

## SECTION II

### WATER DISTRIBUTION SYSTEM AND APPURTENANCES

A.	GENERAL	II-3
B.	REFERENCES	II-3
C.	ENVIRONMENTAL PROTECTION AGENCY	II-3
D.	PUBLIC EASEMENTS AND UTILITIES	II-3
E.	SYSTEM EXTENSION	II-3
F.	MAIN OVERSIZING	II-4
G.	FIRE PROTECTION	II-4
	1. Anticipated Fire Flow Loadings	
	2. Private Booster Pumps for Fire Protection	
H.	INSTALLATION REQUIREMENTS	II-5
	1. Horizontal Separation & Vertical Separation	
I.	MATERIAL SPECIFICATIONS AND DETAILS	II-5
	1. Ductile Iron Pipe	
	2. Pipe Joints	
	3. Restrained Joints	
	4. Flanged Joints	
	5. Thrust Blocks	
	6. Fire Hydrants	
	7. Valves	
	8. Valve Vaults	
	9. Castings	
	10. Auxiliary Resilient Seat/Wedge Gate Valves	
	11. Air Release Valves	
	12. Sampling Tap	
	13. Water Service Line	
J.	CONSTRUCTION REQUIREMENTS	II-9
	1. Pipe Installation	
	2. Water Services	
	3. Connections to Existing Mains	
	4. Pipe Cutting	
	5. Sheeting and Bracing	
	6. Steel Casing Pipe for Augering or Tunneling	

K.	WATER MAIN PRESSURE TESTING AND DISINFECTION	II-11
	1. Pressure Test	
	2. Preliminary Flushing	
	3. Disinfection	
L.	CONSTRUCTION WATER	II-13
M.	WATER METERS & PITS	II-13
N.	RECORD DRAWINGS	II-13

A. GENERAL

Regardless of size, all developments within the corporate limits or under the control of the Village shall include provisions for construction of water distribution facilities complete with valves, fire hydrants and other appurtenances designed in accordance with the standards herein. Where more than one building is located or planned on one parcel of property, or when water main construction is required on the property for fire protection, the proposed phased development shall also include all water main construction and appurtenances.

The design of all water distribution system improvements proposed for construction as independent projects under the control of the Village shall meet these technical requirements and the Illinois EPA.

B. REFERENCES

Specification references made herein for manufactured materials and installation such as pipes, hydrants, valves and fittings refer to standard specifications as referenced in Section I-G.

C. ENVIRONMENTAL PROTECTION AGENCY

Water main design and construction shall in all respects be in accordance with the regulations of the Division of Public Water Supplies, Environmental Protection Agency, State of Illinois. An Illinois EPA Permit must be obtained prior to construction.

D. PUBLIC EASEMENTS AND UTILITIES

All public water main extensions shall be located within dedicated rights-of-way or easements. If located within an easement, the easement must extend 10 feet either side of the water main.

Underground utility work cannot commence until all existing public and private utilities are field located. Call J.U.L.I.E. at 1-800-892-0123 at least 72 hours in advance.

All necessary precautions shall be taken against damage to existing utilities. In the event of a break in an existing water main, gas main, sewer or underground cable, the contractor shall immediately notify a responsible official from the organization operating the utility interrupted. The contractor or developer shall lend all possible assistance in restoring service and shall assume all costs, charges or claims connected with the interruption and repair of such services.

In the case of damage to Village utilities, the repairs shall be immediately performed by the contractor, or the cost of such repair work will be billed to the contractor or developer on a time and material basis plus fringe, overhead and administrative costs.

E. SYSTEM EXTENSION

Extensions to the water distribution system shall form a complete network and be compatible with the existing water system network. Mains shall be extended to the property lines along public rights-of-way and at any location indicated by the Village Engineer.

Transmission mains within or adjacent to a development shall be sized and located as directed by the Village Engineer. Secondary mains shall be sized, looped, and spaced as required for fire flows and shall have a minimum diameter of eight (8) inches.

Distribution mains shall form a grid to supply water to the local fire hydrants and service lines. At all locations, a minimum diameter of eight (8) inches is required. In all cases, all water mains, including service mains and hydrant "stubs", in excess of 100 feet shall be looped, unless specifically otherwise approved by the Village Engineer and Director of Public Works.

The proposed system extension shall be arranged so that, in the event of a break in any main, minimal service interruption will be caused and in no case will require closure of more than three (3) valves.

For purposes of water main design, maximum daily consumption for water main design shall be based on the following table:

<u>Type of Establishment</u>	<u>Unit</u>	<u>Maximum Daily Consumption Gal/day/unit*</u>
Residential	Occupant	160
Shopping Centers	Employee (1 shift)	110
Store	Employee (1 shift)	70
Offices	Person (1 shift)	50
Warehouse	Employee (1 shift)	30
* Industrial	Person (1 shift)	75
* Restaurant	Meal Served	10
Theater	Per Seat	10
Hotel	Per Guest	80
* Schools	Per Student	25

\* Quantities are exclusive of processed water requirements which must be estimated and added.

F. MAIN OVERSIZING

When the construction of a transmission main is deemed necessary by the Village Engineer, Director of Public Works and/or Fire Chief, the additional incremental construction cost to oversize the water main in the same location may be accommodated by a recapture agreement or borne by the Village if so accepted and authorized by the Board of Trustees.

G. FIRE PROTECTION

1. Anticipated Fire Flow Loadings

If required by the Village Engineer or Fire Chief, the design engineer shall show, in a separate report to both the Village's Engineering Department and the Fire Prevention Bureau, that at various locations, selected by the Village Engineer, the proposed water main system will supply the required fire flows in excess of domestic consumption demands. A "C" factor of 100 for old water main pipe or 140 for new ductile iron pipe (cement lined) shall be assumed. A minimum fire flow requirement of 1200 qpm, 20 p.s.i., residual gallons per minute should be used for single-family residential fire flow

calculations. The Fire Department jointly with the Engineering Department shall determine the minimum required fire flows for other proposed developments.

2. Private Booster Pumps for Fire Protection

No pump shall be installed without specific approval of the Fire Prevention Bureau. The Standards of the National Fire Protection Association have been adopted by reference in the Village Building and Fire Prevention Code. Proper backflow prevention devices are required in accordance with the Illinois Plumbing Code (77 Ill. Adm. Code 890.1510 and I.E.P.A. Technical Policy Statements 35 Ill. Adm. Code 653.801 et seq.).

H. INSTALLATION REQUIREMENTS

1. Horizontal and Vertical Separation

All water mains shall maintain minimum ten (10) feet horizontal and eighteen (18) inch vertical separations from any sewer lines, in accordance with the requirements of the Illinois Environmental Protection Agency. If the IEPA separations cannot be met, then adequate provisions for protection of the water supply must meet the requirements of the IEPA and Village. There shall be a twelve (12) inch vertical separation from all other utilities.

I. MATERIAL SPECIFICATIONS AND DETAILS

All water main pipe, be it a new installation, replacement and/or repair, shall be ductile iron cement-lined bituminous coated pipe, Class 52 (minimum). Class 55 is to be used outside the right-of-way, in rear or side yards, in casings and where specified by the Village Engineer. All ductile iron pipe shall have 8 mil. polyethylene encasement.

1. Ductile Iron Pipe

All ductile iron pipe shall comply with AWWA Standard Specifications for ductile iron pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids - AWWA C151.

Special consideration of alternate pipe materials may be allowed by the Village Engineer if highly corrosive soils or special site conditions exist.

(a) Ductile iron pipe shall conform to AWWA Specifications C151. Normal working pressure shall not exceed 150 p.s.i. Pipe shall be furnished in nominal eighteen (18) foot laying lengths.

(b) Ductile iron pipe shall be bituminous coated outside and cement - mortar lined inside as specified in Section 51-8.2 of ANSI A21.51 (AWWA C151).

Each pipe shall have the weight and class designated on it. In addition, the manufacturer's mark and year in which the pipe was manufactured shall be marked on the pipe.

- (c) All underground fittings and related fittings/hardware shall be ductile iron and connected to sections of water main pipe by means of mechanical joints with Grade #304 stainless steel bolts and Grade #300 stainless steel series nuts to conform to ASTM A193 and ASTM A194 or approved push-type joints. Where threaded rods are required, they shall be stainless steel Grade #304 with Grade #300 nuts.

All fittings shall meet current AWWA C110 (ANSI 21.10), Ductile Iron and Gray Iron Fittings four (4) inches through forty-eight (48) inches for water and other liquids.

All ductile iron pipe water distribution system elements shall conform to the following specifications:

- Pipe class thickness - ANSI A21.50 (AWWA C150), (minimum thickness, Class 52)
- Pipe - ANSI A21.51 (AWWA C151)
- Pipe lining - ANSI A21.4 (AWWA C104)
- Fittings - ANSI 21.10 (AWWA C110)
- Joints - mechanical and push-on, ANSI A21.11 (AWWA C111)
- Polyethylene encasement (8 mil) - ANSI A21.5 (AWWA C105)

2. Pipe Joints - Ductile Iron Water Main

- (a) Slip Joints

Sections of water main pipe shall be connected by means of slip joints, consisting of bells cast integrally with pipe which have interior angular recesses conforming with the shape and dimensions of a rubber sealing gasket, the interior dimension of which is such that it will admit the insertion of the spigot end of the joining pipe in such manner as to compress the gasket tightly between the bell of the pipe and the inserted spigot, thus securing the gasket and sealing the joint.

The lubricant used in conjunction with the slip joints shall be one recommended by the supplier of commercially processed animal fat or vegetable shortening.

- (b) Mechanical joint pipe shall meet the above requirements. Bolting materials shall be stainless steel with Grade #304 bolts and Grade #300 nuts.

3. Restrained Joints - Ductile Iron Pipe

The unbalanced forces at pipe bends, tees, etc., shall be restrained by transmitting those forces of the pipe wall by means of rigid concrete thrust blocks, retaining glands or a bolt/tie rod system. If bolt/tie rod system is used, rods (Grade #304), bolts (Grade #304) and nuts (Grade #300) must be stainless steel and poly wrapped. Restrained joints where required, shall be US pipe TR flex retainer weldment and locking segment system or approved equal.

4. Flanged Joints

Flanges for ductile iron fittings, companion flanges and castings shall be in conformity with the current ANSI B16.1, "Cast Iron Pipe Flanges and Flanged Fittings", Faced and Drilled, Class 125. Flat-faced flanges shall be used where the mating flange is flat-faced.

All flanged joints shall be made with one-eighth (1/8) inch thick red rubber gaskets, full face, and shall conform to AWWA C110.

5. Thrust Blocks

Thrust blocks and/or restrained joints are required at all valves, hydrants, tees and bends. Engineering drawings shall indicate the location of each concrete thrust block to be installed. Where undisturbed earth is not available or not likely to be available to back up pressure type concrete thrust blocks, the design engineer shall specify tie rods or retaining glands with or without anchor type concrete thrust blocks.

All thrust blocks shall be poured with Class X concrete. When poured, care shall be taken so that the cement does not interfere with access to joints or with hydrant drainage.

6. Fire Hydrants

(a) Type:

Fire hydrants shall be the break flange type and shall be Traverse City Model TVC-5 or Mueller Super Centurian A423, as detailed on the Standard Detail contained in the Appendix.

(b) Spacing:

Fire hydrants shall be installed so that residential property will not be further than one hundred and fifty (150) feet from a fire hydrant. Fire hydrants shall be provided so as to provide the required fire flows to structures as described in the "Fire Suppression Rating Schedule," latest edition, published by the Insurance Service Office. Where water transmission lines or offsite water lines are installed on private property, the first private hydrant must be installed at no more than five hundred (500) foot interval distance from the street hydrant and at three hundred (300) foot intervals thereafter to the most remote point of the building. Commercial areas require a fire hydrant within 100 feet of a building siamese connection.

(c) Installation Specifications:

(1) The hydrants shall be installed to meet the requirements as indicated on the Standard Detail in the Appendix.

(2) Fire hydrants shall be typically installed not further than seven (7) feet nor less than four (4) feet from the back of curb. Parking lots shall be designed to provide not less than fifteen (15) feet of hydrant clearance

on one side of the hydrant on which a steamer or hose connection is located to permit easy fire truck access.

7. Valves

Valves shall be located on water mains so as to effectively isolate the sections from the system with minimal disruption should a break or other failure occur. The valves' spacing shall be installed so that not over six hundred sixty 660 feet of main will be shut off at any given time, or less in commercial and industrial areas or multi-family, PUD, as deemed necessary by the Village Engineer unless the Village Engineer permits spacing at greater intervals.

Valves ten (10) inch and smaller shall be iron body, resilient seat gate valves, counter clockwise to open, (AWWA C-509); twelve (12) inch and larger shall be iron body, rubber seat, butterfly valve, Class 150B, AWWA C504. All valves shall open counter clockwise.

Joint end - mechanical, AWWA C111

All nuts and bolts shall be as specified in Section II. I. 1 (c).

8. Valve Vaults

Valve vaults shall be precast reinforced concrete circular barrel and cone sections (ASTM C478) with mastic watertight joints.

For six (6) inch diameter service line valves and eight (8) inch diameter valves, valve vaults shall have a forty-eight (48) inch minimum inside diameter. For pressure connections and valves ten (10) inch diameter and larger, valve vaults shall have a sixty (60) inch inside diameter.

No more than three (3) precast concrete adjusting rings with twelve (12) inch maximum height adjustment shall be allowed.

9. Castings

Manhole frame and cover shall be Neenah No. R-1772C, embossed "WATER" with a one (1) inch concealed pick hole in yard areas or Neenah R-1712 with a one (1) inch pick hole in a paved area.

10. Auxiliary Resilient Seat Valves (Valves shall be by Clow, Mueller or Waterous as follows or as approved by the Village Engineer and Director of Public Works:

Resilient seat - Mueller Valve - hydrant auxiliary - #2360-16-flange/mechanical.

Resilient seat - Mueller Line Valves - A-2360-20 - Size 4"-10"- mechanical/mechanical.

Waterous Auxiliary Valve - AFC-2500 - D.I. - flange/mechanical.

Waterous Line Valve - AFC-2500 - D.I. - mechanical/mechanical.



Clow - Line Valve - R/W - #F-6100. - mechanical/mechanical.  
- #F-6106. - mechanical/flange.

Butterfly Valves - Pratt Groundhog - Mueller Lineseal III (Model #B3211).

11. Air Release Valves

Air release valves shall be placed on the water main at high points as deemed necessary by the design engineer and/or the Village Engineer to serve as air vents preventing air locking of the water main. These air release valves shall be of the Apco 200 A type or an approved equivalent. All air release valves shall be placed in vaults.

12. Sampling Tap

Three-quarter (3/4) inch (minimum) bronze corporation cocks shall be installed in all water mains at intervals not exceeding six hundred (600) feet.

The contractor must notify the Engineering Department at least twenty-four (24) hours in advance to arrange for appropriate pressure testing and water samplings. All water samples will be sent by the Village to a State of Illinois certified testing lab for coliform bacterial analysis. Samples will be taken at 24 and 48 hour intervals after chlorination. The contractor must notify the Public Works Department at least forty-eight (48) hours in advance to arrange for existing valve operation for putting new mains in service.

13. Water Service Line

The water service line and connection shall be in accordance with the Standard Detail in the Appendix.

J. CONSTRUCTION REQUIREMENTS

1. Pipe Installation

Pipe shall be installed in accordance with "Standard Specifications For Water and Sewer Main Construction in Illinois" latest edition, the applicable AWWA standards including C600 and the requirements of the Village Engineer.

2. Water Services

The required minimum one (1) inch diameter copper line (Type K) shall be laid in a trench at a minimum depth of five and one-half (5 1/2) feet.

The water service line for each property shall be laid from the buffalo box into the building, through a water meter and then into the plumbing system of the building. All plumbing shall conform, at a minimum, to the Illinois Plumbing Code (77 Ill. Adm. Code 890).

The maximum length of a non-looped water service shall be 150-feet as measured from the main to the building.

The location of the buffalo box (B-Box) shall be sawcut in the curb as a "w," and the location field marked with a painted "blue" 4" x 4" hardwood timber installed vertically.

The B-Box shall be located in the center of the lot frontage and located in the street right-of-way or street easement.

No meter will be placed into service until an inspection of the existing building's plumbing system has been made by Village personnel to insure positive and permanent disconnection of previous well water supply and adequate flushing and disinfection. There shall be no intermingling of the municipal and individual well water supplies in the building's plumbing. Continued use of a well water supply is permitted for non-domestic benefit (sprinkling and irrigation, etc.) only if the potable Village water supply is completely physically disconnected from the non-Village supply.

An approved backflow prevention device shall be installed wherever, in the Director of Development's opinion, such installation is necessary in order to comply with the Plumbing Code (77 Ill. Adm. Code 890) and I.E.P.A. Technical Policy Statements (35 Ill. Adm. Code 680). All backflow prevention devices or methods required shall be approved by the Research Foundation for Cross Connection Control of the University of Southern California, American Water Works Association, American Society of Sanitary Engineering, or American National Standards Institute and certified by the National Sanitation Foundation to be in compliance with applicable industry specifications.

The water meter must be installed within the building at a visible location with the meter reading through a glass block ten inch by ten inch (10" x 10") and which insures protection from freezing, allows convenient access for repairs and periodic reading from the exterior and is as close to the supply line entrance as possible. A meter remote may be used if approved by the Director of Public Works.

3. Connections to Existing Mains

All connections to the Village water distribution system shall be made under full water service pressure unless otherwise approved by the Village Engineer. Where connections are made to existing valves, said valves shall be pressure tested at 150 p.s.i. before connection is made.

4. Pipe Cutting

The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to cement lining and so as to leave a smooth end at right angles to the axis of the pipe.

5. Sheeting and Bracing

Sheeting and bracing may be placed in the ditch, as may be necessary, for the installation of the work.

Sheeting and/or bracing shall be progressively removed as the backfill is placed in such a manner as to prevent the caving in of the sides of the trench or excavation and to prevent damage to the work.

Sheeting which is placed shall not be removed until the backfill has been placed and thoroughly compacted. While sheeting is being withdrawn, all vacancies shall be carefully filled with sand, free from silt, rammed into place, puddled or otherwise firmly compacted.

The contractor is responsible for the construction techniques, procedures and compliance with O.S.H.A. standards to insure a safe and proper installation.

6. Steel Casing Pipe for Augering or Tunneling

Circular steel casing pipe for augering or tunneling shall be fabricated to a minimum of 0.375 inches thick rolled sheet steel wall, of the diameter specified, with a continuous circular one-half (1/2) inch bead weld and shall meet the requirements of A.S.T.M. A-120. Ends of casing pipe shall be filled inside with pea gravel blown in and casing ends sealed with brick and mortar after main has been inserted. Record drawings are required for casing location and elevation.

K. WATER MAIN PRESSURE TESTING AND DISINFECTION

1. Pressure Test

(a) Each section of water main and appurtenances without services shall be hydrostatically tested by the contractor and witnessed by the Village. Any defects or leaks shall be corrected by the contractor at his expense before proceeding.

(b) All newly laid water main pipe shall be subjected to a hydrostatic pressure of one hundred fifty (150) pounds per square inch. Duration of each pressure test shall be for a period of not less than two (2) hours. Each valved section of main shall be filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe. Allowable leakage shall be computed in accordance with AWWA C-600, Section 4.1 guidelines.

Before applying the specified test pressure, all air shall be expelled from the pipe. Any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced and the test repeated until satisfactory results are obtained.

2. Preliminary Flushing

Prior to chlorination, the main shall be flushed as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after a successful pressure test has been completed.

3. Disinfection

(a) Reference:

All water mains shall be disinfected and tested according to the requirements of the "Standards for Disinfecting Water Mains," AWWA C651, Section 5, and as

required by the standards in this Manual. All disinfection shall be performed by a state registered firm exhibiting experience in the methods and techniques of this operation and shall be approved by the Village.

The preferred point of application of the chlorinating agent shall be at the beginning of the pipeline extension or any valved section of it and through a corporation stop in the top of the newly laid pipe.

Water from the existing distribution system or other source supply shall be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine (maximum 50 ppm) (gas preferred).

Valves shall be manipulated so that the strong chlorine solution in the line being treated will not backflow into the existing line supplying the water.

(b) Retention:

The retention period shall be at least twenty-four (24) hours. After the chlorine-treated water has been retained for the required time, the chlorine residual at the pipe extremities and at other representative points should be at least 25 ppm.

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

(c) Final Flushing, Sampling and Analysis:

Twenty-four (24) hours after chlorination, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water, throughout its length shall, upon test and receipt of laboratory results, be approved as safe water by the Village Engineer. This quality of water delivered by the new main should remain for a period of at least two (2) full consecutive days as demonstrated by laboratory examination of samples taken from taps on two (2) consecutive days under Village supervision. Water samples should be taken at all dead ends and at 600-foot intervals on main lines before and after flushing. Samples must be taken on two (2) consecutive days.

Bacteriological analysis of the samples shall be performed by a laboratory certified by the Illinois Department of Public Health. Should the initial treatment result in an unsatisfactory bacterial test, the procedure shall be repeated until satisfactory results are obtained. Results of the analysis shall be transmitted by the laboratory directly to the Village Engineer. Test results shall indicate the date the sample was collected, the date the analysis was made, the exact locations at which samples were taken and the project at which the samples were collected. Once all water sample results have been determined to be acceptable, the new main should be placed in service and all water service taps may then be made under pressure on the live main.

L. CONSTRUCTION WATER

Construction water is hereby defined as that unrestricted supply of municipal water required by the various trades involved in building construction for concrete, masonry, painting, plastering, cleanup and other related purposes, which is paid per schedule as part of the building permit fee. The water use privilege intended by this charge does not include water used for landscaping or trench jetting. This water must be metered (obtain meter from Public Works). Hydrant use is not allowed without permission from the Director of Public Works and use of a meter and check valve.

The construction water usage privilege will terminate upon installation of the water meter.

No water service deposit shall be required of any developer or building contractor for any new construction awaiting future transfer of ownership (sale). This waiver of Village policy is based upon the existence of other performance controls on such construction and to ease the administrative burden of handling interim deposits.

M. WATER METERS & PITS

It will be the responsibility of the general contractor to contact Public Works (Customer Service, 272-4711) for an appointment to install Village water meters. Installation of water meters must occur prior to final inspection and occupancy approval by the Building Department.

In general, cold water displacement meters, manufactured in accord with AWWA Standard C700 shall be used for domestic and lower usage commercial buildings. For larger users, compound meters meeting AWWA Standard C702 shall be used. Compound meters shall be single register.

Remote readers shall be required at all locations. In structures using one (1) inch meters, glass blocks (10" x 10") shall be installed with meters utilizing remote readers conforming to AWWA Standard C707. All other locations shall be supplied with meters having encoder remote readers conforming to AWWA Standard C706. In some applications, subject to approval by the Plumbing Inspector and Public Works Director, propeller meters (AWWA C704) or turbine meters (AWWA C701) may be used.

N. RECORD DRAWINGS

Prior to acceptance of the water distribution systems, Record Drawings must be delivered to the Village Engineer. The Record Drawings shall indicate the location of all valves and B-Boxes, and size, location, and depth of all water lines, and shall be certified as to accuracy by an Illinois Registered Professional Engineer or Registered Surveyor.