

STANDARD SPECIFICATIONS

for

WATER UTILITY DESIGN AND CONSTRUCTION

May 2024

prepared by the



City of Decatur, Illinois
Public Works Department
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1. Reference Standards

The following standards are incorporated by reference:

- A. The Illinois Department of Transportation (IDOT) "Standard Specifications for Road and Bridge Construction", Current Edition.
- B. "Standard Specifications for Water and Sewer Construction in Illinois", Current Edition.
- C. The IDOT "Manual of Test Procedures for Materials" Current Version.

2. Reference Drawings

Reference drawings are available on the City's website in the Public Works Department, Construction Standards Page.

- A. 4000 Fire Hydrant
- B. 4005 Tapping Sleeves and Valves
- C. 4009 Watermain Valves – 4" to 12"
- D. 4010 Watermain Valves 16" and Larger
- E. 4019 Concrete Blocking Watermain – 4" to 12"
- F. 4020 Concrete Blocking Watermain – 6" to 10"
- G. 4021 Concrete Blocking Watermain – 12" to 42"
- H. 4030 Air Release Valve Vault
- I. 4040 Water Service Installation, Typical Domestic Water Service
- J. 4050 Tracer Detail for PVC Pipe
- K. 4060 Witness Post Detail
- L. 4070-1 Water Service Disconnect, Typical Domestic Water Service
- M. 4070-2 Water Service Disconnect, Typical Domestic Water Service

3. Valve Operation

The necessary regulation or operation of valves to allow for the connections being made shall be performed only by the employees of the City's Water Services Division. Notice must be given forty-eight (48) hours in advance when a shut-off is to be made to allow for a connection.

4. Water Main

Water Main shall be constructed of ductile iron pipe unless otherwise approved in advance by the Public Works Director.

Materials

Ductile iron pipe shall be designed in accordance with ANSI A21.51 (AWWA C151)- latest revision) using 60,000 psi tensile strength, 42,000 psi yield strength and 10% elongation. All pipe shall be Thickness Class 52 or higher, 3-1/2 feet to 6 feet cover, trench condition 1, flat bottom, no blocks on tamped backfill, and at least 100 psi water hammer allowance and 2 to 1 factor of safety.

Pipe shall have a standard pipe coating outside and be lined with **thin cement lining and seal coated inside in accordance with ANSI A21.4 - latest revision** (AWWA C104 - latest revision) wherever applicable and as further specified herein.

Minimum wall thickness shall conform to the following:

SIZE	CLASS	METAL THICKNESS (INCHES)
6" Ductile Iron	52	0.31
8" Ductile Iron	52	0.33
10" Ductile Iron	52	0.35
12" Ductile Iron	52	0.37
14" Ductile Iron	52	0.39
16" Ductile Iron	52	0.40
18" Ductile Iron	52	0.41
20" Ductile Iron	52	0.42
24" Ductile Iron	52	0.44

The pressure class or thickness class, net weight of pipe without lining, length of pipe and name of manufacturer shall be clearly marked on each length of pipe.

All pipe, fittings, and glands shall be completely coated outside with asphaltic coating for corrosion resistance.

All pipe shall be new and secured from reputable manufacturers. All listed iron and steel products used in this project must be produced in the United States. The term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

Any pipe delivered along the line of the improvement that is broken or damaged will be rejected.

Construction Requirements

Horizontal & Vertical Separation

Water main and water services shall be protected in accordance with the Standard Specifications for Water and Sewer Construction in Illinois.

Earth Excavation

The trenches shall have a minimum width of twelve (12) inches plus the diameter of the water main to be laid therein, and of such a depth that there shall be a minimum of three (3) feet six (6) inches of cover, measured from the surface of the street or natural ground to the top of the pipe.

All pavements, sidewalks, driveways, culverts, curbs, curb and gutters, cross walks or similar obstructions, which interfere with the construction work, must be tunneled under or removed to the width of the trench before the excavation is made. All materials unsuitable for backfilling must be kept separate from other excavated materials and disposed of as directed by the Engineer, at the contractor's expense.

Where the ground is sufficiently firm, the pipe may be laid directly on the bottom of the trench, but wherever soft or unsuitable ground is encountered, or wherever trenches are excavated through cinder fills or other unsuitable material, the Engineer may require that the trench be excavated to an additional depth of six (6) inches and backfilled with suitable foundation material.

The trenches shall be kept free of water during the progress of the work. All tools and equipment for pumping and bailing and all materials for building drains or other work necessary to keep the trenches free of water shall be furnished by the contractor. This work and equipment shall be considered incidental to the contract and no extra compensation will be allowed.

All sewer, water, gas and other pipes or conduits and service connections encountered shall be carefully supported and protected from damage while the excavations are being made and backfilling finished.

City Utility Location

It shall be the contractor's responsibility to locate existing water services. Where there is reasonable assurance a City utility exists (storm sewer, sanitary sewers, water mains and/or other City services), but cannot otherwise be located, the contractor, at the engineer's direction, will excavate to locate said utility before construction reaches that area. This will usually require digging in the street/boulevard and the Engineer shall be present when such exploration is done. Granular trench backfill shall be used when directed by the Engineer.

This work will in no way relieve the contractor of their obligation to contact JULIE for the location of other utilities.

Pipe Laying

Water main pipe shall be handled and installed per ANSI/AWWA C600 (latest revision) and by the following additions:

Pipe shall be handled by mechanical equipment or other approved means. Handling of pipe by means of hooks at both ends of the pipe will not be allowed.

All pipe and fittings shall be thoroughly cleaned by brushing with a wire brush at joints and by swabbing the pipe interior.

Pipe shall be laid on a firm bed and as straight as possible. Excavation must be made under the bell of each pipe so the entire length of pipe will lay on the bottom of the trench and the pipe weight will not rest on the bell.

In laying mechanical joint pipe, all surfaces, which come in contact with the rubber gasket seals, shall be thoroughly brushed with a wire brush and just prior to slipping the gasket over the spigot end and into the bell, all surfaces including the gasket, shall be thoroughly cleaned with soap and water. The gland and gasket shall then be placed on the spigot end and the pipe inserted in the bell.

The gasket shall then be pushed into position and evenly seated, the gland shall be placed in position, the bolts inserted and the nuts tightened.

When tightening bolts, the gland shall be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This shall be done by partially tightening the bottom bolt first, then the top bolt, next the bolts on either side, and last the remaining bolts. This cycle shall be repeated until all bolts are torqued to the manufacturer's specifications within the following range of torque:

BOLT SIZE INCHES**RANGE OF TORQUE FT. - LB.**

5/8	45 - 60
3/4	75 - 90
1	100 - 120
1-1/4	120 - 150

The above torque loads shall be applied with torque measuring wrenches.

In laying "Push-On" pipe, the bell socket and the plain end of the entering pipe must be absolutely clean and free of foreign matter prior to the seating of the gasket. The gasket shall be wiped clean, flexed, and then placed in the socket with the large round end entering first, so that the gasket is seated evenly around the inside of the socket with the groove fitted over the bead. As the gasket fits snugly in the gasket seat it may be necessary to smooth out the gasket around the entire circumference to remove any bulges, which might interfere with the proper entry of the spigot end.

A thin film of lubricant shall be applied to the inside surface of the gasket which will come in contact when entering the plain end of the pipe. In some cases, it is desirable to apply a thick film of lubricant to the outside of the plain end for about one inch back from the end. Lubricant other than that furnished with the pipe shall not be used.

The plain end of the pipe shall be aligned and carefully entered into the socket until it just makes contact with the gasket.

Joint assembly shall then be completed by forcing the plain end of the entering pipe past the gasket until it makes contact with the bottom of the socket. The first painted spigot stripe shall be inside the socket and the front edge of the second spigot stripe shall be approximately flush with the bell face. If the assembly is not accomplished with the application of reasonable force, the plain end of the pipe shall be removed to check for the proper positioning of the gasket.

Installation of restrained joint pipe, when required, shall be the same as "push-on" pipe with the following additions:

The length of restrained joint pipe required each side of a bend or fitting is a function of the pipe size, internal pressure, depth of cover and the characteristics of the soil. Because of all these variables, the amount of restrained joint pipe at each fitting shall be shown on the plans or described in the special provisions of the contract documents. Normally, the City asks the contractor to install, at a minimum, two "field-lok" gaskets before and after all fittings.

Restrained joint pipe is a special push-on or mechanical joint pipe that is designed to provide longitudinal restraint without the aid of thrust blocks, although thrust blocking may still be required. U.S. Pipe's TR Flex or joint pipe are examples of this type of restrained joint pipe.

Trench water shall be kept out of the pipe and the pipe kept closed by means of test plugs whenever the work is not in progress.

Caps or plugs shall be put on all open ends of pipe, open bends, open tees, or crosses. All fittings shall be firmly backed against solid earth with suitable masses of concrete of a thickness equal to the pipe diameter and of a length to reach from end to end. Solid concrete blocks 8" X 8" X 16" shall be used for blocking. Poured Portland Cement Concrete blocking shall be used only with the approval of the Engineer.

Any special fittings, plugs, or similar appurtenances necessary to complete the work shall be furnished by the contractor at no additional cost.

All required connections to existing water mains or services shall be completed so that no service or existing water main shall be left open and unconnected at the close of a working day.

5. Polyethylene-Encased Water Mains

This work shall comply with ANSI/AWWA C-105/A21.5 (latest revision.)

All pipe, fittings and appurtenances such as valves, tees tapping saddles and crosses shall be polyethylene encased.

6. Ductile Iron Fittings

Fittings 6 inches to 12 inches diameter shall be Mechanical Joint type and shall be Class 350 ductile iron in accordance with ANSI A21.10 - latest revision (AWWA C110 - latest revision) where applicable as to thickness and radius of curvature, but not as to length. Cement linings shall be standard thickness.

Fittings 14 inches and greater shall be Class 250 ductile iron.

Fittings shall be cement-mortar lined and coated with an asphaltic material outside in accordance with ANSI/AWWA A21.4/C104.

At the proposed locations where a tee is to be installed with a line valve, a mechanical joint fire hydrant anchoring tee with rotating gland shall be installed in the main line to secure the valve.

Stainless steel tapping sleeves may be considered for use in some cases and shall be Mueller H-304 or an approved equal. This generally will be when a small size tap (6 inches to 12 inches) is to be made to a large main (24 inches or larger). The sleeve shall be of a minimum two-piece construction and compatible with a Mueller tapping valve.

The contractor must submit specifications and any pertinent information (location, reason, etc.) to the Director of Public Works for approval prior to installation.

7. Joint Accessories

Mechanical joint pipe, fittings, and other appurtenances shall be furnished according to ANSI A21.11 - latest revision (AWWA C111 - latest revision) and furnished complete with mechanical joint accessories.

8. Sleeves

Sleeves shall be Series RS3800 Restrained Sleeve manufactured by EBAA Iron or an approved equal.

9. Grip Ring Accessory Kit

Grip Ring Accessory Kit shall be manufactured by Romac Industries, Inc., or approved equal.

10. Polyvinyl Chloride (PVC) Pressure Pipe

PVC pipe shall only be used with the prior written permission of the Director of Public Works.

Materials

All 6-inch through 12-inch PVC pipe shall meet the requirements of AWWA C900 (latest revision), "Polyvinyl Chloride (PVC) Pipe" for pressure Class 150, DR18 PVC pipe with ductile iron pipe equivalent outside diameters.

The pipe shall be laid in accordance with the pipe manufacturer's specifications, AWWA C-605 (Latest Revision) or the pipe laying specifications contained herein, whichever is more restrictive.

Where fittings are required, ductile iron fittings shall be used. All ductile iron fittings and tapping saddles used with PVC pipe shall be polyethylene encased and shall be incidental to the contract.

The joints shall be elastomeric-gasket bell ends meeting the requirements of AWWA C900.

A Blue #12 AWG high-strength copper clad steel conductor tracer wire shall be laid with all PVC pipe. The main tracer shall be continuous throughout. Tracer wire shall be extended to each fire hydrant and terminate at an access point above finished grade and connected to a hydrant flange. Tracer wire shall extend from each service tapping saddle to the curb stop and terminate at an access point located in the buffalo box riser or be bonded directly to the buffalo box with a grounding clamp.

All tracer wire splices shall be waterproof and corrosion-proof using a manufactured splicing kit recommended by the manufacturer.

When the main tracer must be spliced with a new spool, the connection shall be with a "Kernie" wire connector. This being a screw down clamp. At each fire hydrant and house service, a #12 THHN service wire shall be connected to the main tracer and to the fire hydrant or house service.

All connections shall be taped and moisture sealed with electrical mastic and Scotch #2210 E-2 seal.

11. Valves

All valves 12 inches in diameter and less shall be AWWA Resilient-Wedge type gate valves and shall equal or exceed the AWWA C509 - latest revision standard. The valves shall be ductile iron body, bronze mounted, with non-rising stem.

All valves up through 12 inches in size shall have a working pressure rating of 200 psi with a test pressure of 400 psi. Valves larger than 12 inches shall have a working pressure rating of 150 psi with a test pressure of 300 psi. All valves shall be provided with a 2-inch operating nut, which opens to the right (clockwise).

Gate valves shall be provided with two "O" ring stem seals. One "O" ring shall be located below the thrust collar. The space between the "O" rings and around the thrust collar shall be filled with a lubricant to provide for thrust collar lubrication each time the valve is operated.

Gate valves shall be so designed that the wedging mechanism of the disc assembly is actuated when the bottom wedge contacts a single rib located in the bottom of the valve body. Top wedge, bottom wedge, and side spreaders shall be free to adjust themselves to assure equal distribution of seating pressures at four separate contact points near the outer edge of each disc, so as to minimize disc deflection and to provide tight sealing qualities.

Gate valves larger than 12 inches shall be equipped with bevel gears totally enclosed in a sealed grease case so designed that stem packing may be replaced without disturbing the grease case. They shall also be equipped with a by-pass valve, sized and located to comply with Section 24 of AWWA C500 - latest revision standard.

"Resilient-seat" type gate valves will be specified. Resilient-seat gate valves shall equal or exceed the AWWA C-509 - latest revision standard. They shall be of the iron body, bronze mounted type with non-rising stem.

The valve shall meet the same working and test pressure on the double disc valve and shall also be provided with the same type operating nut. The interior of the valve body shall be free of pockets or ledges where sediment or debris can collect and shall be bubble tight at 200 psi working pressure in either direction and with the valve in any position.

The "O" ring stem seal(s) shall be replaceable with the valve under "working" pressure. The valve shall have a full-size unobstructed waterway capable of passing a full-sized shell cutter equal to the nominal diameter of the tapping valve.

The valve body and bonnet shall be coated on all exterior and interior surfaces with a bonded epoxy coating conforming to the requirements of AWWA C116 - latest revision - Protective Fusion-Bonded Epoxy Coatings for the Interior Surfaces of Ductile-Iron and Grey-Iron Fittings.

Valves shall be furnished with mechanical joint end connections with gaskets.

Butterfly valves may only be used with prior written authorization of the City Engineer. 12 inches through 24 inches shall conform to the latest revision of AWWA Standard C504, Class 150-B, and to the following:

- A. Valve bodies shall be cast iron, ASTM A126 Class B. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125; or mechanical joint in accordance with AWWA C111. All mechanical joint end valves shall be furnished complete with joint accessories (bolts, nuts, gaskets and glands.) All valves shall conform with AWWA Standard C504, Table 3, Laying Lengths for Flanged Valves and Minimum Body Shell Thickness for all Body Types.
- B. The valve disc shall be ductile iron ASTM A-536, grade 65-45-12. The valve disk shall be of the offset design providing 360-degree uninterrupted seating.
- C. The resilient seat shall be natural rubber bonded to an 18-8, Type 304 stainless steel retaining ring secured to the disc by 18-8, Type 304 stainless steel screws. The seat shall be capable of mechanical adjustment in the field in either direction and field replaceable without the need for special tools.
- D. Valve shafts shall be 18-8, Type 304 stainless steel. Shafts shall be of the two-piece stub design and attached to the disc by means of "O" ring sealed taper pins with lock nuts.
- E. The valve shaft seal shall consist of "O" rings. Where the valve shaft projects through the valve body for actuator connection, the "O" ring packing seal shall be field replaceable as a part of a removable bronze cartridge.
- F. The valve body seal shall be 18-8, Type 304 stainless steel and shall be designed to "float," compensating for changes in the direction of flow to assure bubble-tight sealing.
- G. The valve assembly shall be furnished with a non-adjustable factory set thrust bearing design to center the valve disc at all times.
- H. The shaft bearings shall be contained in the integral hubs of the valve body and shall be self-lubricated sleeve type.
- I. When manual actuators are required, they shall be of the traveling nut design capable of withstanding 450 foot pounds of input torque against the open or closed stops. All actuators shall have adjustable mechanical stop limits. The closed position stop shall be externally adjustable.

- J. All valves shall be coated in conformance to AWWA Standard C550, latest revision. Interior wetted ferrous surfaces shall be coated a nominal 10 mils thick for long life; and body exterior shall have a minimum 3 to 4 mils coating thickness.

All valves shall have the name of the manufacturer and year of manufacture clearly cast on the valve body. They shall be new and secured from a reputable manufacturer.

Tapping valves shall be of the same type as specified above, except they shall be provided with the AWWA standard tapping valve flange on one end to correspond with the tapping sleeve outlet flange. Tapping sleeves shall be of a class equal to that specified for "**Ductile Iron Pipe Fittings**".

All valves shall be new and secured from responsible manufacturers and use of valves other than specified above must receive written approval from the Director of Public Works no later than twenty-four (24) hours prior to bid opening.

Valves and fittings shall be set on a foundation or footing of concrete laid on firmly compacted ground. The foundations shall be solid concrete block(s) not less than 8" X 8" X 16" for 6" and 8" water mains and a minimum of 2 - 8" X 8" X 16" solid concrete blocks for 10" and larger water mains. Leveling shims shall be of hard wood material.

The elevation of the valves and fittings and their foundations shall be such as to conform to the height of the connecting pipe so there will be no strain on the joints.

12. Air Release Valve and Vault

When required by the City, the air valve and vault shall be constructed per the City Construction Standard 4030. The air valve shall be fully automatic type design to drain off air pockets accumulating at high points of the pipeline. They shall also be designed to open and admit air into the line when pressure in the line is less than atmospheric.

Valve shall be an Apco A200 air valve or approved equal.

13. Fire Hydrants

All fire hydrants shall equal or exceed the AWWA C502 - latest revision standard. They shall be of the compression type with the main valve closing with the pressure. They shall be of the dry barrel, dry top design.

The hydrant body shall be cast of ASTM A126 Grade B gray iron with all interior parts fully bronze mounted, including a permanent bronze bushing threaded and locked into the shoe casting providing bronze to bronze threads between the seat ring and shoe for easy removal of the main valve assembly.

Hydrants shall be of the "breakable" type so designed that neither the barrel nor stem shall be damaged on impact and so designed that repairs may be affected by easily replaceable components.

The hydrant shall have only one flange above ground line secured with a traffic model breakable safety flange that will break clean on vehicular impact. The breaking point of the stem coupling shall be below the flange so that a tire cannot depress the stem and open the main valve.

The hydrant bonnet assembly shall be provided with an integral lubricant reservoir so designed that operating nut threads, stem threads, and thrust collar are automatically lubricated each time the hydrant is operated. The lubricant reservoir, stem threads, and operating nut shall be sealed from the waterway by two (2) "O" ring stem seals bearing on a bronze bushing near the top of the stem. The lubricant reservoir and operating nut shall also be sealed to the atmosphere to prevent leakage of lubricant and contamination of lubricant by the elements.

Hydrants shall have a specially molded rubber main valve, which shall seat against an ASTM B62 bronze seat ring with an inside diameter of 5-1/4 inches. The main valve assembly shall include two integral drain valves, which operate automatically each time the hydrant is opened or closed with no toggles, springs, and adjustable mechanisms. There shall be at least two bronze lined drain ports located in the hydrant shoe.

Hydrants shall be furnished with two 2-1/2-inch hose nozzles and one 4-inch pumper nozzle. Pumper nozzle to face the street. All nozzle threads shall be National Standard Threads. They shall be furnished with a pentagon-shaped 1-1/4-inch bronze operating nut with an approved weather cap. All hydrants shall be opened by turning right (clockwise).

Each fire hydrant shall be installed using an auxiliary valve that is tied to the main line through the use of a mechanical joint hydrant tee with rotating gland. The fire hydrant valve and line shall be 6 inches. The auxiliary valve and required box shall be specified under "**Valves**" and "**Valve Boxes**". The fire hydrant shall be installed using a "6 INCH ANCHOR COUPLING". The contractor may substitute "6 INCH POLYWRAPPED DIP and 6 INCH OFFSET NIPPLE" for the "6 INCH ANCHOR COUPLING".

Hydrants shall be furnished with Mechanical Joint inlet (shoe) connection and shall be sized for a minimum bury (trench) depth of 4-1/2 feet.

The Mueller Centurion Model A423 is the preferred hydrant.

Use of Hydrants other than as specified above, must receive written approval from the Director of Public Works a minimum of twenty-four hours prior to bid opening.

Fire Hydrants shall be set in such a manner that the steamer connection is facing the closest street. They shall be set vertically upon a solid concrete block not less than 8" X 8" X 16" (See Standard #4000).

Hydrants shall be set with solid concrete blocking (8" X 8" X 16"), placed behind the barrel and behind the tee connection between the water main and the hydrant lead to prevent movement of the pipe or hydrant (See Standard #4000). Poured concrete blocking is allowed, but only with the approval of the Engineer. When shims are required, they shall be hard wood shims.

To provide adequate drainage, the base of the hydrant shall be embedded in a minimum 1 cubic yard of 1 inch washed stone enveloped in plastic sheeting per Standard 4000.

14. Thrust Blocks and Thrust Collars

When required, thrust blocks and/or thrust collars shall be constructed per City Construction Standards 4020 or 4021.

Materials

When using standard 4021, the following materials will be used:

- A. Class SI concrete shall be used.
- B. #5 reinforcement bars shall be used as shown on the standard.
- C. 16-gauge sheet metal plates cut to size as shown on the standard.

Construction Requirements

- A. The contractor shall follow the standard dimensions as closely as possible, but in no case will a smaller dimensioned block be acceptable.
- B. The bottom of the foundation for the block shall be clean and conform to the shape shown in the standard.
- C. The sides of the block shall conform to the shape shown on the standard. Forms must be used to ensure that the block configuration is being adhered to and to insure the retention of the concrete during its consolidation. The concrete shall not hinder the removal of any flange bolts.
- D. The back side of the block must be poured against undisturbed earth. If during the installation of the water main, additional earth has been excavated or disturbed, the concrete block shall be extended to an undisturbed area.
- E. No backfilling may take place until the poured concrete has taken its initial set.
- F. Reinforcement bars must be placed in proper position prior to pouring. Floating the bars into position will not be allowed.

15. Testing

All tests shall be made in the presence of the City Engineer or their assigned representative.

The work of laying the pipes, fittings, hydrants, valves and other appurtenances shall be of such character as to leave all the pipes and connections watertight. To ensure these conditions, the water main and all appurtenances shall be subjected to a pressure test and leakage test with water pressure of not less than one hundred ten (110) pounds per square inch.

Pressure testing and leakage testing shall conform to the requirements of the Standard Specifications for Water and Sewer Construction in Illinois. The tests shall be made between valves as far as practicable, or as directed by the Engineer, within two (2) working days of the completion of each section of main. Where it is impracticable to test between valves or near connections to existing mains, temporary caps or plugs shall be placed on the mains to close off a section of the main so that it may be tested. The pressure shall be raised to a minimum of one hundred ten (110) pounds and so maintained for a period of not less than two (2) hours.

The amount of water forced into the main during this time shall be determined and this amount shall be taken as a basis to compute the leakage for twenty-four (24) hours. Pressure shall not vary more than two (2) pounds from the above during the test period. Results of tests shall be submitted to the City.

Allowable leakage shall be computed on the basis of fifteen (15) gallons per inch of pipe diameter, per mile of length, per twenty-four (24) hours. On this basis, the allowable leakage per one thousand (1,000) lineal feet of water main is as follows:

PIPE DIAMETER (INCHES)	TOTAL ALLOWABLE IN 2 HOURS (GALLONS)	LEAKAGE PER 1,000 FEET IN 24 HOURS (GALLONS)
2	0.5	5.7
4	0.9	11.4
6	1.4	17.0
8	1.9	22.7
10	2.4	28.4
12	2.8	34.1
14	3.3	39.8
16	3.8	45.4
18	4.3	51.1
20	4.7	56.8
24	5.7	68.2

If the leakage is at a greater rate than allowable the trenches shall be re-excavated where necessary, the joints remade and all defective work and materials replaced until the leakage is reduced to the allowable amount. This work is at the contractor's expense.

When the City can conveniently furnish water for testing pipe joints, jetting backfill or other purposes, there shall be no charge, except for the labor of turning the water off and on. However, the City shall not be obligated to furnish water, with or without charge, unless it can do so with reasonable convenience and entire safety to the public.

16. Disinfecting Water Mains

Flushing and disinfecting new water mains shall be done per AWWA C651 (latest revisions).

Flushing shall be done through open ends. At the end of each straight run, flumes or suitable means shall be provided to carry the wastewater up to and over the ground surface to an outlet. To keep the wastewater to a minimum, a "pig" shall be inserted into the upstream end of the new pipe 12 inches or larger during construction. Flushing through fire hydrants will not be permitted.

Preliminary flushing shall be done per Section 5.2.2 of AWWA C651-86 standard.

All flushing of mains shall be done during periods of low water demand or at such times as may be directed by the Engineer and Water Services Supervisor.

To guard against a contaminated water supply and to provide safe, potable water for domestic use, all mains shall be thoroughly sterilized before being placed in service.

Water mains shall be sterilized as soon as pressure tests are completed per AWWA C651-86, Section 5.2.3, except paragraph 4 shall be deleted.

The form of chlorine to be used shall be granular calcium hypochlorite. Any deviation from this must have written approval from the Engineer.

The amount of sterilizing agent introduced shall be as per Table 4 of AWWA C651 under Column for 1-percent chlorine solution.

Final flushing, bacteriological tests and any re-disinfection shall be done per Sections 6, 7 and 8 of AWWA C651. In addition, bacteriological tests shall meet the requirements of Illinois Environmental Protection Agency.

Samples should be taken at approximately 500-foot intervals and at each branch line. Under special conditions on long construction runs, samples may be taken every 1,200 feet, but only with approval of the Engineer. Two consecutive samples must be taken from the same location with a minimum of twenty-four (24) hours between samples. The first sample must come back as negative for coliform and E coli bacteria. If either sample fails, the main must be flushed and the sample port must be sterilized before taking another set of samples.

17. Backfilling

Backfilling of all water main shall be made in accordance with the Standard Specifications for Water and Sewer Construction in Illinois. Jetting will be permitted outside the limits of the pavement.

After the pipe is laid (and as soon as possible after testing,) the trench shall be filled with either selected earth or select graded aggregate free from boulders or any foreign matter. Ashes, cinders, or other corrosive material shall not be allowed. Backfill around the pipes and to a depth of six (6) inches above the top of the pipes shall be thoroughly rammed and tamped. Place material in eight (8) inch lifts and compact using a mechanical tamper or roller. Care should be taken to prevent any lateral movement of the pipe from the tamping operation.

During the installation of all water mains, care must be exercised so that the trees in the boulevard and on private property behind the sidewalk will not be disturbed. All disturbed boulevard areas shall be graded and seeded.

When not otherwise ordered, the backfilling shall not be left unfinished more than three hundred (300) feet behind the completed pipe work.

18. Valve Boxes

Cast iron valve boxes or adaptors shall be provided for all valves.

If valve boxes are used, they shall be provided with adjustable top boxes approximately 5 inches in diameter so constructed that the removable cover will not be thrown out by travel over it. Boxes shall be provided with a hood at the base of the lower section to relieve any strain on the valve bonnet. They shall extend from 36 inches to 54 inches unless otherwise specified. The valve boxes shall be new and obtained from reputable manufacturers.

If used, valve boxes shall be set so that the base will be two (2) inches or more above the flanged joints of the valve dome. The nut of the valve shall be in line with the hub or upper part of the valve box base where it is connected with the upright jacket. After the valve boxes have been placed in proper position, they shall be backfilled with appropriate material and thoroughly hand tamped up to the surface of the ground. In no case shall the boxes be allowed to shift from a perpendicular position.

If valve adaptors are used, they shall be installed upon the valve with the use of a Valve Box Adaptor II as manufactured by Adaptor, Inc. or an approved equal. The Valve Box Adaptor II shall be installed in lieu of hardwood blocking and shall be incidental to the valve and box installation.

19. Water Service Lines

Section 5 of Chapter 64 of the City Code reads in part, "...Water service lines are originally supplied by the owner of the property served thereby. The City shall maintain and keep in repair

domestic water service lines from the main to the discharge side of the curb stop..." Therefore, when replacing existing mains, the contractor shall install a new service line from the new main to the curb box location.

Water Service Lines shall be installed using one of the following Types:

- Type I A new service from ductile iron main to curb stop with no connection to an existing line.
- Type II A new service from ductile iron main to curb stop with connection to an existing line.
- Type III A new service from a PVC main to curb stop with no connection to an existing line.
- Type IV A new service from a PVC main to curb stop with connection to an existing line.

The above listed types shall be installed per Chapters 64 and 75 of the City Code, City Construction Standard 4040 and as follows:

- A. The new domestic water service shall not be installed until the new main has been placed in service.
- B. Stops, boxes and copper pipe shall be new.
- C. When the existing house service is near the new curb box, the old curb box and curb stop shall be removed and the existing house service shall be connected to the new curb stop.
- D. When the existing curb box is inaccessible from the street side of the property (existing line coming from alley) or if the property is an empty lot, the contractor shall install the new service line at the location marked by the City or its representative. Connection to the existing service will not be required.

All service taps to PVC or HDPE mains require the use of a bronze service saddle per Section 3 of Chapter 75 of the City Code. The drilling operations shall be done per the PVC manufacturer's specifications.

The following is a list of approved stops, boxes and saddles for water service installations. Others may be used, but only with written approval of the Director of Public Works at least five (5) working days prior to the scheduled bid opening.

- A. Corporation Stops – Mueller H-15008N
- B. Curb Stops – Mueller H-15155N or B-25155N
- C. Curb Boxes – Mueller H-10300 or H-10300-99008

D. Service Saddle – Mueller BR2B Series, Polywrap required for service line.

The copper service line used between the main and curb box shall meet the specifications for seamless copper tubing, ASTM B88, Type K.

The installation shall be in accordance with the City Code, Construction Standard 4040, Standard Specifications for Water and Sewer Construction in Illinois, and specifications contained herein.

The water service line shall be laid sufficiently and placed in a manner as to prevent rupture or breakage from the settling of the ground.

20. Dust Control

The contractor shall be responsible for control of dust within the construction area. Contractors are advised that street surfaces or portions of same undisturbed by trench excavation, haul routes and similar areas used by the contractor and subject to traffic, shall be maintained clear of dirt, sand or debris by sweeping, flushing or other appropriate measures. Such cleaning shall in no event lag more than one city block behind the trench excavation operation and shall be maintained as necessary for the duration of the construction work.

Where temporary surfacing over excavated areas must be maintained to allow trench consolidation and such surfacing becomes a source of dust, the engineer may authorize application of calcium chloride or approved chemical suppressant at such rate as will inhibit the dust problem.