33 10 00 WATER UTILITIES

1. Applicability

1.1. The installation, construction, alteration, and repair of the water utility system (domestic and fire water) beginning five feet from the building foundation on any and all University of Minnesota property in the state of Minnesota.

1.2. See Division 33 19 00 for domestic water metering, including deduct meters.

2. General Information

2.1. Ownership of the water utility system varies by Campus and location throughout the state of Minnesota. The UMN Civil Engineer shall be consulted regarding utility ownership during feasibility and/or pre-design.

2.2. Additions, extensions, and replacement of any University owned water infrastructure on University property shall be designed in accordance with the Minnesota Department of Health, the latest revision of Recommended Standards for Water Works by the Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers (Ten State Standards), and the latest revision of the City Engineers Association of Minnesota (CEAM) Standard Specifications. The local water purveyor's requirements shall be consulted as well. In the case of conflicting requirements, the standards in this section shall govern.

3. Permits

3.1. University Building Code Department (BCD)

3.1.A. Additions, connections, and/or modifications to the water utility system require a Utility Permit.

3.2. Authority Having Jurisdiction (AHJ)

3.2.A. Connection to water utility systems not owned by the University may require permits from the AHJ. Contact the UMN Civil Engineer.

3.2.B. A joint powers agreement may be in effect. Contact the UMN Civil Engineer.

3.2.C. Water Access/Availability Charge (WAC)

3.2.C.1. The AHJ may require payment of a WAC for new connections or extensions of watermains and service laterals.

3.2.C.2. Refer to Division 22 and the University Building Code Department website for permits related to WAC or similar for new connections to the domestic water utility.

3.3. Minnesota Department of Health (MDH)

3.3.A. Watermain Plan Review may be required by MDH for installations and replacement of watermain more than 100 linear feet.

3.3.B. Plan review may be required for other water related projects including:

3.3.B.1. Pumphouses, Booster Stations, Storage Tanks, etc.

3.3.C. See the MDH website for more information.

3.4. Other permits may apply.

4. Acceptable Materials

4.1. Ductile Iron

4.1.A. Ductile Iron Pipe

4.1.A.1. Ductile Iron Pipe to be AWWA Class 50 or thicker wall, slip joint with rubber gaskets and lined with concrete mortar.

4.1.A.2. Buried pipe shall conform to the latest requirements:

4.1.A.2.a. AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings

4.1.A.2.b. AWWA C111 - Rubber Gasket Joints for Ductile Iron Pressure Fittings

4.1.A.2.c. AWWA C150 - Thickness Design of Ductile Iron Pipe

4.1.A.2.d. ANSI/AWWA C151/A21.51-96 - American National Standard For Ductile Iron Pipe, Centrifugally Cast, For Water

4.1.A.2.e. All linings and coatings in contact with potable water shall be in compliance with ANSI/NSF Standard 61.

4.1.B. Ductile Iron Fittings

4.1.B.1. Fittings shall conform to the latest requirements:

4.1.B.1.a. AWWA C110/A21.10-21 - Gray Iron and Ductile Iron Fittings; or

4.1.B.1.b. AWWA C153-11 - Ductile Iron Compact Fittings, and

4.1.B.1.c. AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings.

4.1.B.2. Buried fittings shall be mechanical slip joints with rubber gaskets and lined with concrete mortar.

4.1.B.3. Mechanical joint restraints for ductile iron pipe to be Megalug joints or approved equal to meet the requirements of ASTM A536 and AWWA C600.

4.2. Copper

4.2.A. Copper Pipe

4.2.A.1. Pipe less than 3” diameter shall conform to the lastest requirements:

4.2.A.1.a. ASTM B88 for Seamless Copper Water Tube, Type K, Soft Annealed temper

4.2.A.1.b. ANSI/NSF Standard 61

4.2.B. Copper Fittings

4.2.B.1. Fittings shall be cast copper alloy conforming to AWWA C800, having uniformity in wall thickness and strength, and shall be free of defects affecting serviceability.

4.2.B.2. Buried copper pipe fittings shall be flared type.

4.2.B.3. **PROHIBITED:** Lead solder and flux

4.3. High Density Polyethylene (HDPE)

4.3.A. HDPE Pipe

4.3.A.1. Pipe 4” diameter and larger shall conform to the latest requirements:

4.3.A.1.a. ASTM 3035; and

4.3.A.1.b. AWWA C906-15 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. through 65 In., for Waterworks.

4.3.A.1.c. Pipe shall be PE4710 compound conforming to ASTM D3350 minimum cell classification 445574C-CC3, Pressure Class 200, SDR 11, at 73 deg F. and have outside diameters similar to ANSI A-21.51 ductile iron pipe.

4.3.A.1.d. Joints shall be butt heat fusion type, ASTM F2620.

4.3.A.1.e. ANSI/NSF Standard 61

4.3.A.2. Pipe 3" diameter and smaller shall conform to the latest requirements:

4.3.A.2.a. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, ½ In. through 3 In., for Waterworks

4.3.A.2.b. Pipe shall be PE4710 compound conforming to ASTM D3350 minimum cell classification 445574C-CC3, DR 9, have a minimum working pressure of 250 psi at 73 deg. F. and have outside diameters similar to iron pipe size.

4.3.A.2.c. Joints shall be butt heat fusion type, ASTM F2620.

4.3.A.2.d. Joints may be socket fused type for service pipes.

4.3.A.2.e. ANSI/NSF Standard 61

4.3.B. HDPE Fittings

4.3.B.1. All fittings for pipe 4" diameter and larger shall conform to the latest requirements:

4.3.B.1.a. ASTM 3035; and

4.3.B.1.b. AWWA C906-15 - Polyethylene (PE) pressure Pipe and Fittings, 4 In. through 65 In. for Waterworks.

4.3.B.1.c. Fittings shall be PE4710 compound conforming to ASTM D3350 minimum cell classification 445574C-CC3, Pressure Class 200, SDR 11, at 73 def. F. and have outside diameters similar to ANSI A-21.51 ductile iron pipe.

4.3.B.1.d. Fittings shall be butt heat fusion type ASTM F2620.

4.3.B.1.e. All fittings shall be molded if a molded fitting is available. If a molded fitting is not manufactured, then a fabricated fitting may be used.

4.3.B.1.f. All fabricated fittings shall be rated for a minimum operating pressure of 200 psi.

4.3.B.1.g. All fabricated fittings shall be equivalent diameter ration 11 full inside diameter (EDR-11, full ID).

4.3.B.2. All fittings for pipe 3" diameter and smaller shall conform to the latest requirements:

4.3.B.2.a. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, ½ In. through 3 In., for Waterworks

4.3.B.2.b. Pipe shall be PE4710 compound conforming to ASTM D3350 minimum cell classification 445574C-CC3, DR 9, have a

minimum working pressure of 250 psi at 73 deg. F. and have outside diameters similar to iron pipe size.

4.3.B.2.c. Fittings shall be butt heat fusion type, ASTM F2620.

4.3.B.2.d. All fittings shall be molded polyethylene fused-type suitable for use on iron pipe size HDPE pipe.

4.4. C900 PVC

4.4.A. C900 PVC Pipe

4.4.A.1. Pipes 4" diameter and larger shall conform to the latest requirements:

4.4.A.1.a. AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 12 In. for Water Distribution

4.4.A.1.b. ANSI/NSF Standard 61

4.4.A.1.c. All pipe shall have a minimum dimension ration (DR) of 18 corresponding to a working pressure of 150 psi.

4.4.A.1.d. The pipe shall be manufactured to ductile iron outside dimensions.

4.4.B. C900 PVC Fittings:

4.4.B.1. Pipe fittings 4" diameter and larger shall conform to the latest requirements:

4.4.B.1.a. AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 12 In. for Water Distribution

4.4.B.1.b. All fittings shall be epoxy coated ductile iron, having a minimum working pressure rating of 150 psi and shall conform to the requirements of AWWA C110 or AWWA C153 - Ductile Iron Compact Fittings.

4.4.B.1.c. All joints shall be a formed bell complete with a single rubber gasket. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C900.

4.4.B.1.d. Gasket material shall be SBR or approved equal.

4.4.B.1.e. Joint restraint shall be an internal self-restraining system, and shall be rated by the manufacturer to pressures that meet or exceed the rating of the C900 PVC pipe being restrained.

4.5. **PROHIBITED:** Lead pipe, solder, and flux.

5. Water Utility Distribution Piping

5.1. Pipe Material

5.1.A. Watermains shall be ductile iron pipe (DIP) with mechanical joint fittings.

5.1.B. High density polyethylene pipe (HDPE) may be used upon approval by the UMN Civil Engineer.

5.1.C. Other pipe materials may be considered based on local municipality standards.

5.2. Watermains shall be a minimum of 6" diameter.

5.3. Isolation valves shall be placed at fittings as specified by the UMN Civil Engineer.

5.4. Pipe Excavation and Installation

5.4.A. Pipes shall be installed with a minimum cover of 7.5 ft.

5.4.B. Pipes buried with less than 7.5 ft of cover shall be approved by the UMN Civil Engineer during project design.

5.4.B.1. Pipes shall have insulation installed above the pipe.

5.4.B.2. See 33 05 00 for insulation requirements.

5.4.C. Trench excavation, pipe installation and backfill shall be in accordance with pipe manufacturer's recommendations.

5.5. Watermain shall be constructed more than 5 ft from a building foundation.

5.6. Tracer wire shall be installed on all watermains.

5.6.A. See 33 05 00 for tracer wire requirements.

5.7. **PROHIBITED:** "Dead legs" or dead-end pipes on watermains.

6. Water Utility Service Laterals

6.1. Service laterals shall be aligned perpendicular to the building wall and run in a straight line from the building to the watermain.

6.2. The water meter shall be installed directly inside the building where the service line enters.

6.3. Service laterals shall not be routed under a building for more than 2' unless approved by the UMN Civil Engineer.

6.4. Tracer wire shall be installed on all service laterals.

6.4.A. See 33 05 00 for tracer wire requirements.

6.5. Pipe Material

Pipe Diameter	Pipe Material
Smaller than 3"	Type K Copper HDPE
3" and Larger	Ductile Iron Pipe HDPE
4" through 12"	C900 PVC (upon UMN Civil Engineer approval)

6.5.A. See Section 4 Acceptable Materials.

6.5.B. Other pipe materials may be considered based on local municipality standards.

6.6. Service laterals shall be sized based on proposed building needs as determined by a registered mechanical engineer.

6.7. Fire Protection Service Laterals

6.7.A. The fire service lateral and domestic water service lateral shall be two pipes with separate structures/stem pipes, taps, and valves at the main unless approved by the UMN Civil Engineer.

6.7.B. UMTC: Fire protection service laterals shall be constructed with an in-line double detector ASSE 1047 or 1048 check valve with a ¾ inch bypass assembly with an integral water meter and double check valve.

6.7.B.1. See 33 19 00 Water Utility Metering

6.8. Pipe Excavation and Installation

6.8.A. Pipe to be buried with a minimum of 7.5 ft of cover.

6.8.B. Pipes buried with less than 7.5 ft of cover shall be approved by the UMN Civil Engineer during project design.

6.8.B.1. Pipes shall have insulation installed above the pipe.

6.8.B.2. See 33 05 00 for insulation requirements.

6.8.C. Trench excavation, pipe installation and backfill shall be in accordance with pipe manufacturer's recommendations. See 33 05 00 for pipe installation guidelines.

6.9. Projects located in the City of Minneapolis: Minneapolis Water Department shall furnish and install the service tap and valve at the expense of the project, unless when located on UMN owned mains. Contact the UMN Civil Engineer for utility ownership.

7. Valves

7.1. Valve Type

7.1.A. Valves with diameters greater than 2" are to be gate valves.

7.1.B. Valves on water service laterals with diameters 2" and smaller may be a curb stop or a gate valve.

7.1.C. Post Indicator Valves (PIV)

7.1.C.1. See the latest update NFPA 24 for when required. Only PIVs required by NFPA 24 shall be allowed.

7.1.D. **PROHIBITED:** Butterfly valves on exterior water utility piping.

7.1.E. **PROHIBITED:** Buried valves with no access.

7.1.F. **PROHIBITED:** Brass tap valves

7.1.G. **PROHIBITED:** Saddle valves

7.2. Valve Products

7.2.A. General

7.2.A.1. All valves to be certified to NSF/ANSI 61.

7.2.B. Gate Valves

7.2.B.1. Shall conform to all applicable requirements of AWWA C-500, C-509, or C515.

7.2.B.2. Shall be provided with a 2" square operating nut opening counterclockwise and mechanical joints.

7.2.B.3. Shall be non-rising stem (NRS) type furnished with O-Ring stem seals.

7.2.B.4. All internal and external surfaces of the valve body and bonnet shall have an epoxy coating, complying with ANSI/AWWA C500.

7.2.B.5. All gate valves shall have stainless steel body bolts unless otherwise specified.

7.2.C. Curb Stops

7.2.C.1. Shall conform to the applicable requirements of AWWA C800

7.2.C.2. Shall be 1/4 turn type only.

7.3. Valve Installation

7.3.A. Valves to be installed centered on the structure opening and to be accessible by long stem key.

7.3.B. No permanent stems shall be installed on valves owned by the UMN.

7.3.C. Valves 2" and larger

7.3.C.1. All valves shall be installed in a 48" diameter access structure. See UMN standard plate WTR-0001.

7.3.C.1.a. Exception: Valves located within City of Minneapolis right-of-way are to be in a valve box.

7.3.C.1.b. Exception: Valves at UMD shall be in a valve box.

7.3.C.1.c. Exception: Hydrant valves shall be in a valve box, see Section 11 below.

7.3.C.2. Valves smaller than 2"

7.3.C.2.a. May be in a valve box or a 48" diameter access structure. See UMN standard plate WTR-0002.

8. Fittings

8.1. Largest bend allowable is 45 deg.

8.1.A. **PROHIBITED:** 90 deg (right angle) bends.

8.2. See Section 4 for acceptable materials.

9. Thrust Blocking and Restraining

9.1. All pipe bends, tees, caps, plugs, and other thrust points shall have proper thrust blocking.

9.2. Concrete Thrust Blocks

9.2.A. Concrete thrust blocks shall be designed by the Engineer of Record.

9.2.A.1. City Engineers Association of Minnesota Standard Specification section 2611.3 A4 Blocking and Anchoring of Pipe may be used.

9.2.A.2. May comply with local municipal standards.

9.2.B. Concrete thrust blocks shall be poured against firm, undisturbed ground and shall be formed in such a way that the joints can be wrapped in poly so that they will be kept free of concrete and remain accessible for repairs.

9.2.C. Wood forms shall be removed prior to backfilling.

9.2.C.1. Ground contact green treated wood forms may be allowed to remain prior to backfilling with prior approval by UMN Civil Engineer.

9.3. Joint Restraint Devices

9.3.A. Contractor shall furnish and install approved joint restraint devices at each fitting or as indicated in the plans.

9.3.A.1. MEGALUG joints or approved equal.

10. Structures and Appurtenances

10.1. Structure

10.1.A. Access Structure

10.1.A.1. Precast concrete riser sections and appurtenant units used in the construction of access structures shall conform with the requirements of ASTM C-478 and MnDOT 2506.

10.1.A.2. The precast sections and appurtenant units shall conform to all requirements as shown on the UMN standard plates. See UMN standard plate WTR-0001.

10.1.A.3. The barrel shall be 48" diameter with a personal access of 27" diameter.

10.1.A.4. Joints of manhole riser sections shall be tongue and groove with rubber "O" ring or profile gaskets.

10.1.A.5. Pipe connections to the structure shall have 4" minimum closed cell foam around the pipe, completely filling the annular space between the pipe and the structure wall. Apply a layer of mortar over the foam.

10.1.A.6. Base to have a 6" diameter hole in the center for draining purposes.

10.1.A.7. Top section may be as follows:

10.1.A.7.a. MnDOT standard plate 4005 Type B for eccentric cones

1. **PROHIBITED:** MnDOT standard plate 4005 Type A for concentric cone

10.1.A.7.b. MnDOT standard plate 4020 for top slabs

10.1.A.8. A minimum of two 2" adjusting rings shall be installed. A maximum of five, 2" adjusting rings shall be installed.

10.1.A.8.a. Concrete: Adjusting rings shall be installed with a full bed of mortar between each ring.

10.1.A.8.b. HDPE: Follow manufacturers instructions for installation.

10.1.A.8.c. Modifications to existing structures shall adhere to minimum and maximum adjusting ring requirements.

10.1.A.9. Structures shall install steps spaced 16" on center.

10.1.A.9.a. Steps shall be Neenah R-1980E or similar.

10.1.A.10. To the maximum extent practicable, locate structures outside of pedestrian walkways and plazas.

10.1.B. Valve Box

10.1.B.1. Product:

10.1.B.1.a. Valve box shall be screw type Tyler Series 6860-HD, Mueller H-10391, or approved equal, with a 5-¼" inside diameter and be extendable from 48" to 102".

10.1.B.1.b. Valve box shall be cast iron.

10.1.B.1.c. Risers shall be compatible with valve box top sections.

10.1.B.1.d. Risers shall accommodate standard 5-¼" drop lids.

10.1.B.2. Installation:

10.1.B.2.a. Valve boxes shall be firmly supported and maintained centered and plumb over the wrench nut of the valve.

10.1.B.2.b. Valve boxes must be installed with a valve box adapter.

10.1.B.3. See standard plate WTR-0002.

10.2. Structures located in pavers, Class V, or gravel

10.2.A. Install a concrete collar that extends a minimum of 12” around all sides of casting. See UMN standard plate GEN-0002.

10.2.A.1. Concrete shall be designed for traffic loading, 8” minimum thickness.

10.2.A.2. When located in paver surface, size concrete collars such that there are no pavers less than ½ of a paver wide.

10.2.A.3. EXCEPTION: Valve box, see standard plate WTR-0002 for concrete collar dimensions.

10.2.B. Install chimney seal around adjusting rings of structure.

10.3. Structures located in pedestrian areas

10.3.A. To the maximum extent practicable, locate structures outside of pedestrian walkways and plazas.

10.4. Castings and Frames

10.4.A. All castings to be flush with grade, unless specified below:

10.4.A.1. Casting may be installed up to ¼” below grade in areas that have pedestrian traffic.

10.4.A.2. Castings may be installed up to ½” below grade in areas that have vehicle traffic.

10.4.A.3. Castings in mulched areas to be installed 1” above grade.

10.4.B. Access Structure

10.4.B.1. Frame: Neenah R-1733 or approved equal.

10.4.B.2. Casting: Neenah R1733-0806 or approved equal with a University of Minnesota block ‘M’ and the word “water” stamped onto the lid.

10.4.B.2.a. See UMN standard plate WTR-1103.

10.4.C. Valve Box

10.4.C.1. Tyler 6860 or Mueller H-10361 or approved equal.

10.4.C.2. Material shall be cast iron.

10.4.C.3. Cover shall have the word “water” stamped onto the lid.

10.4.C.4. See UMN standard plate WTR-0002.

11. Water Utility Fire Hydrants

11.1. The design and construction of fire hydrants shall conform to the latest edition of the Minnesota State Fire Code.

11.2. If not specified below, follow local municipal standards for fire hydrants.

11.3. University of Minnesota Building Code Office in conjunction with the UMN Civil Engineer will review and approve the design of the University of Minnesota fire protection watermains and hydrants.

11.4. Contractor to furnish and install fire hydrants.

11.5. Fire Hydrant service lines to be 6” diameter, minimum.

11.6. Fire Hydrant Valves

11.6.A. Service line valves to be gate valves.

11.6.B. Valves to be installed in a valve box. See UMN standard plate WTR-0002.

11.6.C. Valves to be placed within 10 feet from the hydrant.

11.6.C.1. Exception: Hydrant valves at UMD shall be placed adjacent to the watermain. Valves shall be connected directly to an anchoring tee. When not possible, hydrant service lines to be connected to the main with Megalug joints or approved equal.

11.7. Clearance

11.7.A. Fire Hydrants to have a 3 ft clearance around all sides.

11.7.B. Fire Hydrants to have no parking within 10 ft.

11.7.C. Fire Hydrants susceptible to be hit by vehicles or damaged shall be protected by bollards placed at a distance of 3 ft from the hydrant.

11.8. Hydrant Color

11.8.A. All new hydrants shall be purchased in the color specified below.

11.8.B. All UMN owned hydrants shall be red.

11.8.B.1. Exception: UMN owned hydrants within the City of Minneapolis shall be yellow. See section 11.8 below.

11.8.C. UMD Hydrant Caps

11.8.C.1. Hydrant caps shall be red when the hydrant is downstream from a water meter.

11.8.C.2. Hydrant caps shall be painted yellow when the hydrant is not downstream of a water meter.

11.9. UMN owned hydrants in Minneapolis

11.9.A. Hydrants shall be plumbed off of a building plumbing system or a University owned watermain.

11.9.A.1. Water supplies to private hydrants are to be separated from the city water supply by a listed OS&Y valve, a detector check valve with bypass meter, and a listed indicating gate valve.

11.9.A.2. When the supply from the city water system also supplies sprinkler or standpipe systems, a listed indicating gate valve shall isolate the hydrant system from the other systems. A check valve is to be installed in the supply piping downstream of the hydrant system and upstream of the other systems to prevent water from entering the hydrant system when the fire department pumps into the fire department connection of the sprinkler or standpipe system.

11.9.B. Hydrants shall be yellow.

12. Fire Service Backflow Protection

12.1. Follow the requirements of the utility watermain owner.

12.2. Buildings supplied by a UMN owned watermain:

12.2.A. Acceptable products:

12.2.A.1. Badger Recordall Fire Service Assembly, or approved equal.

13. Water and Sewer Crossings

13.1. Watermain and services located near gravity sanitary and storm sewers

13.1.A. A minimum of 10 ft measured horizontally between the outer surfaces of the pipes is required.

13.1.B. In locations where local conditions prevent the required separation indicated above (due to the presence of rock, buildings, other significant obstructions), the water pipe may be laid closer to the gravity sewer if one of the following conditions is met:

13.1.B.1. The bottom of the water pipe is laid at least 18" above the top of the sewer on a separate shelf; or

13.1.B.2. The sewer is constructed of materials and with joints that are equivalent to watermain standards for construction and is pressure tested to ensure water tightness prior to backfilling.

13.2. Watermain and services crossing gravity sanitary and storm sewers

13.2.A. A minimum vertical separation of 18" shall be provided between the outer surfaces of the pipes, with preference that the water pipe crosses above the sewer, wherever possible.

13.2.A.1. Vertical separations less than 24" between a water pipe and sewer pipe shall have insulation installed 6" from the water pipe, placed between the water pipe and sewer pipe. See 33 05 00 for insulation installation requirements.

13.2.B. One full length of water pipe shall be located so both joints will be as far from the sewer as possible.

14. Temporary Water

14.1. The contractor shall be responsible for all costs associated with the installation of temporary water if required during a construction project.

14.2. In many cases the work to install and remove the temporary water service may be completed by the governing utility owner (e.g. City of Minneapolis Water Department, or the UMN). The cost to cover the work shall be covered by the contractor.

14.2.A. Work completed by the UMN will require an Internal Service Agreement (ISA).

14.3. The contractor shall provide a back-flow prevention device between the existing water system and the temporary construction system.

14.4. The contractor shall maintain the system in a manner that will prevent freezing, flooding, or contamination.

14.5. Fire hydrants may be used as a source for temporary water during construction. The hydrant will require a back-flow prevention device, a meter, and a heated tent if construction is occurring during cold weather to prevent freezing. The utility owner shall be contacted for approval and required permits. The contractor is responsible for any charges required for the use of a fire hydrant for temporary water.

15. Abandoning/Removing Domestic Water

15.1. Abandoning/Removing Pipes

15.1.A. Water service laterals that are taken out of service shall have the tap disconnected from the main, and the watermain restored. The manhole/valve shall also be removed.

15.1.A.1. Exception: UMD: remove the service lateral up to the tee and cap the tee.

15.1.B. Water pipes shall be removed as much as practicable based on a project's excavation limits and construction activities.

15.1.C. Remaining water pipes that are not removed shall be properly abandoned.

15.1.C.1. Pipes smaller than 3" diameter can be left in place as-is.

15.1.C.2. Pipes 3" diameter and larger shall be filled with flowable fill and both pipe ends bulkheaded.

15.2. Abandoning/Removing Structures

15.2.A. Structures that are taken out of service shall be removed as much as practicable based on a project's excavation limits and construction activities.

15.2.B. Structures may be abandoned if allowed by the UMN Civil Engineer based on project excavation limits.

15.2.C. Abandoned access structures shall follow UMN standard plate GEN-0001.

15.3. Documentation of Abandoned Features

15.3.A. All abandoned pipe ends and structures shall be located and included on as-builts.

15.3.A.1. UMTC: GPS locations required.

15.3.A.2. Tie-ins dimensioned on as-built prints if GPS locating is not available.

16. Disinfection and Acceptance Testing of Water Utilities

16.1. Disinfection

16.1.A. See the most current edition of the City Engineer's Association of Minnesota (CEAM) specifications.

16.2. Hydrostatic Testing

16.2.A. See the most current edition of the City Engineer's Association of Minnesota (CEAM) specifications.

16.3. All testing shall be in the presence of the UMN Building Code Official or other university representative as determined. A minimum of 72 hours advance notice is required.

16.4. Submittals

16.4.A. Submit copies of all water testing results to the University Building Code Official.

END OF SECTION