



# Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

September 13, 2013

SUBJECT: FAI Route 90/94/290 (I-90/94/290)  
Section 2013-051T  
Cook County  
Contract No. 60X27  
Item No. 82, 9/20/13 Letting  
Addendum A

## NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Replaced the Schedule of Prices.
2. Revised pages 4-38 of the Special Provisions.
3. Revised sheets 3, 4 & 5 of the Plans.

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

John D. Baranzelli, P.E.  
Acting Engineer of Design and Environment

A handwritten signature in cursive script, reading "Ted B. Walschleger P.E.".

By: Ted B. Walschleger, P. E.  
Engineer of Project Management

cc: John Fortmann, Region 1, District 1; Tim Kell; Estimates

ILLINOIS DEPARTMENT OF TRANSPORTATION  
 SCHEDULE OF PRICES  
 CONTRACT  
 NUMBER - 60X27

State Job # - C-91-048-14

Project Number

Route

County Name - COOK - -

FAI 90/94

Code - 31 - -

\* REVISED: SEPTEMBER 13, 2013

FAI 290

District - 1 - -

Section Number - 2013-051T

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
*REV X0370141	D I WP RJ 24	FOOT	140.000				
*REV X0370142	D I WP RJ 48	FOOT	420.000				
X0370143	STEEL CASINGS 72	FOOT	50.000				
X0370144	DI WPF 48X24 3BMJ TEE	EACH	3.000				
X0370145	DI WPF 48 2BMJ 1/4 B	EACH	2.000				
*REV X0370146	DI WPF 48 MJ SLEEVE	EACH	1.000				
*REV X0370147	DI WPF 48 2BMJ 1/8 B	EACH	5.000				
X0370148	DI WPF 48 2BMJ 1/16 B	EACH	2.000				
X0370149	54 RS MECH JT TR COUP	EACH	1.000				
X0370150	54X48 2BMJ REDUCER	EACH	1.000				
*REV X0370151	DI WPF 24 2BMJ 1/8 B	EACH	7.000				
*DEL X0370152	DI WPF 24 2BMJ 1/16 B	EACH	2.000				
*DEL X0370153	DI WPF 24 MJ SLEEVE	EACH	1.000				
X0370154	WM CV 48 BUTTERFLY V	EACH	2.000				
*ADD X0370155	DI WPF 48X12 3BMJ TEE	EACH	1.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
*ADD X0370156	DI WPF 24 MJ TR SLEEV	EACH	1.000				
*ADD X0370157	DI WPF 48 MJ TR SLEEV	EACH	1.000				
*ADD X0370158	DI WPF 24X16 2BMJ RED	EACH	2.000				
*ADD X0370159	DI WPF 48 RJ PLUG	EACH	1.000				
*ADD X0370160	DI WPF 48 RJ CAP	EACH	1.000				
*ADD X0370161	WM CV 16 GATE VALVE	EACH	1.000				

## **SUBMITTALS**

There are elements of construction that may require long lead times between order and delivery to the project site for installation. The Contractor must prioritize timely submittals of shop drawings to minimize any delays in project execution.

Shop drawings for water main pipe, fittings, valves and other items to be supplied for the construction of the 54" water main relocation must be provided no later than one (1) week after the award of this contract. These shop drawings must be reviewed by the Engineer. The Engineer will provide any comments on the shop drawings in an expedited time. The Contractor is expected to immediately correct any deficiencies in the shop drawings. The District anticipates having shop drawings with no exceptions or limited noted exceptions no more than two (2) weeks after award.

The Contractor shall provide notice to the Engineer concerning shop drawing submittal schedules and when shop drawing submittal deadlines may be delayed.

## **WATER MAIN PIPE, FITTINGS, VALVES AND OTHER ITEMS (CDWM)**

Description. This work under this item consists of furnishing ductile iron water main pipe, fittings, valves and other items for the 54" water main relocation by others in west Harrison Street, Halsted Street and along the west right-of-way of the southbound I-90/94. The work shall be performed as detailed on the plans, specified herein and directed by the IDOT Resident Engineer and the Chicago Department of Water Management Commissioner or his representative (Engineer).

The items included within the requirements of this special provision include the following:

DUCTILE IRON WATER PIPE RESTRAINED JOINT - 24"  
DUCTILE IRON WATER PIPE RESTRAINED JOINT - 48"  
STEEL CASINGS 72"  
DUCTILE IRON WATER PIPE FITTINGS-48"X24" 3 BELL MECHANICAL JOINT TEE  
DUCTILE IRON WATER PIPE FITTINGS-48" 2 BELL MECHANICAL JOINT 1/4 BEND  
DUCTILE IRON WATER PIPE FITTINGS-48" MECHANICAL JOINT SLEEVE  
DUCTILE IRON WATER PIPE FITTINGS-48" 2 BELL MECHANICAL JOINT 1/8 BEND  
DUCTILE IRON WATER PIPE FITTINGS-48" 2 BELL MECHANICAL JOINT 1/16 BEND  
54" R&S X MECHANICAL JOINT TRANSITION COUPLING  
DUCTILE IRON WATER PIPE FITTINGS - 54"X48" 2 BELL MECHANICAL JOINT REDUCER  
DUCTILE IRON WATER PIPE FITTINGS-24" 2 BELL MECHANICAL JOINT 1/8 BEND  
WATER MAIN CONTROL VALVE-48 INCH BUTTERFLY VALVE  
DUCTILE IRON WATER PIPE FITTINGS-48"X12" 3 BELL MECHANICAL JOINT TEE  
DUCTILE IRON WATER PIPE FITTINGS-24" MECHANICAL JOINT TRANSITION SLEEVE  
DUCTILE IRON WATER PIPE FITTINGS-48" MECHANICAL JOINT TRANSITION SLEEVE  
DUCTILE IRON WATER PIPE FITTINGS - 24"X16" 2 BELL MECHANICAL JOINT REDUCER  
DUCTILE IRON WATER PIPE FITTINGS - 48" RESTRAINED JOINT PLUG  
DUCTILE IRON WATER PIPE FITTINGS - 48" RESTRAINED JOINT CAP  
WATER MAIN CONTROL VALVE-16 INCH GATE VALVE

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Restrained joint pipe and fittings shall be furnished complete with all necessary gaskets, locking segments and accessories required for a complete and fully operational assembly. Mechanical joint fittings shall be furnished complete with all necessary gaskets, restraint glands, nuts, bolts and accessories required for a complete and fully operational assembly.

Design Requirements. The furnishing of ductile iron water main, fittings, valves and other items for the relocation of the 54" water main shall conform to the Contract and the applicable sections of the Chicago Department of Water Management's Technical Specifications for Water Main Construction shown below and included as part of this special provision (See Appendix A):

Ductile Iron Pipe and Fittings	Section 33 11 13
Water Main Control Valves	Section 33 12 16

All items must be manufactured within the United States.

The 54" R&S X MECHANICAL JOINT TRANSITION COUPLING will be used to transition from an existing section of concrete pipe. The coupling shall include both an R&S spigot and an MJ spigot end.

Delivery. The Contractor must deliver all items to an IDOT facility within three (3) miles of 800 W. Harrison Street in the City of Chicago. The IDOT facility that will accept the items will be designated in advance of the delivery. The Contractor shall delay delivery at the Engineer's direction for up to thirty (30) days from the notification that all items have been manufactured and tested as necessary and are ready for delivery. Prior to delivery of all ductile iron water main, fittings, valves and other items, the Contractor shall provide the Engineer a layout plan for the delivery site that identifies the minimum area for all items to be stored and information on protective beds, pads, racks or other items that will be used for storage purposes.

Every precaution must be taken to prevent damage to the ductile iron water main, fittings, valves and other items during transportation and delivery. Valves and fittings must be sealed with caps or by another suitable method upon transportation from the supplier. Caps or end seals must be sturdy, secure, and wind resistant so as to protect the valves at all times prior to installation. Extreme care must be taken in loading and unloading the valves and fittings. Such work must be done slowly with suitable equipment and the ductile iron water main, fittings, valves and other items must be under complete control at all times. Under no conditions may items be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the water main pipe, fittings, valves and other items

If in the process of transportation, handling, or delivery, any item is damaged, the item must be replaced by the Contractor with no additional payment allowed.

Method of Measurement. Water main pipe and steel casings at specified diameter will be measured per foot of pipe or casings delivered and accepted. Fittings, valves and other items will be counted as each item delivered and accepted.

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Basis of Payment. The Work under this Item shall be paid for at the Contract unit price per foot for DUCTILE IRON WATER PIPE RESTRAINED JOINT - 24", DUCTILE IRON WATER PIPE RESTRAINED JOINT - 48" and STEEL CASINGS 72" or the Contract unit price per each DUCTILE IRON WATER PIPE FITTINGS-48"X24" 3 BELL MECHANICAL JOINT TEE, DUCTILE IRON WATER PIPE FITTINGS-48" 2 BELL MECHANICAL JOINT 1/4 BEND, DUCTILE IRON WATER PIPE FITTINGS-48" MECHANICAL JOINT SLEEVE, DUCTILE IRON WATER PIPE FITTINGS-48" 2 BELL MECHANICAL JOINT 1/8 BEND, DUCTILE IRON WATER PIPE FITTINGS-48" 2 BELL MECHANICAL JOINT 1/16 BEND, 54" R&S X MECHANICAL JOINT TRANSITION COUPLING, DUCTILE IRON WATER PIPE FITTINGS - 54"X48" 2 BELL MECHANICAL JOINT REDUCER, DUCTILE IRON WATER PIPE FITTINGS-24" 2 BELL MECHANICAL JOINT 1/8 BEND, WATER MAIN CONTROL VALVE-48 INCH BUTTERFLY VALVE, DUCTILE IRON WATER PIPE FITTINGS-48"X12" 3 BELL MECHANICAL JOINT TEE, DUCTILE IRON WATER PIPE FITTINGS-24" MECHANICAL JOINT TRANSITION SLEEVE, DUCTILE IRON WATER PIPE FITTINGS-48" MECHANICAL JOINT TRANSITION SLEEVE, DUCTILE IRON WATER PIPE FITTINGS - 24"X16" 2 BELL MECHANICAL JOINT REDUCER, DUCTILE IRON WATER PIPE FITTINGS - 48" RESTRAINED JOINT PLUG, DUCTILE IRON WATER PIPE FITTINGS - 48" RESTRAINED JOINT CAP and WATER MAIN CONTROL VALVE-16 INCH GATE VALVE. All payment is subject to the delivery to an IDOT facility and acceptance by the Engineer.

**APPENDIX A – CHICAGO DEPARTMENT OF WATER MANAGEMENT (CDWM) TECHNICAL SPECIFICATIONS FOR WATER MAIN CONSTRUCTION**

This specification amends the Chicago Department of Water Management (CDWM) Technical Specifications for Water Main Construction included in Appendix B and shall be construed to be a part thereof, superseding any conflicting provisions thereof applicable to the work under the Contract:

1. Revise all references to the Commissioner to the Engineer.
  
2. Section 33 11 13
  - a) Delete Article 1.2.
  - b) Delete Article 1.5 B.
  - c) Delete Article 1.6.
  - d) Modify Article 2.2 B to "Pipe joints must be restrained joints noted on the Drawings, specified here, or as directed by the Engineer."
  - e) Delete Article 2.2 E.
  - f) Delete Article 2.3 F.
  - g) Delete Article 2.4 C.
  - h) Delete Article 2.5.
  - i) Delete Article 2.7.

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- j) Delete Article 3.1.
  - k) Delete Article 3.3.
  - l) Delete Article 3.4.
  - m) Delete Article 3.5.
  - n) Delete Article 3.6.
  - o) Delete Article 3.7.
  - p) Delete Article 3.8.
  - q) Delete Article 3.9.
  - r) Delete Article 3.10.
  - s) Delete Article 3.12.
  - t) Delete Article 3.13.
  - u) Delete Article 3.14.
  - v) Delete Article 3.15.
  - w) Delete Article 3.16.
3. Section 33 12 16
- a) Modify Article 1.1 A to “This section includes requirements for butterfly and gate valves.”
  - b) Delete Article 1.2.
  - c) Modify Article 1.5 C to delete “Gate”.
  - d) Delete Article 1.5 D.
  - e) Delete Article 2.2.
  - f) Delete Article 2.4.
  - g) Delete Part 3.

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## SECTION 33 11 13

# DUCTILE IRON WATER PIPE AND FITTINGS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. This section includes requirements for the installation of ductile iron water pipe and fittings as shown on the drawings and specified here.

#### 1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE

- A. Section 31 23 19 - Dewatering Excavations.
- B. Section 31 23 10 - Excavation, Trenching and Backfilling.
- C. Section 33 11 15 - Thrust Restraint.
- D. Section 33 13 00 - Disinfection and Testing of Water Mains.

#### 1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM), latest edition:
  - 1. AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe and Fittings.
  - 2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - 3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
  - 4. AWWA C111 - Rubber Rubber-Gasket Joints for Ductile-Iron Pressure pipe and Fittings.
  - 5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
  - 6. AWWA C116 - Protective Fusion-Bonded Epoxy Coatings Int. and Ext. Surf. Ductile-Iron/Gray-Iron Fittings.
  - 7. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
  - 8. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.
  - 9. AWWA C153 - Ductile Iron Compact Fittings for Water Service.
  - 10. ASME/ANSI B16.1 - Flanges and Flanged Fittings.
  - 11. ANSI B16.21 - Metallic Gaskets for Pipe Flanges.
  - 12. ASME B18.2.1 - Square and Hex Bolts and Screws.
  - 13. ASME B18.2.2 - Square and Hex Nuts.
  - 14. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
  - 15. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel.
  - 16. ASTM A240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip, for Pressure Vessels and for General Applications.
  - 17. ASTM A307 - Carbon Steel Bolts and Studs.



18. ASTM A536 - Ductile Iron Castings.
19. ASTM A767 - Zinc Coated (galvanized) Steel.
20. ASTM A775 - Epoxy Coated Steel.
21. ASTM A780-93 - Repair of Zinc Coated (Galvanized) Steel.
22. ASTM B308 – Stainless Steel Alloy Standard Structural Shapes, Rolled, or Extruded.
23. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
24. ANSI A21.5/AWWA C105 - Polyethylene Encasement.

#### 1.4 SUBMITTALS

- A. Refer to Book I for submittal requirements and procedures for Shop Drawings, Product Data, Records and Samples.
- B. The Contractor must give notice in writing to the Commissioner, sufficiently in advance of his intention to purchase or place a special order for any pipe required to be installed under this contract. Fully dimensioned drawings and/or manufactures catalog cuts are to be submitted for review.
- C. The Contractor must submit to the Commissioner certified copies of all test reports for test conducted on the pipe by the manufacture when so requested by the Commissioner.
- D. The Contractor must provide the Commissioner with a notarized statement that all tests have been made and met as specified.

#### 1.5 QUALITY ASSURANCE

- A. Each manufacturer supplying pipe for water mains under this contract must furnish all facilities, personnel, and materials to conduct tests required as applicable to the type of pipe being supplied, when requested by the Commissioner. The cost of all plant tests required as proof of the acceptability of the water main pipe will be considered incidental to the Work and no additional payment will be allowed.
- B. **The Work performed on joining all pipe and fittings, must be performed by a plumber licensed in the State of Illinois or the City. This Work must include, but not be limited to, joining all pipe and fittings, installing joint gaskets, assembling all joints, installing continuity wedges, and tightening all gland nuts and bolts, as applicable for the installation.**

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## 1.6 NOTIFICATION AND LIMITATIONS OF WATER MAIN SHUT DOWNS

- A. **Whenever an existing water main or a section thereof is to be shut down during the course of construction, every individual consumer must be notified at least seventy-two (72) hours prior to the shut down. The Contractor must never operate, under any circumstances, an existing valve for a shut down or other purpose without first notifying and obtaining approval from the Commissioner.**
- B. **The time for a consumer shut down must not exceed eight (8) hours. Absolutely no shut downs will be permitted before 8:00 AM without approval from the Commissioner.**
- C. In case of emergency shut downs, the Contractor must notify customers immediately. Notification may be verbal on a door-to-door basis. However, if a consumer cannot be contacted, a written notice must be placed at the property site showing all pertinent information regarding the shut down. The notice must show a telephone number the consumer may call for information or to express any problem that the consumer may have with the shut down.
- D. If a consumer cannot withstand a planned shut down due to a dialysis machine being present or other medical reason, the Commissioner must be notified immediately.
- E. All valves 16-Inches in diameter and larger must be operated only by personnel of the Department. Notify the Commissioner seventy-two (72) hours prior to the need for operation of the valve.

## PART 2 - PRODUCTS

### 2.1 DUCTILE IRON PIPE

- A. Ductile iron pipe must conform to the requirements of AWWA C151 and with the additions or substitutions specified in this Section.
- B. Pipe bells must be designed to provide a watertight joint without leakage and must be capable of withstanding pressures exceeding those that will rupture pipe of this class and thickness without requiring additional jointing material.

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- C. Electrical conductivity must be provided at each joint on all push-on and mechanical jointed pipe 16-inches in diameter and smaller, to facilitate thawing of frozen pipe and building water services. It must also be provided on pipe 24-inches in diameter and larger when building services are directly connected to the water main. Conductivity is to be accomplished by installing serrated silicon wedges as recommended or supplied by the pipe manufacture. **The use of lead tip gaskets will not be allowed.** Wedges are to be installed in accordance with the requirements of paragraph C in Articles 3.6 and 3.7 of this specification.
  
- D. All pipes must be manufactured so that where a cut is made at any point along the barrel, the cut end will fit properly into a standard mechanical joint bell and be drip tight at hydrostatic test pressure.
  
- E. Exterior of pipe must be coated with a petroleum asphaltic material in conformance with AWWA C110, Section 10-10. Interior of pipe must be cement lined in accordance with AWWA C104.
  
- F. Pipe thickness and classes must conform to standards shown in Table A.

**TABLE A PIPE THICKNESS AND CLASS**

Pipe Size	Nominal Wall Thickness	Thickness Class
3-inch	0.34-inch	54
4-inch	0.38-inch	55
6-inch	0.40-inch	55
8-inch	0.45-inch	56
10-inch	0.47-inch	56
12-inch	0.49-inch	56
14-inch	0.48-inch	55
16-inch	0.46-inch	54
18-inch	0.44-inch	53
20-inch	0.45-inch	53
24-inch	0.50-inch	54
30-inch	0.47-inch	52
36-inch	0.53-inch	52
42-inch	0.59-inch	52
48-inch	0.65-inch	52
54-inch	0.73-inch	52
60-inch	0.77-inch	52

## 2.2 JOINTS

- A. **LEAD JOINTS ARE NOT TO BE USED UNDER ANY CIRCUMSTANCES.**
- B. Pipe joints must be push-on type joints unless otherwise noted on the drawings, specified here, or directed by the Commissioner. Push-on type joints must conform to AWWA C111.
- C. Restrained joints when specified are to meet the following requirements:
1. Mechanical joint pipe with mechanical joint restraint glands. Mechanical joints must conform to AWWA C110. Gaskets must conform to Section 2.4 of this specification.
  2. Restrained joint pipe with manufactured weldment, field weldments or manufactured locking rings, locking segments and runner retainers and appurtenances conforming to AWWA C110. Acceptable products are Super-Lock Pipe manufactured by Clow Water Systems Company; FlexRing Pipe or Lok-Ring Pipe manufactured by American Ductile Iron Pipe; or TRFLEX manufactured by United States Pipe and Foundry Company.
- D. Mechanical Joint Restraint Glands.
1. Provide restraint glands at all mechanical joints.
  2. Restraint glands must be designed for use with the standardized mechanical joint bell pipe conforming to AWWA C110 and AWWA C153. Restraint is to be incorporated into the design of the gland. Acceptable products for this use are Mega Lugs manufactured by EBAA Iron Works; Uniflange manufactured by Ford Meter Box; or Star Grip manufactured by Star Pipe Products.
  3. Restraint is to be accomplished by the use of multiple, wedge style restraints. Proper actuation of the wedges is to be ensured with torque limiting twist off nuts.
  4. Glands 3-Inches through 16-Inches are to be pressure rated at 350-psi; glands 18-Inch through 48-Inch are to be rated at 250 psi.
  5. The gland body and restraint components are to be made from ductile iron conforming to ASTM A536, 65-45-12. Ductile iron wedges are to be heat-treated within a range of 370 to 470 BHN.
  6. The joint is to be capable of full deflection during assembly and joint deflection after assembly

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7. Provide glands with minimum weights and number of wedges as shown in Table B.
8. Retainer glands are not acceptable.

**TABLE B – MINIMUM WEIGHT & NUMBER OF WEDGES PER RESTRAINED JOINT**

Pipe Size.	Number of Wedges	Minimum Weight
3-inch	2	6.0-lbs
4-inch	2	7.0-lbs
6-inch	3	11.0-lbs
8-inch	4	14.5-lbs
10-inch	6	23.0-lbs
12-inch	8	28.5-lbs
14-inch	10	46.0-lbs
16-inch	12	52.0-lbs
18-inch	12	63.6-lbs
20-inch	14	71.0-lbs
24-inch	16	90.0-lbs
30-inch	20	190.7-lbs
36-inch	24	226.5-lbs
42-inch	28	400.0-lbs
48-inch	32	488.0-lbs

- E. Flanged joints, when shown on the Drawings, specified, or directed by the Commissioner, must conform to the following:
  1. Flanged joints must conform to AWWA C115. Flanges must be the long hub type, screwed on the threaded end of the pipe in the shop. There must be no leakage through the pipe threads. The flanges must be designed to prevent corrosion of the threads from the outside.
  2. Flanges must be drilled according to the requirements of ANSI/ASME B16.1, Class 125 unless special drilling is called for on the Drawings, specified, or directed by the Commissioner. Bolt holes must be equally spaced, drilled smooth and true. When stud bolts are used flanges must be drilled and tapped to accommodate the studs.

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3. The face of the screwed-on flange and plain-end of the pipe must be accurately refaced together, at right angles to the pipe axis. After facing and drilling, the face of the screwed-on flange must immediately be covered with an appropriate rust-preventive coating.
4. Flanged joints must be secured with either bolts and nuts, or stud bolts with a nuts. Bolts, stud bolts, and nuts must meet the requirements of ASTM A307, Grade B. Bolts and stud bolts must conform to ANSI/ASME B18.2.1. Nuts must conform to ANSI/ASME B18.2.2. All bolts, stud bolts, and nuts must be primed with bitumastic paint after the bolts and nuts have been installed and tightened.
5. Gaskets must conform to Section 2.4 of this specification.

### 2.3 FITTINGS

- A. Fittings to be furnished and installed as specified or shown on the Drawings must be mechanical joint, ductile iron in accordance with AWWA C110. Laying length of mechanical joint castings must be as shown in AWWA C110. Wall thickness and allowable variation in the thickness of mechanical joint castings must conform to AWWA C110 and have a 250-psi pressure rating.
- B. Compact fittings may not be used unless otherwise approved by the Commissioner.
- C. Plain ends of mechanical joint fittings must be beveled and gauged to properly seat in push-on joint bells.
- D. The fittings must be smooth and free from defects of every nature that would make them unfit for the use that they were intended. Plugging of fittings is not allowed. Repairing of defects by welding will be allowed if such repairs will not adversely affect the serviceability of the fittings or their ability to meet the strength requirements of the referenced AWWA standards.
- E. All castings must be coated with a petroleum asphaltic material in conformance with AWWA C110, Section 10-10. Interior of pipe must be cement lined in accordance with AWWA C104.
- F. Flanged fittings must conform to AWWA C110, and have a 150-pound per square inch pressure rating.

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## 2.4 GASKETS

- A. All gaskets for pipe, fittings and appurtenances must be vulcanized natural or vulcanized synthetic rubber, non-porous, free of foreign materials and visible defects. Recycled rubber may not be used.
- B. When soil conditions do not permit the use of natural or synthetic rubber gaskets and when directed by the Commissioner, all gaskets for pipe, fittings and appurtenances must be Nitrile (acrylonitrile butadiene), nonporous, free of foreign materials and visible defects.
- C. Gaskets for flanged joints must be of the ring type, 1/16-Inch thick, and meet the requirements of ANSI Standard B16.21. Acceptable manufactures for gaskets type as manufactured by the Crane Company; Garlock Packing Company; or U.S. Rubber Company.
- D. Gaskets must be stored in a cool place and protected from light, heat, oil, or grease until installed. Any gasket showing signs of cracking, weathering, abrasion or other deterioration will be rejected.

## 2.5 POLYETHYLENE ENCASEMENT

- A. Polyethylene encasement material must be either 8-mil, low density or 4-mil, cross-laminated, high-density polyethylene tubing in accordance with AWWA C105.

## 2.6 TRANSITION SLEEVES

- A. Transition sleeves for pipe 16-inches in diameter and smaller must be of type as manufactured by Dresser, Style 253 Modular Cast Couplings; Smith Blair, Type 441 Cast Transition Couplings; Ford, Style FC2A Transition Couplings; Power Seal, Model 3501 Transition Couplings; or JCM Industries Model 212 Transition Couplings. Transition sleeves for pipe diameter greater than 16-inches must be of type as manufactured by Ford, Style FC2A or Style FC5 Transition Couplings; Romac Industries, Style 501 Transition Couplings; Dresser Style 38, Style 62, or Style 138 Transition Couplings; or Power Seal, Model 3501 Transition Couplings.
- B. Transition sleeves must be designed to join class "B" pit cast iron pipe to AWWA C111/C151 standard ductile iron pipe. They must provide for pipe misalignment and settlement deflection and make a leak proof non- soldered joint, which allows for limited line movement due to expansion and contraction. Design couplings for a minimum rated working pressure of 150-pounds per square inch.

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- C. Transition sleeves pipe 16-Inches in diameter and smaller must be constructed of ductile iron conforming to ASTM A536. Transition sleeves for pipe diameters greater than 16-Inches must be constructed of ductile iron conforming to ASTM A536 or carbon steel conforming to ASTM A36. Ends must have a smooth inside taper for uniform gasket seating. The follower flanges must be ductile iron conforming to ASTM A536 or carbon steel conforming to ASTM A36.
- D. Transition sleeves must be shop coated inside and outside with fusion bonded epoxy coating conforming to AWWA C-213.
- E. Gaskets must be of molded rubber conforming to ASTM C564 for potable water service.
- F. Bolts and nuts must be 5/8-Inch in size and must be Grade 304L stainless steel, annealed. Nuts must be Teflon coated to prevent galling during storage.
- G. Each transition sleeve must be supplied with four electrical continuity brackets electrical continuity across the sleeve. The angle bracket must be made from ASTM A240-T304 stainless steel with a stainless steel set screw.
- H. Contractor must field measure the existing cast iron water main for exact size of outer dimension and degree of out-of-roundness at the location to install the transition sleeve prior to ordering and installing the transition sleeve for that location.

## 2.7 PIPE SUPPORT SYSTEMS AND HANGERS (INTENDED FOR PERMANENT INSTALLATIONS)

- A. Manufactured pipe support systems, fasteners, and miscellaneous hardware must be fabricated from high strength stainless steel conforming to ASTM B308, or hot-dipped galvanized steel conforming to ASTM 123 and ASTM 153. Pipe support systems must be designed to have a minimum load safety factor of three (3) times the anticipated loading.
- B. Field fabricated pipe support systems, fasteners, and miscellaneous hardware must be cold-galvanized by painting metal surfaces with a 2-mil thick coating of ethyl silicate in-organic zinc-rich paint primer per manufacture's directions. Galvanized primer must be completely dry before backfilling the excavation. Field fabricated pipe support systems must be designed to have a minimum load safety factor of three (3) times the anticipated loading.
- C. Repair damaged galvanized coated surfaces in accordance with ASTM A780-93. Apply 2-mil thick coating of ethyl silicate in-organic zinc-rich paint primer per manufacturer's directions. Zinc primer must be allowed to completely dry before backfilling the excavation.

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- D. Cold-galvanizing zinc primer paint must be of the inorganic, ethyl silicate type, containing at least 60% zinc dust and 40% adhesive binders, and conform to ASTM 780-93, type as manufactured by Tnemec Products, Kansas City, MO., Brite Products, Detroit, Mich., or Valspar Coatings, Minneapolis, MN.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. All ductile iron pipe, fittings, and appurtenances must be installed in accordance with the manufacturer's recommendations and requirements.
- B. All pipe, fittings, and accessories must be delivered, unloaded, strung, and laid as specified here.
- C. The water mains must be laid with depths of cover as indicated under Article 3.12 of this specification, unless otherwise shown on the drawings, or directed by the Commissioner. The pipes must be laid true to line and grade.
- D. Fittings as specified must be used where shown on the drawings and where grade or alignment changes require offsets greater than those recommended by the pipe manufacturer.

#### **3.2 TRANSPORTATION, DELIVERY AND STORAGE**

- A. Every precaution must be taken to prevent damage to the pipe during transportation and delivery. Pipe ends, fittings, valves and hydrants must be sealed with caps or by another suitable method upon transportation from the supplier. Caps or end seals must be sturdy, secure, and wind-resistant so as to protect the pipe at all times prior to installation. Extreme care must be taken in loading and unloading the pipe and fittings. Such work must be done slowly with skids or suitable power equipment and the pipe must be under complete control at all times. Under no conditions may the pipe be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe. When handling the pipe with a crane, a suitable pipe hook or rope sling around the pipe must be used. Under no condition may the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends and lining.
- B. If in the process of transportation, handling, or installation, any pipe or fitting is damaged, such pipe or fitting must be replaced by the Contractor and be considered incidental to the construction and no additional payment will be allowed.

- C. The Contractor must store pipe in a manner that will prevent damage. Pipe must be placed on wooden timbers or another suitable support on level ground. The Contractor must prevent the pipe from rolling. The procedures used to prevent rolling must be approved by the Commissioner

### 3.3 PREPARATION FOR LAYING PIPE

- A. Materials, coatings, and linings must be as specified herein, shown on drawings, or directed by the Commissioner. Water mains and services must be installed where shown on the drawings. Installation must be in accordance with standards as recommended by the pipe manufacturer, and as specified herein.
- B. Proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings must be used.
- C. Before lying, all pipe and fittings must be thoroughly examined for defects and no piece may be installed which is known to be defective. If defects are discovered after pipe or fittings have been installed, the Contractor must remove the defective pipe and/or fitting and replace it with a sound one at his expense and to the satisfaction of the Commissioner.
- D. The pipe and fittings must be thoroughly cleaned before they are laid and must be kept clean until they are accepted in the finished work. Care must be exercised to avoid leaving bits of wood, dirt, rock and other foreign particles in the pipe. If any such materials are discovered before the final acceptance of the work, they must be removed and the pipe and fittings replaced, if necessary. All pipes must be kept absolutely clean during construction and must be stopped off with night plugs at the end of each day's work. Exposed ends of uncompleted lines and existing water mains and services cut and not abandoned must be capped or otherwise temporarily sealed at all times when pipe laying is not in progress.
- E. When cutting ductile iron pipe, it must be neatly cut perpendicular to the longitudinal axis of the pipe without damaging the pipes lining or coating or jointing surface area.

### 3.4 LAYING WATER MAIN PIPE

- A. All pipelines must be laid in trench excavations on bedding or other foundations, as shown on the drawings, specified herein, or ordered by the Commissioner. The pipe must be properly secured against movement and pipe joints must be made in the excavation as required. Pipes must have solid bearing throughout their entire length.

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- B. At locations where pipe thrust is anticipated to occur, pipe and fittings must be anchored or restrained as shown on the drawings, specified in Section 33 11 15 – Thrust Restraint, or as directed by the Commissioner. **Polyethylene encasement is to be installed on all new water main pipe and fittings before pipe is installed and braced against movement.** Care must be taken so as not to damage the polyethylene encasement during the installation or blocking of the pipe and fittings. If damage occurs, the Contractor must repair or replace the polyethylene encasement at his expense to the satisfaction of the Commissioner.
- C. Pipe lying will be permitted only in dry trenches having a stable bottom. Groundwater or water from other sources must be removed as per Section 31 23 19 – Dewatering Excavations. If the trench bottom is unsuitable for the pipes foundation, the kind of stabilization to be utilized will be ordered in writing.
- D. If, in the opinion of the Commissioner, the Contractor has failed to obtain an acceptably dry trench bottom using conventional methods of dewatering, the Commissioner may order the Contractor to excavate below the intended grade and to place sufficient sub-grade material as may be suitable over the trench bottom in accordance with Section 31 23 10 – Excavation, Trenching and Backfilling.
- E. The Contractor must also take such required precautions to prevent flotation of the new pipeline.

### 3.5 ASSEMBLY OF FLANGED JOINTS

- A. Flanged joints must be made with bolts or bolt studs with nuts as specified in Section 2.2 of this specification.
- B. Tighten flange bolts as recommended by the gasket manufacturer to ensure an evenly compressed gasket and leak tight joint.
- C. After the bolts and nuts have been properly installed, tightened, and cleaned, prime them with bitumastic paint.

### 3.6 ASSEMBLY OF MECHANICAL JOINTS

- A. Thoroughly brush the surfaces with which the rubber gasket comes in contact with a wire brush just prior to assembly of the joint. Brush lubricant over the gasket and the plain end just prior to installation. In making up mechanical joints, the spigot must be centered in the bell.

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- B. The gasket and gland must be placed in position, the bolts inserted, and the nuts tightened finger tight. The nuts must be tightened by means of a torque wrench in such a manner that the gland must be brought up evenly into the joint.
- C. Joints are to be made up to allow electrical continuity from one pipe to another by installing wedges as specified in Article 2.1, paragraph C of this specification and are to be installed in the following manner:
  - 1. Use two (2) wedges per joint for 3-Inch to 12-Inch diameter pipes. Wedges must be placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.
  - 2. Use four (4) wedges per joint for 16-inch to 24-inch diameter pipes. Wedges must be installed side by side in pairs placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.
  - 3. Use six (6) wedges per joint for pipes larger than 24-inches in diameter only if building services are directly connected to the main. Wedges must be installed side by side in pairs 120 degrees apart at the 12, 4, and 8 o'clock positions around the joint.
- D. The following range of bolt torques must be applied as specified in Table C. If sealing is not obtained at the maximum torque requirements listed in Table C, the joint must be disassembled, thoroughly cleaned, and reassembled.

**TABLE C – BOLT TORQUE REQUIREMENTS**

Bolt Size	Torque Range
5/8-inch	45-60 ft-lbs
3/4-inch	75-90 ft-lbs
1-inch	85-100 ft-lbs
1 1/4inches	105-120 ft-lbs

**3.7 ASSEMBLY OF PUSH-ON RUBBER GASKET JOINTS**

- A. Thoroughly brush the gasket seat in the bell with a wire brush and wipe the gasket and gasket seat with a cloth. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat. Apply a thin film of NSF 61 approved joint lubricant to the inside surface of the gasket that will come into contact with the entering pipe.

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- B. Thoroughly brush the plain end of the pipe with a wire brush and placed it in alignment with the bell of the pipe to which it is to be joined. Make up the joint by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket.
- C. Joints are to be made up to provide electrical continuity from one pipe to another by installing wedges as specified in Article 2.1, paragraph C of this specification and are to be installed in the following manner:
  - 1. Use two (2) wedges per joint for 3-Inch to 12-Inch diameter pipes. Wedges must be placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.
  - 2. Use four (4) wedges per joint for 16-Inch to 24-Inch diameter pipes. Wedges must be installed side by side in pairs placed on opposite sides of the joint at an equal distance apart (9 and 3 o'clock positions) around the joint.
  - 3. Use six (6) wedges per joint for pipes larger than 24-Inches in diameter only if building services are directly connected to the main. Wedges must be installed side by side in pairs 120 degrees apart at the 12, 4, and 8 o'clock positions around the joint.
- D. Assemble restrained joint pipe in accordance with manufacture's instructions.

### 3.8 TEMPORARY BULKHEADS

- A. At ends of constructed sections where adjoining water mains or structures have not been completed and are not ready to be connected, temporary bulkheads must be used.

### 3.9 SHORT TUNNEL CONSTRUCTION

- A. Pipes to be placed in short tunnels must be jointed prior to being pulled into position. Pipe must be pushed or pulled into position in a manner arranged to keep joints tight and to prevent deflection.

### 3.10 ENCASING DUCTILE IRON PIPE IN POLYETHYLENE

- A. All cast and ductile iron pipe and fittings must be encased in polyethylene tubing before being installed, blocked, or braced.

### 3.11 USE OF DAMAGED, DEFECTIVE, OR NON-SPECIFIED CASTINGS AND FITTINGS

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- A. All construction castings and pipe fittings that are determined to be damaged, defective or do not meet these specifications and are stored within the Work area must be marked for non-use and removed and replaced with fittings that conform to these Specifications.

**3.12 DEPTH OF PIPE COVER**

- A. Unless otherwise shown on the Plans or directed by the Commissioner, all water mains and services must be installed so a minimum pipe cover is achieved as shown in Table D.

**TABLE D – MINIMUM DEPTH OF COVER FOR WATER MAINS**

<b>Size of Pipe</b>	<b>Depth of Cover</b>
3/4 to 3-inches	5-ft 6-inches <u>±</u> 3-inches
4-inch	5-ft 6-inches <u>±</u> 3-inches
6-inch	5-ft 6-inches <u>±</u> 3-inches
8-inch	5-ft 3-inches <u>±</u> 3-inches
12-inch	5-ft <u>±</u> 2-inches
16-inch	4-ft 6-inches <u>±</u> 2-inches
24-inch	4-ft <u>±</u> 1-inch
30 to 42-inches	3-ft 6-inches (min) or as detailed on drawings
48-inches & Larger	3-ft (min) or as detailed on drawings

**3.13 ABANDONMENT OF EXISTING WATER MAINS**

- A. All openings on abandoned pipe or conduit are to be sealed with a concrete mortar plug of a minimum of one (1) foot in length within the pipe. Pipe 16-Inches in diameter and larger must be filled with fine graded aggregate or controlled low strength material (CLSM) flowable fill, as appropriate, or directed by the Commissioner. CLSM flowable material must meet standards specified in Section 31 23 10, “Excavation, Trenching and Backfilling”, paragraph 2.3, C of these specifications.

**3.14 DISINFECTION OF PIPE AND FITTINGS**

- A. Protect new and existing pipe and fittings from water, debris and foreign materials as specified in Section 31 23 10 – “Excavation, Trenching and Backfilling”.

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- B. All new pipe, fittings, and valves must be disinfected in accordance with Section 33 13 00 – “Disinfection and Testing of Water Mains”, and the requirements of the Bureau of Water Quality which may be contacted at 312.744.8190.
- C. Swab all pipe and fittings that will not be pressure tested or chlorinated with a chlorine solution during installation. Extra precautions must be taken to prevent debris or ground water from entering the section of water main to be swabbed. Incorporate untested section of water main into the flushing routine when the work is necessitated, or part of, a water main replacement project. When connecting pipes to the existing city water system use normal operating pressure to visually inspect for leaks. If feasible, inspect for leaks prior to backfilling the excavation. Comply with all standards and requirements of the Bureau of Water Quality.

### 3.15 WATER MAIN SUPPORT SYSTEMS

- A. Support and anchor all piping in proper position and alignment with due allowance for expansion and contraction.
- B. The type, location, and arrangement of hangers and supports must be as shown on the drawings, or as directed by the Commissioner. Pipe supports and hardware must be appropriate to meet installation conditions, anticipated loading, and fabricated from corrosion resistant materials described in paragraph 2.7 - Pipe Support and Hangers, of this specification. All support systems whether pre-manufactured or field fabricated must have a minimum load safety factor of three (3) times the anticipated loading. Corrosion protective coatings damaged during installation of the pipe support system must be repaired per the manufactures requirements, or as directed by the Commissioner to maintain corrosion protection.

### 3.16 SEPARATION BETWEEN WATER AND SEWER MAINS

- A. When a water main crosses above a sewer main and the vertical separation is between 18 and 6-inches, as measured between the bottom of the water main and crown of sewer pipe, the sewer must be constructed of ductile iron pipe with rubber gasketed joints to a distance one foot beyond the wall of the trench excavation. Flexible transition coupling must be used to join the ductile iron pipe to the sewer pipe and be encased in concrete as shown on the drawings.

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- B. When a water main crosses below a sewer main, the sewer pipe must be constructed of ductile iron pipe with rubber gasket joints for a perpendicular distance of 10 feet on either side of the center line of the water main, and an 18-Inch vertical separation must be maintained. Flexible transition couplings must be used to join the ductile iron pipe to the sewer pipe.

## **SECTION 33 12 16**

### **WATER MAIN CONTROL VALVES**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. This section includes requirements for the installation of gate valves, resilient wedge valves, and butterfly valves.

##### **1.2 WORK OF THIS SECTION SPECIFIED ELSEWHERE**

- A. Section 33 13 00 - Disinfection and Testing of Water Mains.

##### **1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM), latest edition:

- 1. ASTM A48 - Gray Iron Castings.
- 2. ASTM A126 - Gray Iron Castings for Valves, Flanges.
- 3. ASTM A436 - Austenitic Gray Iron Castings.
- 4. ASTM A439 - Austenitic Ductile Iron Castings.
- 5. ASTM B584 - Copper Alloy Sand Castings for General Application.

- B. AWWA C110 - Ductile Iron and Gray Iron Fittings, latest edition.

- C. AWWA C111 - Rubber Gasket Joints for Ductile Iron, latest edition.

- D. AWWA C500 - Metal-seated Gate Valves for Water Supply Service, latest edition.

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- E. AWWA C504 - Rubber Seated Butterfly Valves, latest edition.
- F. AWWA C509 - Resilient Seated Gate Valves, latest edition.
- G. AWWA C550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants, latest edition.
- H. Federal Specification FF-B-575C - Bolts; Hex and Square, latest edition.
- I. Federal Specification FF-N-836E - Nut; Square, Hex, Cap, latest edition.

#### 1.4 SUBMITTALS

- A. Contractor must provide an affidavit stating that all Butterfly Valves, valve operators, and torque overload protectors comply with all applicable provisions shown on the drawings and as specified in this specification.
- B. Provide manufactures catalog cuts and/or certified drawings of all valves, valve operators, and torque overload protectors to be furnished. The manufactures catalog cuts and/or certified drawings must provide all necessary information regarding dimensions and materials used and conformance to requirements stated in these specifications.
- C. All submittals must be reviewed and approved by the Commissioner prior to installation.

#### 1.5 QUALITY ASSURANCE

- A. Each valve must be hydrostatically tested at the manufacturer's shops and proven hydraulically tight at all pressures up to 200-pounds per square inch.
- B. For gate valves, the following tests are required:
  - 1. The first test consists of applying a 200-pound per square inch hydrostatic pressure between the discs through an opening in the bonnet casting.
  - 2. The second test consists of applying a 200-pound per square inch hydrostatic pressure against the outside of each disc in the manner prescribed below:
    - a. The valves must be plugged or capped on both ends. The caps or plugs must be drilled and tapped to accept the pressure test piping.

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- b. With the pressure test piping in place, open the gates of the valve, the test-piping valve, and remove the plug in the bonnet. Fill the valve with water. When a discharge occurs at the outlet side, close the water supply line and insert the bonnet plug.
- c. Close the gates of the valves, open test-piping valve, and apply a 200-pound per square inch hydrostatic pressure on the inlet side.

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- d. Hold test pressure for one (1) minute. During this time no water should discharge from the outlet end of the test piping. If no leak occurs, release pressure, reverse the test piping, and repeat the test procedures for the other gate. If a leak occurs, repair and / or replace the valve as directed by the Commissioner. Repeat the test procedures.
3. An affidavit must be furnished from the manufacturer to attest to the fact that each of the valves furnished under this Contract were proven hydrostatically tight in accordance with the specified test procedures.
- C. Valves that do not meet the requirements of this Section will be rejected and removed by the Contractor, and replaced with valves that conform to this Section, within the time period allowed by the Commissioner. Gate valve removal and replacement will be considered incidental to the installation of the valves and no additional payment will be allowed.
- D. **The Work performed for installing valves must be performed by a plumber licensed in the State of Illinois or the City. The Work may include, but not be limited to, setting the valve; cutting and joining all pipe; installing test taps, fittings, adapters, joint gaskets, and continuity wedges; and tightening all gland nuts and bolts, as applicable for the installation.**

## PART 2 - PRODUCTS

### 2.1 GATE VALVES

- A. All gate valves are to be Chicago Standard Gate Valves of the size shown on the drawings that are designed, manufactured, tested, and inspected in accordance with AWWA C500, and in accordance with the exceptions noted here. All valves are to be delivered fully assembled.
- B. The following characters must be cast in 1/2-inch letters on the bonnet of each valve:
  - Chicago
  - Year of Manufacture
  - Manufacture's Name
- C. Gate valves must be of mechanical joint type double disk and in the following sizes: 4-Inch, 6-Inch, 8-Inch, 12-Inch, and 16-Inch. Larger size valves must be of a butterfly style.
- D. Material used must meet the requirements as to physical and chemical properties, as specified in this Section.

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- E. Valves found to contain defects such as blowholes, shrinkage or slag holes, cold shuts, or cracks will be rejected.
- F. The thickness of metal in castings, whose standard thickness is less than 0.8-Inch, must not be more than 0.08-inch less than the standard thickness. The deficiency in thickness of castings, whose standard thickness is 0.8- inch or more, must not exceed 10% of the standard thickness. The above allowable deficiencies in thickness, however, must not extend over more than one-half of the area of the casting.
- G. After being cleaned and tested, every assembled valve and all metallic parts must be coated inside and outside with coal tar pitch varnish. It must produce a smooth and non-tacky coating tough and tenacious when cold and not brittle nor with any tendency to scale off.
- H. The brass castings must comply with ASTM B584, Copper Alloy UNS No. C83600.
- I. The bronze in the valve stem and in the stem nut must be manganese bronze, complying with ASTM B584, Copper Alloy UNS No. C86700. Stem seals are to be double o-rings complying with ASTM D2000 and ASTM 568A
- J. The gaskets used between the flanges must be fully faced, 1/32-inch thick and made of heavy-duty, asbestos-free, fiber composition, suitable for water service.
- K. Bolts and nuts must be made of cast iron or steel. Heads of seal plate bolts must conform to the dimensions shown on the Drawings (an alternate of hex or square head bolt is acceptable) while all other requirements of seal plate bolts must conform to Federal Specification FF-B-575C and nuts must conform to FF-N-836E. Heads of bolts must be unfinished and nuts must be semi-finished. Both bolts and nuts must be hot dipped galvanized as specified in the applicable Federal Specification.
- L. The valves herein specified must be furnished complete with mechanical joint accessories. The mechanical joint accessories must consist of mechanical joint thrust restraint glands, rubber gaskets, and tee head bolts and hex nuts, all conforming to AWWA C110. Dimensions and tolerances for mechanical joints must conform to table 1 of AWWA C110.
- M. It will be the manufacturer's responsibility to provide the patterns and gauges necessary to perform the work to be done hereunder. The Department will not furnish these items.

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- N. The Department reserves the right to make at any time such tests as it may deem proper to determine that the materials used are proper for the Work and that the valves are of good mechanical construction. The manufacturer must give the authorized inspectors of the Department free access to all places where valves are being made. At the Department's request, the manufacturer must furnish properly prepared standard test specimens of the materials used and must provide facilities for testing them.
- O. All valves must open by turning the operating stem clockwise.
- P. Operating nuts must be 2 ½-Inches square at the base of the nut.

## 2.2 RESILIENT SEATED WEDGE GATE VALVES

- A. The Contractor must furnish and install resilient-seated gate valves that are designed, manufactured, tested, and inspected in accordance with AWWA C509, with following exceptions, deletions, or additions:
  - 1. Exceptions for Section 4.4.7. Valves are to be supplied with 2 ½-inch square operating stem wrench nuts.
  - 2. Exception for Section 4.4.7.2. All valves must open by turning the operating stem clockwise as viewed from top of the valve.
- B. Resilient seated wedge gate valves must be of the mechanical joint type supplied complete with joint thrust restraint glands, vulcanized natural or synthetic rubber gaskets, and tee head bolts and hex nuts, all conforming to AWWA C110. Dimensions and tolerances for mechanical joints must conform to Table 1 of AWWA C110.
- C. All valves must provide an unobstructed waterway of full size when open. Gates or stems must not extend into the waterway. Valves are to be supplied in sizes between 4 and 12-Inches as noted on the drawings.
  - 1. The bronze in the valve stem and in the stem nut must be manganese bronze, complying with ASTM B584, Copper Alloy UNS No. C86700. Stem seals are to be double o-rings complying with ASTM D2000 and ASTM 568A.
  - 2. After being cleaned and tested, every assembled valve and all metallic parts must be coated inside and outside with coal tar pitch varnish. It must produce a smooth and non-tacky coating tough and tenacious when cold and not brittle nor with any tendency to scale off.

## 2.3 BUTTERFLY VALVES

- A. Butterfly valves, as specified here, must be designed, manufactured, tested, and inspected in accordance with AWWA C504, Class 150Band with the requirements of this Section as listed hereafter:
1. Body Type: Short bodied mechanical joint, as specified.
  2. Maximum Non-shock Shut-off Pressure: 100psi.
  3. All valves must have flow through discs.
  4. Each valve furnished must be subjected to the performance, leakage and hydrostatic tests described in Section 5.2 of AWWA C504.
  5. A minimum of two (2) weeks prior to the test dates, the manufacturer must notify the Commissioner in writing when the shop testing of the valve will occur. Failure to notify the Commissioner will not be grounds for rejection.
  6. The manufacturer must submit to the Commissioner records of all tests performed under Sections 2.3, 3.8.5, and 5.2 of AWWA C504.
  7. Shaft seals must be either split V type packing or "O" ring seals. Shaft seals consisting of a stuffing box with pull down packing are not acceptable.
  8. The shaft seal area must not be exposed to the environment. Should the valve design utilize an open packing bonnet area, that area must be enclosed with a 304 series type 18-8 stainless steel, minimum 1/4-Inch thick removable shroud. The shroud must be fully sealed and rated for buried service. An access cover must be provided on the shroud with a minimum opening of 6-Inches x 8-Inches.
  9. The valve shaft must be 304 or 316 stainless steel.
  10. The valve body must be made of cast iron conforming to ASTM A126, Class B or ASTM A48, Class 40 alloy cast iron ASTM A436, Type 1 and 2 or ASTM A439, type D2 with maximum of 0.003% lead. The valve disc must be ductile iron conforming to ASTM A536, and it must have a seating edge of 304 or 316 stainless steel. The seating edge may be installed in the valve body if the rubber seat is applied to the valve disc. The valve seats for 24-inch and larger butterfly valves must be capable of adjustment or replacement at the installation site.

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11. Valve discs must be secured to shafts by means of solid, smooth-sided stainless steel or monel taper pins or dowel pins having a circular cross section. Each taper pin or dowel pin must be extended through the shaft and mechanically secured in place. The use of bolts, setscrews, knurled or fluted dowel pins, flat sided taper pins, expansion pins, roll pins, tension pins, spring pins, or other devices in lieu of the pins specified herein will not be acceptable.
12. The valves and valve operators must be rated for buried service, except electric actuators.
13. Valve operators must conform to AWWA C504 for Class 150B. Manual operators must be Limitorque worm gear, self-locking type designed to hold the valve in any intermediate position without creeping or fluttering. Operators must be equipped with torque overload protection to prevent over travel of the disc in the open and closed position. Spur gear must be furnished with an operator to increase the number of turns and reduce operating torque. A separate limit stop device must also be installed in accordance with "Torque Overload Protection", described below. Operators must provide position indication on the housing of the operator. Valves must open with a clockwise rotation of the nut. The valve and valve operator must be rated for bi-directional flow.
14. Valve operators must be equipped with a Chicago standard style hub nut. The hub nut must be attached to the input shaft of the operator by means of a shear pin. The shear pin must be sized such that it fails when 350 foot-pounds of input torque is applied to the hub nut. Three (3) additional shear pins must be furnished as replacement part for each valve ordered.
15. Corrosion resistant nameplates, as described in Section 6.1 of AWWA C504, must be permanently attached to both the valve and valve operator. There must be two (2) valve nameplates. One must be affixed to the valve body and the other must be affixed to the valve operator in a prominent location. In addition to the normal valve data, the plate must also include the number of turns required to operate the valve and the direction to open (clockwise to open). There must be one (1) operator nameplate affixed to the valve operator. The minimum number of turns to close the valve must be no less than 2 turns per inch (5 turns per centimeter) of valve size in order to minimize water hammer.

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16. The manufacturer must provide all nuts, bolts, gaskets, and glands required to make connections.

B. Torque Overload Protection

1. Contractor must furnish torque overload protection devices. The device must be installed on top of the Chicago standard hub nut on butterfly valve operators and in conformance to the following requirements.
2. Purpose: The over torque protector must prevent butterfly valve and operator from damage due to excessive operating torque.
3. Operation: The device must transmit applied torque in either direction only up to a preset amount and automatically disengage if greater torque is applied. It must automatically reset if the applied torque is below the preset amount.
4. Description: The device must be of overall rugged and of durable construction suitable for long-term reliable operation and suitable for buried service.
5. The upper end must have an integral 2 ½-Inch square operating nut and the lower end must have a matching socket. The socket must have one (1) 2-Inch square head set screw in each of two (2) adjacent faces.
6. The operating mechanism must employ spring-loaded tapered rollers engaged in matching tapered detents. A ball bearing type design will not be accepted.
7. The manufacturer's identification must be cast in 3/8-inch or larger letters on an upper surface.
8. Corrosion Protection and Lubrication: The entire housing must be coated inside and outside with two-part epoxy. The outside must have a topcoat of two-part polyurethane similar in color to U.S. Paint #G9337 "Sun Yellow".
9. The operating mechanism must be permanently lubricated and sealed to withstand 50-feet of water head.
10. There must be no water-retaining external cavities.

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11. Service Life: The device must have a minimum life of one-thousand (1000) trips from rated capacity.
12. Trip Torque Set Point: The device must be factory set to trip at 200 foot-pounds of applied torque.
13. Trip Torque Adjustment: Trip torque must be adjustable from 10% to 100% of rated capacity without disassembling the unit. The adjustment means must be sealed and concealed to prevent tampering.

#### 2.4 QUARTER TURN AWWA ELECTRIC VALVE ACTUATORS (OPEN-CLOSE SERVICE)

- A. When shown on the Plans, specified, or as directed by the Commissioner, the Contractor must furnish electric valve actuators in conformance with the following requirements.
  1. The electric valve actuator must include the motor, actuator unit gearing, position limit switches, torque switches, declutch lever, and hand wheel, as self-contained unit. The actuator must meet the latest revision of the applicable AWWA specification. The actuator must be of sufficient capacity to operate the attached butterfly valve in a modulating action against 100-pounds per square inch pressure.
  2. The motor must be rated for continuous duty, specifically designed for valve actuator service, and must be of high starting torque, totally enclosed, non-ventilated construction. Motor insulation must be a minimum NEMA Class F, with a maximum continuous temperature rating of 311° Fahrenheit (rise plus ambient) for the duty cycle specified. Provide optional insulation classes where specified or where service conditions warrant.

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3. The motor must be of sufficient size to open or close the valve at the maximum torque. The motor must be capable of operating at plus or minus 10% of specified voltage. The motor duty rating must be sufficient for one (1) complete cycle (open-close-open, or reverse) without exceeding its temperature rating. Motor bearings must be of the anti-friction type, and permanently lubricated.
4. The motor must be an independent sub-assembly such that the power gearing must not be an integral part of the motor assembly, to allow for motor or gear changes dictated by system operation changes. The motor must be equipped with internal thermal contact, to protect against motor overload, and 120-volt heaters. The motor must be designed to operate on 230/460 VAC.
5. The actuator must be a multiple reduction unit with power gearing consisting of spur or helical and worm gearing. There must be a self-locking worm gear set in the drive train to maintain valve position. The spur or helical gearing and worm gear must be of hardened alloy steel, and the worm gear must be alloy bronze. All power gearing must be accurately cut; non-metallic, aluminum, or cast gearing must not be allowed. Anti-friction bearings with caged balls or rollers must be used throughout.
6. All rotating power train components must be immersed in grease with provisions for inspection and re-lubrication without disassembly. Lubricants must be suitable for ambient conditions between 20° F and 150° F. Adequate seals must be provided on all shafting.

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7. The actuator must have a built-in device, which allows the motor to reach full speed before engaging the valve load when required by unseating applications.
8. A metallic hand wheel must be provided for manual operation, with an arrow to indicate "open" rotation. The hand wheel must not rotate during motor operation. A fused motor must not prevent manual operation. When in manual operating mode, the actuator must remain in this mode until the motor is energized, at which time the actuator will automatically return to electric operation. Changing from motor operation to manual operation must be accomplished by a positive, padlockable declutching lever, which mechanically disengages the motor and related gearing. It must be impossible for simultaneous manual and motor operation to occur. Friction type declutching mechanisms are not acceptable.
9. Position limit switches and associated gearing must be an integral part of the valve actuator. Limit switch gearing must be of the intermittent type, made of bronze or stainless steel, lubricated, and totally enclosed to prevent dirt and foreign matter from entering the gear train. Limit switch contacts must be heavy duty and silver-plated with wiping action. Where specified, the actuator must have sixteen (16) contacts, four (4) contact/four (4) rotor types, all of the same basic design. As an alternative, a limit switch assembly may be directly coupled to the valve stem, eliminating the need for intermittent gearing, and eight (8) single pole, double throw (SPDT) or eight (8) double pole, double throw, (DPDT) contacts. Contacts must be convertible from normally open, to normally closed, or reverse.
10. Switches must be adjustable, allowing for trip points from fully open to fully closed positions of valve travel. They must not be subject to breakage or slippage due to over-travel.

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11. Switch design must permit visible verification of switch position without disassembly.
12. Each valve actuator must be equipped with a switch that will interrupt the control circuit in both the opening and closing directions when valve torque overload occurs. Contacts must be silver-plated. The torque switch must have graduated dials for both open and close directions of travel, and each must be independently adjustable. The torque switch must include a positive means to limit adjustability so as not to exceed the actuator output torque capability. The activating spring back must be of the Belleville spring design.
13. The position limit switch and torque switch contact must be rated 600 volts per NEMA standard ICS 2-125, heavy duty.
14. The control compartment must be provided with a 120-volt space heater.
15. The valve and operator must be aligned in such a manner that when installed, the manual hand wheel is in a horizontal plane.
16. The operating time must be two (2) minutes for 90 °- valve travels.

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### **PART 3 - EXECUTION**

#### **3.1 FIELD TESTING**

- A. All valves will be tested as specified in Section 33 13 00 - Disinfection and Testing of Water Mains.

#### **3.2 SETTING OF VALVES**

- A. Valves must be carefully installed in their proper positions, free from all distortion and strain, with mechanical or flanged joints, and must be packed and left in satisfactory operating condition.

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### 3.3 SETTING OF VALVE BOXES

Valve boxes must be installed where shown on the drawings, or where ordered by the Commissioner, and must be set vertical and concentric with the valve box. Any valve box which has been moved from its original position by direct or indirect actions of the Contractor, so as to prevent the operation of the valve key extension, must be reset and/or replaced as applicable, by the Contractor. This work will be considered incidental to the construction and not considered for additional payment. Any valve key extension or stem, which has been damaged so that it is inoperable, must also be replaced, and will also be considered incidental to the construction and no additional payment will be allowed.

END OF SECTION 33 12 16

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