb valve and a second anode shall be connected to the service pipe between the curb valve and the customer's property. For services with no curb valve, one anode shall be connected to the service pipe in the vicinity of the curb. Anode sizes shall be based on the service diameter, with 17 pound anodes installed on 4 and 6 inch diameter services; 32 pound anodes installed on 8 and 10 inch diameter services and 48 pound anodes installed on

services 12 inch diameter and larger.

10.12 The unit price bid shall include the cost of: installing the prepackaged magnesium anode; all thermite weld equipment and materials; attaching the anode lead wire to the pipe or fitting; splicing the lead wire at test stations, bitumastic coating; repairing the polyethylene tubing; locating joints on existing pipe and furnishing all labor and equipment necessary to complete the work.

FORM NO. 116A 7-65



NOTES:

1. If Curb Box Must Be Installed In Driveway Or Sidewalk, A Curb Box Receptacle Must Be Used When Placing Concrete.

2. Corporation Stop, Curb Stop, Curb Box, And Receptacle (if needed) To Be Supplied By Water Dept.

3. Service Is To Be Wrapped In Polyethylene From The Water Main To The Curb Stop, If Possible.

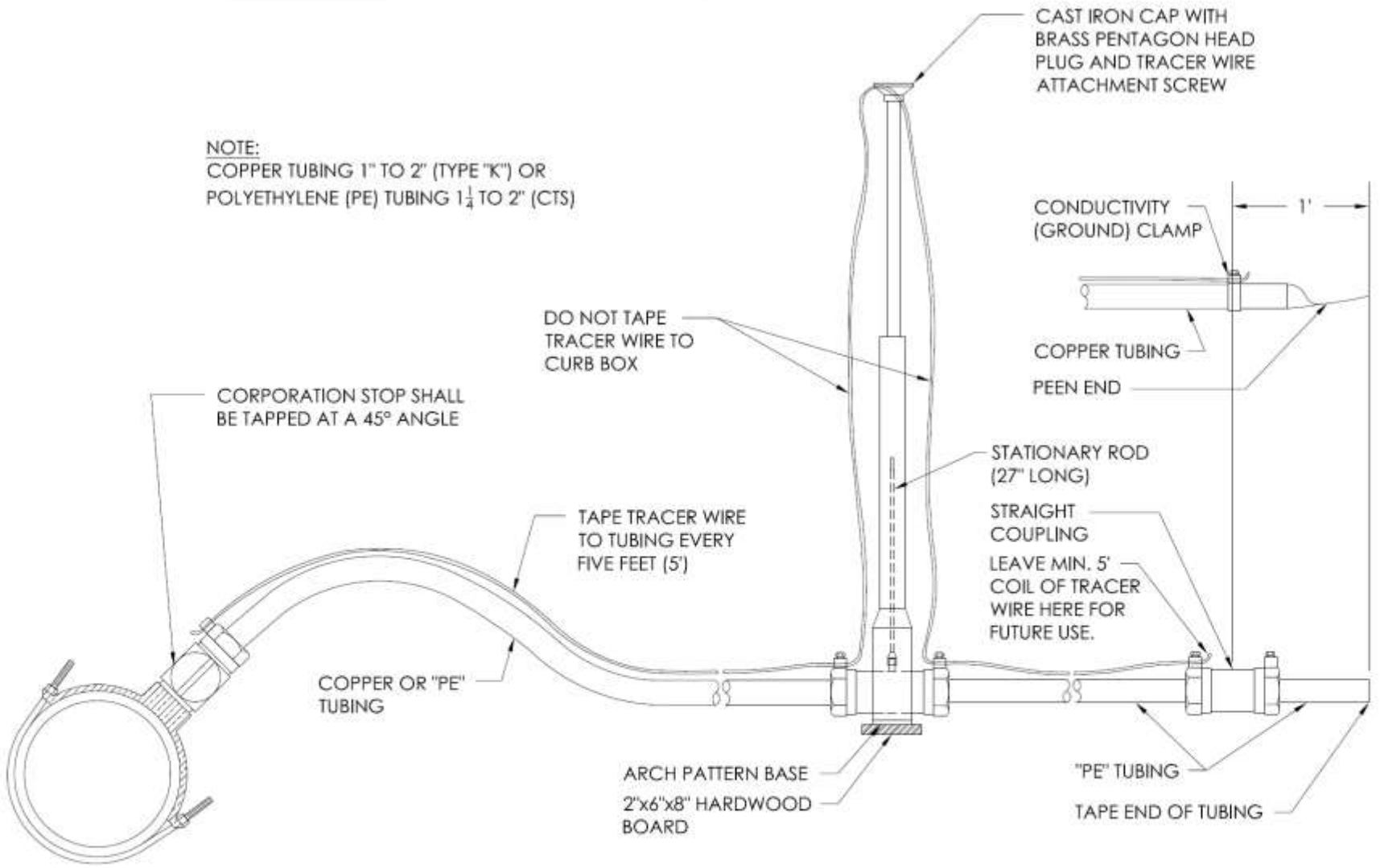
DWG. NO. B-6-1

PROFILE - TYPICAL WATER SERVICE INSTALLATION

MANITOWOC PUBLIC UTILITIES
MANITOWOC, WISCONSIN

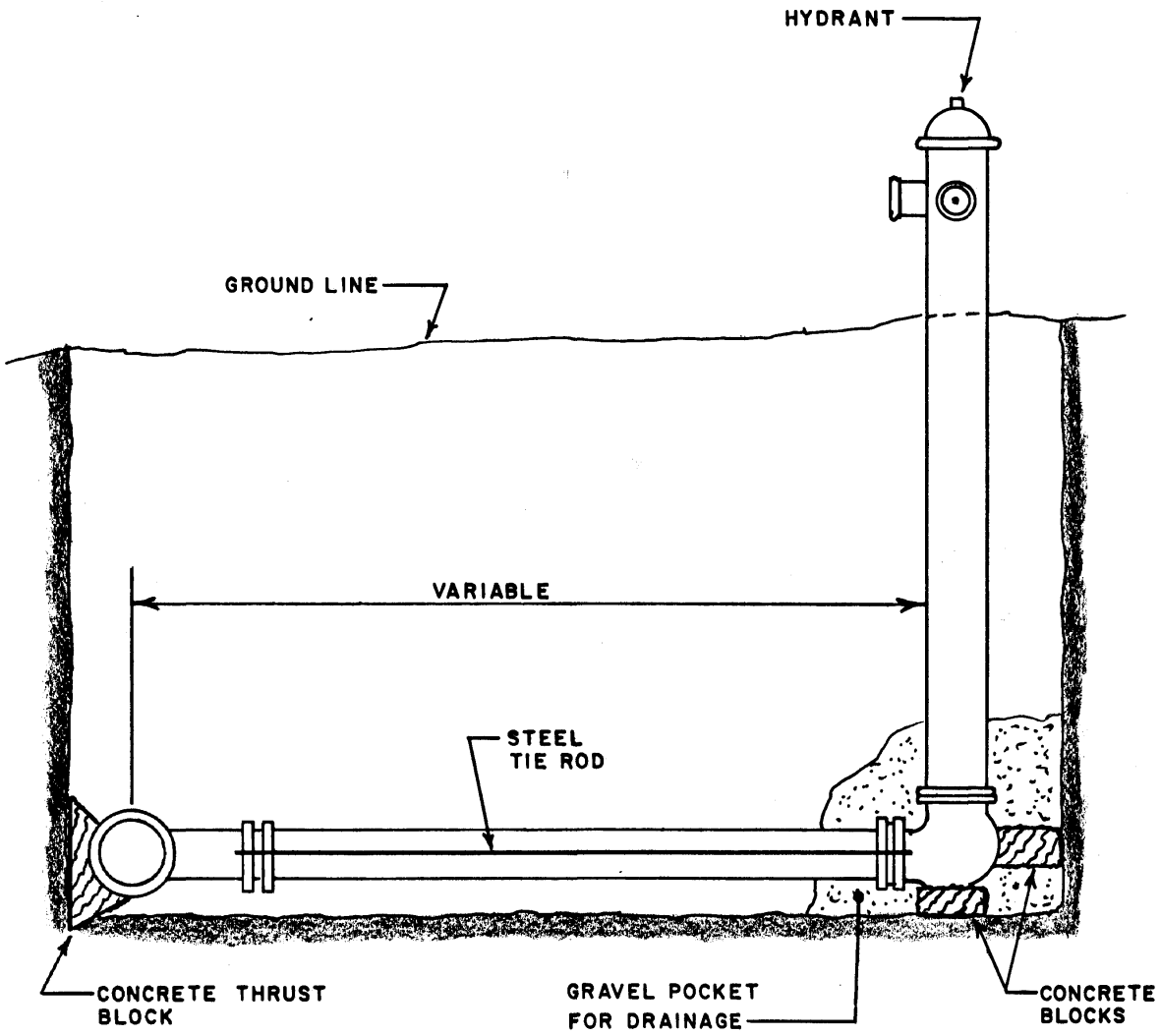
DRAWN BY K.Z. DATE 3-3-86 SCALE None
REVISED
APPROVED

WD-6-S



NO	DATE	DESCRIPTION	BY	TITLE:	DATE: 3-22-2012
				WATER SERVICE LATERALS	DRAWN: CMJ
					CHK'D: RM
					SCALE: NTS
				MPU	DEPT: WD
					TYPE: WORK ORDER
				MANITOWOC PUBLIC UTILITIES MANITOWOC, WISCONSIN	SHEET NUMBER: WD-6A-S

FORM NO. 116A 7-65



NOTE:

1. Backfill The Same As Water Main Installation.

PROFILE—TYPICAL HYDRANT INSTALLATION

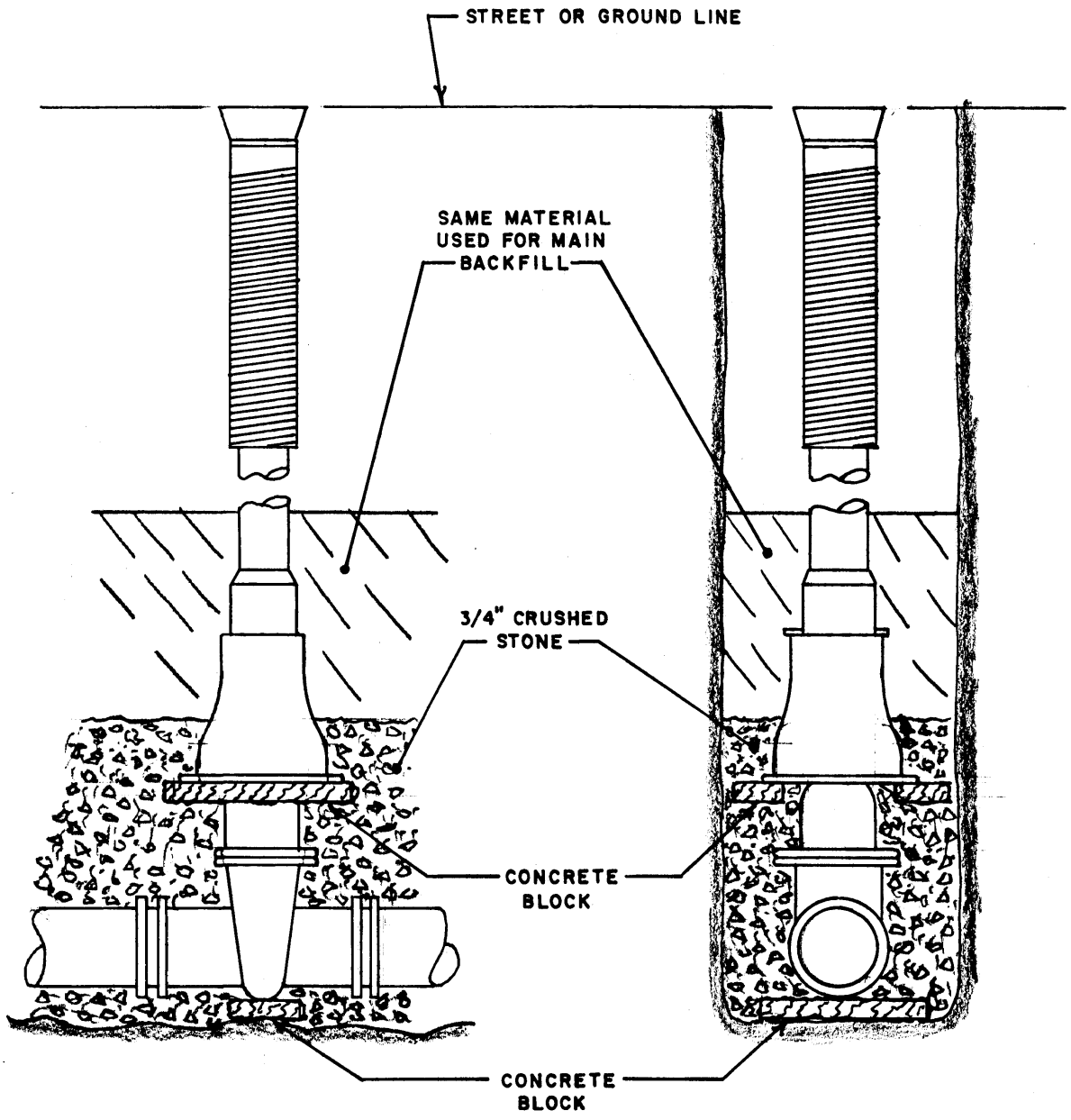
MANITOWOC PUBLIC UTILITIES
MANITOWOC, WISCONSIN

DRAWN BY K.Z. DATE 3-4-86 SCALE None
REVISED 11-6-87 K.Z.
APPROVED

WD-7-S

DWG. NO. B-5-1

FORM NO. 116A 7-65



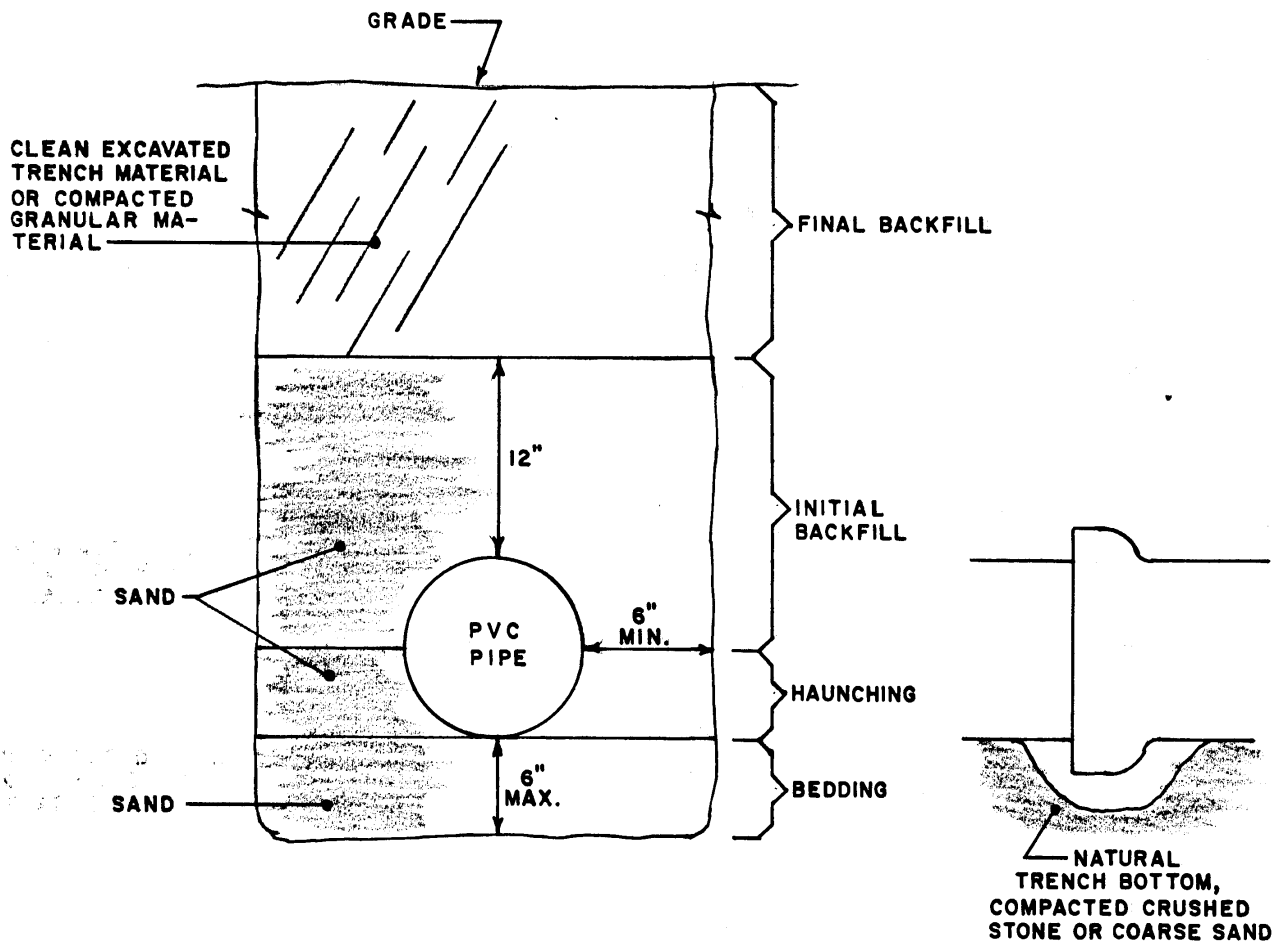
NOTES:

1. All Valves To Be Mechanical Joint Fittings.
2. If Pipe Is PVC, Valve Must Be Blocked As Shown On Typical Concrete Thrust Block Drawing.
3. If In Roadway, Top Two (2) Feet Of Backfill Must Be Compacted Breaker Run Material With No Greater Than 25% Fines.

DWG. NO. B-4-1

TYPICAL INST. OF RESILIENT WEDGE OR GATE VALVE	
MANITOWOC PUBLIC UTILITIES MANITOWOC, WISCONSIN	
DRAWN BY K.Z.	DATE 3-4-86 SCALE None
REVISED 11-6-87 K.Z.	
APPROVED	WD-8-S

FORM NO. 116A 7-65



NOTES:

1. If Trench Bottom Is Rocky Or Frozen, Place A 6" Layer Of Sand Along Bottom For Bedding.
2. Haunching Material Shall Be Well Compacted Sand To A Depth Of One Half The Pipe Dia.
3. Initial Backfill Shall Be Well Compacted Sand To A Depth Of 12" Above The Pipe.
4. Final Backfill May Be Machine Placed With No Large Stones, Frozen Materials, Or Debris.
5. If In Roadway, Top 2 Feet Of Backfill Must Be Compacted Breaker Run Material With No Greater Than 25% Fines.

TYPICAL INSTALLATION OF PVC PIPE

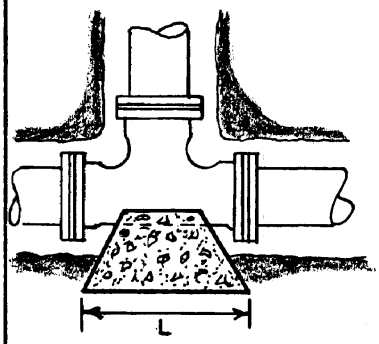
MANITOWOC PUBLIC UTILITIES
MANITOWOC, WISCONSIN

DRAWN BY K.Z. DATE 3-4-86 SCALE None
REVISED 11-6-87 K.Z.
APPROVED

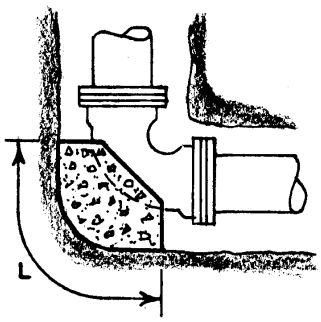
DWG. NO. B-3-1

WD-9-S

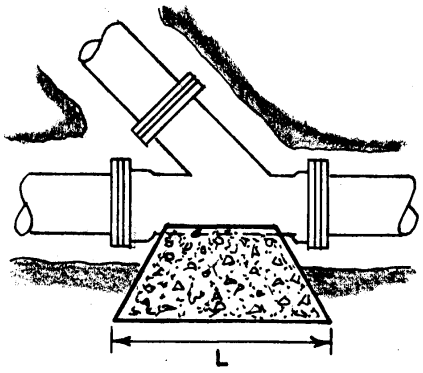
FORM NO. 116A 7-65



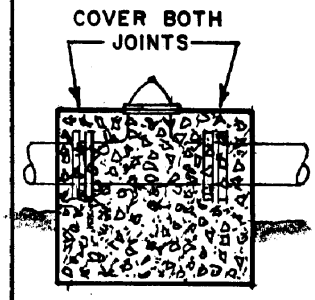
TEE



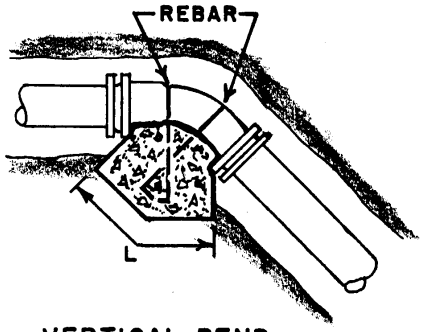
HORIZONTAL BEND



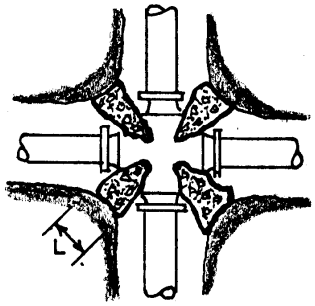
WYE



VALVE TIE-DOWN



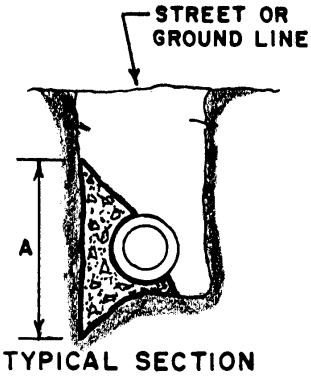
VERTICAL BEND



CROSS

NOTES:

1. Thrust Block Shall Be Placed Against Fitting In A Manner That Insures Nuts And Bolts Can Be Removed.
2. Dimensions (L) Against Undisturbed Soil Is To Be Determined By MPU.
3. Upon Approval By MPU, Tie Rods May Be Used In Place Of Concrete For Ductile Iron Pipe.
4. Steel Reinforcement Bars To Be Sized By MPU.
5. If Undisturbed Soil Is Not Available, A Larger Mass Of Concrete Shall Be Used. Joints Can Be Completely Covered To Tie Pipe And Fittings Together.



TYPICAL SECTION

TYPICAL CONCRETE THRUST BLOCKS

MANITOWOC PUBLIC UTILITIES
MANITOWOC, WISCONSIN

DRAWN BY K.Z. DATE 3-5-86 SCALE None

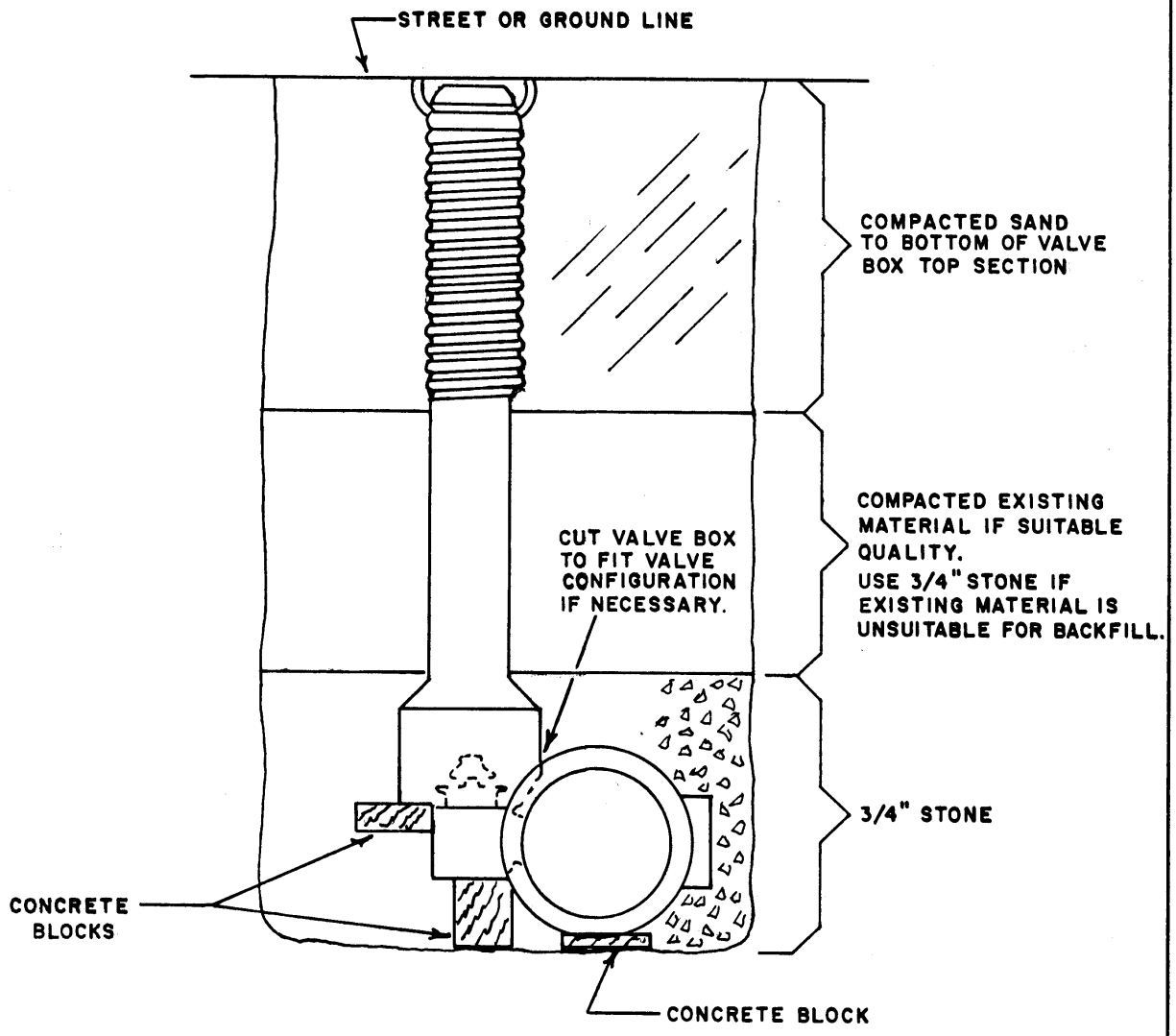
REVISED

APPROVED

DWG. NO. B-2-1

WD-10-S

FORM NO. 116A 7-65



NOTES:

1. All Butterfly Valves To Be Mechanical Joint Fittings.
2. All Pipe And Valve Materials Supplied By MPU.
3. A Sleeve Is To Be Used To Close Pipe When Valve Is A Replacement.
4. Contractor To Provide All Backfill Materials.
5. If In Roadway, Top Two (2) Feet Of Backfill Must Be Compacted Breaker Run Material With No Greater Than 25% Fines.

DWG. NO. B-4-2

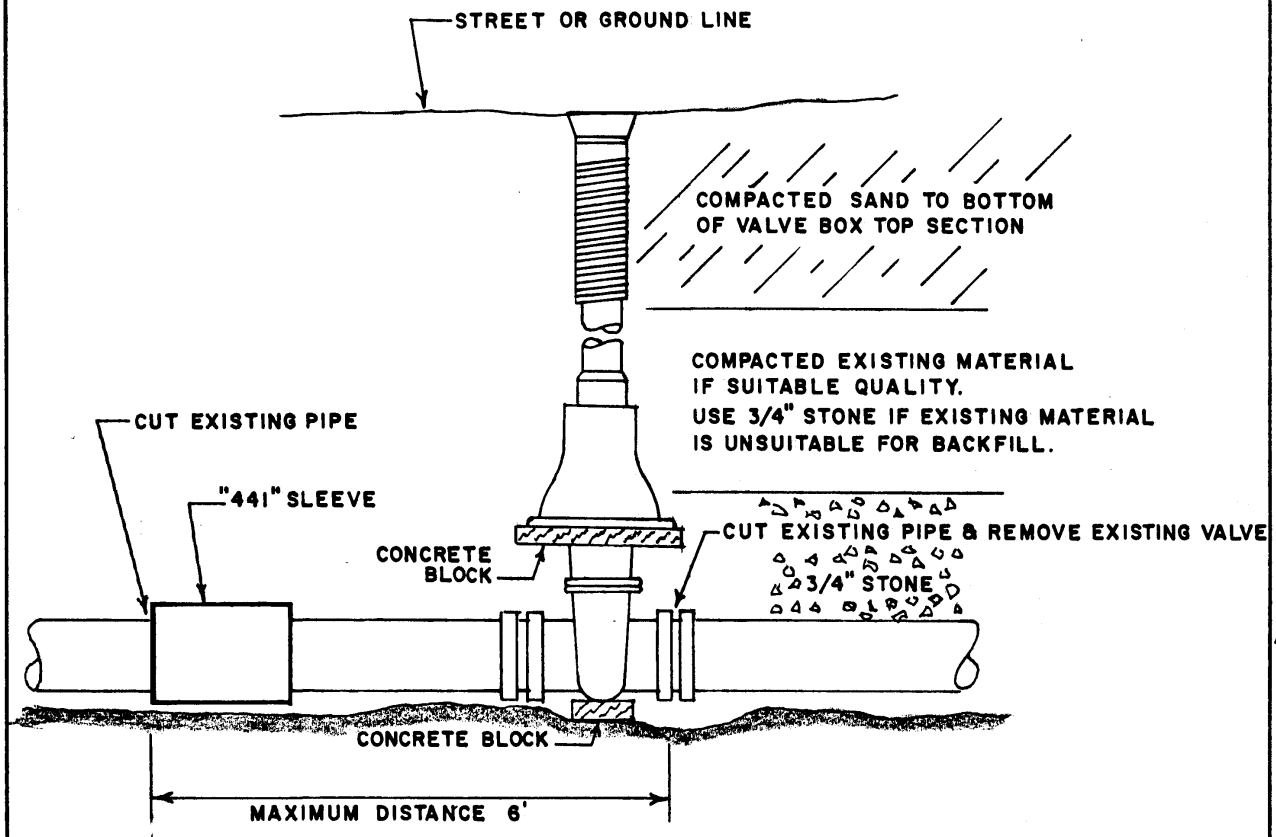
TYPICAL INSTALLATION OR REPLACEMENT OF BUTTERFLY VALVES

MANITOWOC PUBLIC UTILITIES
MANITOWOC, WISCONSIN

DRAWN BY K.Z. DATE 3-5-86 SCALE None
REVISED 11-6-87 K.Z.
APPROVED

WD-11-S

FORM NO. 116A 7-65



NOTES:

1. All Pipe And Valve Materials Supplied By MPU.
2. If Existing Valve Is In Manhole, Remove And Eliminate The Manhole.
3. Contractor To Provide All Backfill Materials.
4. If In Roadway, Top Two (2) Feet Of Backfill Must Be Compacted Breaker Run Material With No Greater Than 25% Fines.
5. If The Pipe Is PVC, Use Concrete Thrust Blocks As Shown On "Typical" Installation. Also Bury Sleeves In Concrete.

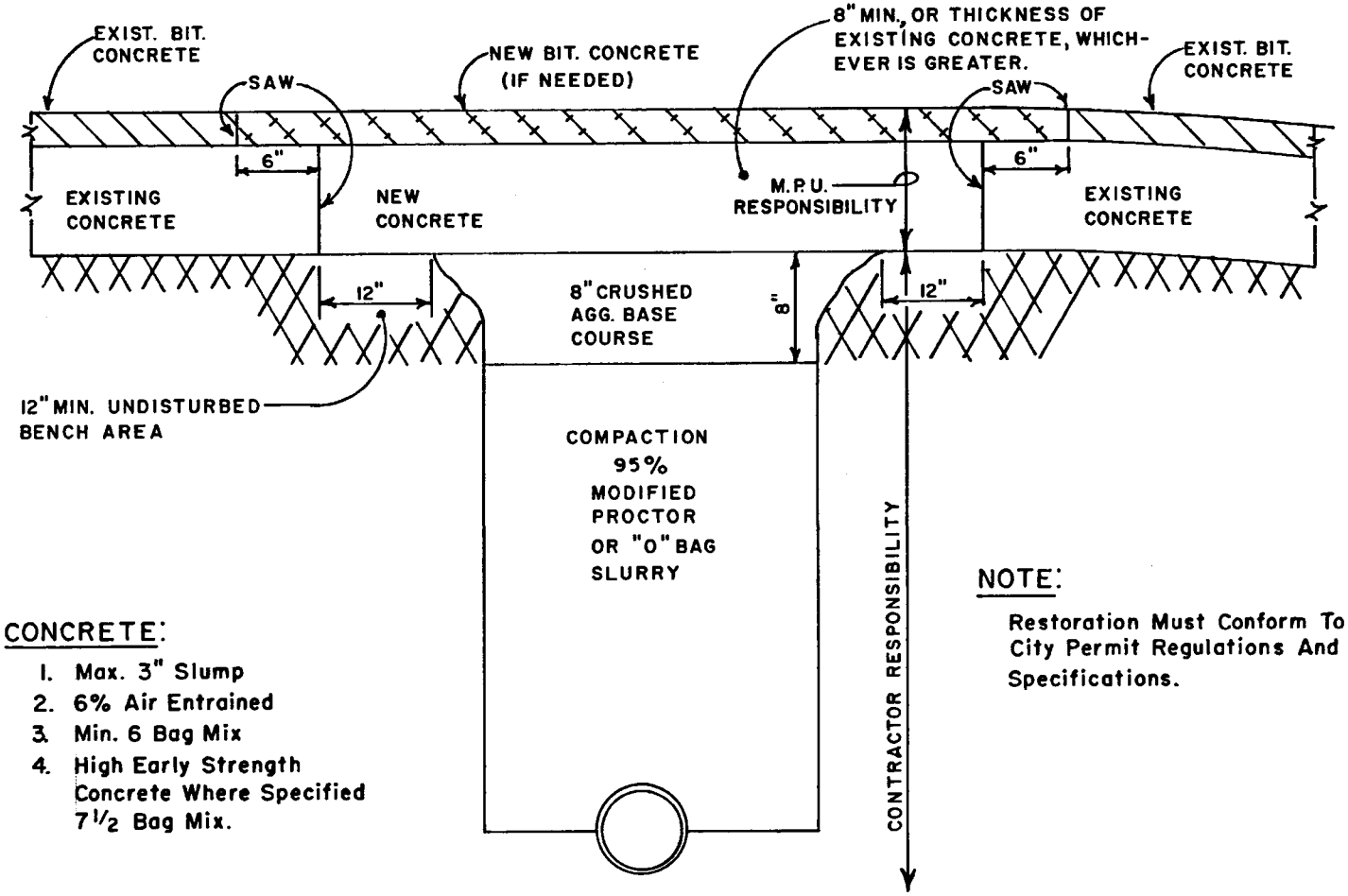
DWG. NO. B-4-3

TYPICAL GATE VALVE REPLACEMENT

MANITOWOC PUBLIC UTILITIES
MANITOWOC, WISCONSIN

DRAWN BY K.Z. DATE 3-5-86 SCALE None
REVISED 11-6-87 K.Z.
APPROVED

WD-12-S



TRENCH RESTORATION

MANITOWOC PUBLIC UTILITIES
MANITOWOC, WISCONSIN

DRAWN BY K.Z. DATE 11-9-87 SCALE
REVISED
APPROVED

WD-13-S

DWG. NO. B-7-1

CONCRETE:

1. Max. 3" Slump
2. 6% Air Entrained
3. Min. 6 Bag Mix
4. High Early Strength Concrete Where Specified 7 1/2 Bag Mix.

NOTE:

Restoration Must Conform To City Permit Regulations And Specifications.

MINIMUM UTILITY TRENCH RESTORATION

FOR

CONCRETE AND RESURFACED CONCRETE OR BRICK PAVEMENTS

FORM NO. 116A 7-65