



CITY OF CORONA

DEPARTMENT OF WATER AND POWER MODIFICATIONS TO

STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

The following Special Provisions supplement and amend the Standard Specifications for Public Works Construction 2012 Edition (Greenbook) and Supplements. These Special Provisions have been arranged into a format that parallels the Greenbook.

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6-15-14

Date

SECTION 2 - SCOPE AND CONTROL OF WORK

1-2 TERMS AND DEFINITIONS. *Add the following:*

Operation, Maintenance, and Warranty Instructions – Where no Operation, Maintenance and Warranty Instructions are submitted, the Agency will presume no operation restrictions or maintenance procedures are required by the manufacturer as a condition for the manufacturer to honor the specified warranty.

2-5 PLANS AND SPECIFICATIONS.

2.5.3.3 Shop Drawings. *Add the following to Table 2-5.3.3(A):*

TABLE 2-5.3.3(A)

Item	Subsection No.	Title	Subject
8	251-1.1	Submittal Package	Water and Sewer System Valves and Appurtenances
9	351-1.6.4	Disinfection Work Plan, Permission to Discharge and Laboratory Results	Disinfection, Testing, Flushing, and Dechlorinating

Add the following subsections:

2-5.3.5 Installation Instructions. When Installation Instructions are referenced, the Contractor shall submit the following:

- a) One original of each Installation Instruction document referenced by the Contract Documents.
- b) Where manufacturers issue Installation Instructions recommending departures from Reference Specifications issued by other agencies, engineering societies or industrial associations, the Contractor's submittal package shall include a written statement from the manufacturer identifying where said departures exist and justifying, to the satisfaction of the Engineer, any departures proposed by the manufacturer. Absent the Engineer's written acceptance of said departures, installation, application, and field testing of pre-manufactured products shall proceed according to the Contract Documents in the specified order of precedence.
- c) Engineer at their sole discretion may waive requirement for submitting Installation Instructions.

2.5.3.6 Manufacturer's Operation, Maintenance, and Warranty Instructions. For Work covered by a manufacturer's warranty, the Contractor shall submit three bound original copies of Operation, Maintenance, and Warranty Instructions to the Engineer.

SECTION 4 - SCOPE AND CONTROL OF WORK

Add the following subsection:

4-1.1.1 Buy-American Clause. Unless otherwise shown, all materials used for water system construction shall be made in the United States of America.

Add the following section:

SECTION - 10 AGENCY STANDARD DRAWINGS

10-1. Standard Water and Wastewater Construction Drawings. Agency standard drawings governing construction in the City of Corona include the following:

Standard 301	Sewer Lateral on New Sewer
Standard 302	Standard Manhole
Standard 303	Drop Manhole
Standard 304	Sewer Lateral Connection on Existing Sewer
Standard 307	Sewer Lateral Terminal Cleanout
Standard 308	Sewer Pipe Bedding and Trench Details
Standard 309	Steel Casing for Sewer Pipe
Standard 310	Concrete Slope Anchors
Standard 401	Concrete Thrust Blocks Details
Standard 402	Steel Casing for Water Pipe
Standard 403	Not Used
Standard 404	Water Sample Station
Standard 405	Guard Post Details
Standard 406	Water Pipe Bedding and Trench Details
Standard 407	Potable Water Line Crossing Under Existing Facility
Standard 407R	Reclaimed Water Line Crossing Under Existing Facility
Standard 408	1" Water Service Connection Detail with Fire Sprinkler Service
Standard 409	1½" and 2" Water Service Connection Detail w/Fire Sprinkler Service
Standard 410	Pressure Regulating Station
Standard 411	Not Used
Standard 412	Fire Hydrant Installation
Standard 412R	Reclaimed Water Fire Hydrant Installation
Standard 413	1" or 2" Combination Air and Vacuum Release
Standard 413R	1" or 2" Reclaimed Water Combination Air and Vacuum Release
Standard 414	1" Water Service Connection Detail without Fire Sprinkler Service
Standard 414R	1" Reclaimed Water Service Connection Detail
Standard 415	1½" and 2" Water Service Connection Detail w/o Fire Sprinkler Service
Standard 415R	1½" and 2" Reclaimed Water Service Connection Detail
Standard 416	6" Fire Hydrant Blow-Off Assembly
Standard 416R	6" Reclaimed Water Fire Hydrant Blow-Off Assembly
Standard 417	Double Detector Check Assembly
Standard 418	Adjustable Pipe Support
Standard 419	Pipeline Separation Requirements
Standard 420	Resilient Wedge Gate Valve Installation
Standard 421	Cut-in Tee
Standard 422	Valve Box and Valve Stem Extension
Standard 423	Not Used

Standard 424	Not Used
Standard 425	Not Used
Standard 426	Compound Flow Meter with Bypass
Standard 427	Not Used
Standard 428	Reduced Pressure Principle Backflow Assembly
Standard 450	Two-Wire Test Station
Standard 451	Four-Wire Test Station
Standard 452	Casing Test Station
Standard 453	Insulator Test Station
Standard 454	Test Pedestal and Wiring Diagram
Standard 455	Test Station Locations in Street Right-of-Way
Standard 456	Alumino-Thermic (CAD) Welding and Pin Brazing
Standard 457	Bonding for Pipe Joints and Fittings
Standard 458	Insulating Joint

SECTION 207 – PIPE

SECTION 207-9 IRON PIPE AND FITTINGS – *Delete entire subsection and substitute with the following:*

207-9 IRON PIPE AND FITTINGS.

207-9.1 Ductile Iron Pipe for Water, Sewage, and Other Liquids. Unless otherwise shown, all ductile iron water pipe, fittings, and appurtenances used in the City of Corona shall meet AWWA C151 or applicable standards listed below. Pipe shall be fully self-restrained without the use of thrust blocks, notwithstanding the requirement for supplemental thrust blocks in City of Corona Standard Drawing 401.

PVC, HDPE, CML&C steel, asbestos cement, or concrete cylinder pipe (CCP) pressure pipe shall not be used in the City of Corona without written approval from the Engineer. Acceptable manufacturers include the following:

TABLE 207-9.1

Item	Manufacturer
Ductile-Iron Pipe	American Cast Iron Pipe Company (ACIPCO)
	Clow Water Systems Company
	Griffin Pipe Products
	Pacific States Cast Iron Pipe Co Div. McWane, Inc.
	U.S. Pipe and Foundry
Ductile-Iron Pipe Fittings	American Cast Iron Pipe
	Clow Water Systems Company
	Griffin Pipe Products
	Star Pipe Products
	Tyler Union Div. McWane, Inc.
	U.S. Pipe and Foundry
Push-on Joints	American Cast Iron Pipe “Fastite”
	Clow Water Systems Company
	Griffin Pipe Products
	Pacific States Cast Iron Pipe Co Div. McWane, Inc.
	U.S. Pipe and Foundry “Tyton”

Restrained Joints – Locking Gasket Type	American Cast Iron Pipe “Fast-Grip”
	Griffin Pipe Products ”Talon”
	Pacific States Cast Iron Pipe Co Div. McWane, Inc. “Sure-Stop”
	U.S. Pipe and Foundry “Field-Lok”
Tee-Head Bolts and Hex Nuts on Mechanical Joints	NSS Industries Corten Tripac
Restrained Joints - Third-Party Follower- Gland-Type Mechanical Joint Restrains for Ductile Iron Pipe	EBA Iron Megalug Series 1100 #1100 for new MJ fittings 3”-48” #1100SD restraint for existing MJ fittings 3”-48”
	Ford Uni-Flange Series 1300 Restrained End Cap for MJ fittings 4”-16”
	Ford Uni-Flange Series 1400 for MJ fittings 4”-36”
Third-Party Follower- Gland-Type Mechanical Joint Restrains for Joining to Existing PVC Pipe	EBA Iron Megalug Series 2000 #2000PV for new MJ fittings 4”-24” #2000SV for existing MJ fittings 4”-24”
	Ford Uni-Flange Series 1500 Circle Lock for MJ fittings 4”-24”
Third-Party Ductile Iron Pipe Restraint Harness for Push-on Bells (For DIP only. Do not use on PVC)	EBA Iron Megalug Series 1700 Restraint Harness 3”-36”
	Ford Uni-Flange Series 1450
Flanged Coupling Adaptor Restraints	See 251-8.2
Shop Coat on Buried Pipe	Koppers 11-S Primer
Polyethylene Encasement	See 251-12.1
Ceramic Epoxy Lining	Induron Protecto 401
Field Coatings on Buried Pipe	Koppers Bituplastic No 33

207-9.2 Materials: Unless otherwise specified, ductile iron pipe shall comply with Table 207-9.2.

TABLE 207-9.2

Item	Material	Specification	
Pipe	Standards	AWWA C151/ANSI 21.50	
	Material	Ductile Iron	
	Size	As shown on Plans	
	Wall Thickness	3" to 12" pipe	Pressure Class 350
		16" to 64" pipe	Pressure Class 250
		Pipe with Grooved Couplings	Thickness Class 53
		Pipe with Threaded Flanges	Thickness Class 53
	Markings	Per AWWA C151 Section 4.6.	
	Lengths	18' or 20' lengths per AWWA C151/ANSI A21.51, except where shorter lengths are required to fit horizontal or vertical alignment.	
	Coatings	Buried	Shop coat with one prime coat of asphaltic coating approximately 1-mil thick per AWWA C151
		Above ground and in vaults	See 251-12
	Cement-Mortar Lining (AWWA C104 "Double Thickness")	3" to 12" pipe	1/8-inch
		14" to 24" pipe	3/16-inch
		30" to 64" pipe	1/4-inch
		Per AWWA C104 using Type II cement. Do not use fly ash or pozzolan.	
NSF-Approved Liquid Epoxy Lining, where shown on Plans	Epoxy Lining	See 251-12	
Ceramic Epoxy Lining, where shown on Plans – required for pipes transporting sewage	Amine cured novalac epoxy lining		
	Minimum 20% by volume ceramic quartz pigment.		
	Permeability rating of 0.00		
	Abrasion resistance = Less than 4 mils loss after one million cycles on ±22.5° sliding aggregate slurry abrasion tester using a sharp natural siliceous gravel with particle size between 2 mm and 10 mm.		
Joints	Standard Push-on Style	AWWA C111/ANSI 21.11	
	Mechanical Joint	AWWA C111/ANSI 21.11	

	Restrained Style (Required on all new pipe construction)	Special push-on type joint providing longitudinal restraint to full test pressure without relying on thrust block
		Locking gasket style
		Mechanical joint style using a gland body and gripping wedges
Joint Gaskets	Material	AWWA C111/ANSI 21.11 Vulcanized Styrene Butadiene Rubber (SBR)
	Material for Hydrocarbon Applications and Contaminated Soils	Nitrile (NBR) (acrylonitrile butadiene) FLUOREL or Viton (FKM) (fluorocarbon)
	Age	<180 days old or <2 years old, but retested <60 days prior to installation
Fittings	Material	Ductile-iron
	Standards	AWWA C110/ANSI 21.10 or AWWA C153/ANSI A21.53
	Style	Mechanical joint (with restraint) or flanged
	Marking	Cast letters "DI" or "DUCTILE" into fittings, unless otherwise specified.
	Coatings	Same coating as adjacent pipe, as described above
	Linings	Same lining as adjacent pipe, as described above
Ductile Iron Pipe Joint Restraints	Material	Ductile Iron
	Style	Gripping Wedge
	Working Pressure Rating	3" to 16"
18" to 64"		250 psi
Flanges	Screwed-on Type for Pipe	AWWA C115/ANSI A21.15
	Integrally-cast Type for Fittings	AWWA C110/ANSI A21.10
Shop Coat	Prime Coat	12 mils MDFT
Polyethylene PE Encasement	<u>Polyethylene Film and Tape</u>	See 251-12.1.1 Color per 251-12.2

Add the following section:

SECTION 251 – WATER AND SEWER SYSTEM VALVES AND APPURTENANCES

251-1 GENERAL.

251-1.1 Submittal Package. Prior to ordering or shipping materials, Contractor shall submit information for valves and appurtenances confirming compliance with Table 251-1.1.

TABLE 251-1.1

Submittal	Description
Shop Drawings	Required for valves larger than 16-inch diameter
Supporting Information	Required for all water and sewer system valves and appurtenances furnished <ul style="list-style-type: none">a) Catalog data (with items, options, sizes and pressure ratings to be furnished clearly highlighted or otherwise indicated on submittal)b) Lining, coating data and thicknessesc) NSF 61 Certificate of Compliance for potable water applicationsd) California AB 1953 Certificate of Compliance for potable water applicationse) Certificate of Compliance with referenced AWWA standardsf) Certified test results for tests required by AWWA standards – proof of design and hydrostatic tests in both directionsg) Installation Instructionsh) Manufacturer’s Operation, Maintenance, and Warranty Instructions
Cavitation Calculations	<ul style="list-style-type: none">a) Required for valves intended for throttling or pressure regulating service where normal pressure drop across valve exceeds 40 psib) If calculations indicate valves shown in Contract Documents are improperly sized or specified, or if internal cavitation trim is not specified, but recommended by manufacturer, submit letter to Engineer requesting appropriate variance

251-1.2 Products Conveying Potable Water. Products conveying potable water shall conform to the following:

- a) Products shall bear National Sanitation Foundation marking showing compliance with NSF 61.
- b) Interior coatings of products shall be listed as complying with NSF 61.
- c) Bronze or brass products shall bear National Sanitation Foundation marking showing compliance with NSF 372.
- d) Products shall contain no more than 0.25% lead by average weight in compliance with Section 116875 of the California Health and Safety Code.
- e) Solder shall be tin-silver solder conforming to ASTM B32, Grade Sb5. Do not use cored solder. Solder and flux used in joints of potable waterlines shall contain no more than 0.2% lead.
- f) Water service-lateral and on-site piping products shall comply with the requirements of Chapter 6 of the California Plumbing Code, “Water Supply and Distribution.”
- g) Stainless steel products may be substituted for bronze or brass products to meet lead-free requirements provided dielectric protection is provided between stainless steel and bronze or copper alloys.

251-1.3 Products Conveying Fluids Other than Potable Water. Products conveying fluids other than potable water shall conform to the following:

- a) Valve materials shall be chemically compatible with chemicals and solutions handled. If any portion of a specified valve is chemically incompatible with chemicals or solutions handled, the Contractor shall substitute a valve with appropriate materials during submittals, stating the reason for the exception.
- b) National Sanitation Foundation marking is not required for piping conveying fluids other than potable water.

251-2 FLANGED AND THREADED CONNECTIONS.

251-2.1 Threaded Ends. Threaded ends of pipe and appurtenances shall comply with ASME/ANSI B1.20.1 NPT National Pipe Thread Taper and ASME/ANSI B2.1

251-2.2 Flanges. Flanges shall be cast iron, ductile iron, PVC, fiberglass, steel or stainless steel and, raised or plain-faced as shown on the Plans. For working pressures in excess of 150 psi, use only ductile iron, steel, or stainless steel flanges and cast ferrous valve components.

251-2.3 Flange Drilling – For working pressures and materials shown on Plans, drilling patterns shall be as listed in Table 251-2.3.

TABLE 251-2.3

Working Pressure	Material	Required Drilling Pattern
0-150 psi	Cast Iron Flanges	ASME/ANSI B16.1 Class 125
	Ductile Iron Flanges	ASME/ANSI B16.42 Class 150
	Steel Flanges	AWWA C207 Class D or E
150-250 psi	Ductile Iron Flanges	ASME/ANSI B16.42 Class 150
	Steel Flanges	AWWA C207 Class E
250-300 psi	Ductile Iron Flanges	ASME/ANSI B16.42 Class 300
	Steel Flanges	AWWA C207 Class F
>300 psi	Steel Flanges	Provide drilling pattern and gasket appropriate for temperature and class of service.

251-2.4 Flange Drilling Alignment. Bolt holes of flanged valves shall straddle horizontal and vertical centerlines of pipe run.

251-2.5 Flange, Coupling, and Harness Bolts, Nuts, and Washers. Acceptable manufacturers are listed in Table 251-2.5:

TABLE 251-2.5

Item	Manufacturer
Anti-Seize Compound for Stainless Steel Bolts and Nuts	Bostik Never Seez
	Christy's Antiseize
	Husk-It Husky Lube O-Seal
	Loctite
	Permatex
	Ramco Antiseize
	Ramco TRX-Synlube
Bolts and Nuts	Industrial Threaded Products, Inc.
	Ocean State Stainless, Inc.
	Pacific Coast Bolt
	Tripac Fasteners
	Western Pacific Products
Buried Bolt Coatings	3M Company (EC 244)
	Protecto-Wrap
	Carboline Bitumastic No. 50
	Engard Coatings 858
	Tnemec Co. (46-465 H.B. Tnemecol)

251-2.5.1 Flange, Coupling, and Harness Bolts, Nuts, and Washers for Buried Ferrous or Plastic Piping. Unless otherwise specified, flange bolts, nuts and washers for buried ferrous or plastic piping or ferrous or plastic piping in underground structures shall conform to Table 251-2.5.1.

TABLE 251-2.5.1

Item	Material	Specification
Bolts for Underground Ferrous Installations	SAE Type 316 Stainless Steel	ASTM A193 B8M T-316 Heavy hexagon series ANSI B1.1 Class 2A fit Project bolt 1/4" to 1/2" through tightened nut Threading per ANSI/ASME B18.2.1 Bolt-Head Identification Mark – "B8M"
Nuts for Underground Ferrous Installations	SAE Type 316 Stainless Steel	ASTM A194 8M T-316 Heavy hexagon series ANSI B1.1 Class 2B fit Threading per ANSI/ASME B18.2.2, 1/4" to 1/2" shall project through tightened nut
Coating for New Bolts and Nuts	Nickel-phosphate Undercoating Blue Teflon or Xylan Fluoropolymer Coating	
Coating for Existing Bolts and Nuts	Antiseize Lubricant	
Washers	Same material as bolt	Provide one washer for each nut

251-2.5.2 Flange, Coupling, and Harness Bolts, Nuts, and Washers for Above-Ground Ferrous or Plastic Piping. Unless otherwise specified, flange bolts, nuts and washers for above-ground ferrous or plastic piping shall conform to Table 251-2.5.2.

TABLE 251-2.5.2

Item	Material	Specification
Bolts for Above-Ground Ferrous Installations	SAE Type 316 Stainless Steel	ASTM A193 B8M-316 Heavy hexagon series ANSI B1.1 Class 2A fit Class 3A fit may be used for holes tapped for studs Project bolt ¼” to ½” through tightened nut Threads may be either cut or cold-formed Threading per ANSI/ASME B18.2.1 Bolt-Head Identification Mark – “B8M”
Nuts for Above-Ground Ferrous Installations	SAE Type 316 Stainless Steel	ASTM A194 8M T-316 ASTM Heavy hexagon series ANSI B1.1 Class 2B fit Threading per ANSI/ASME B18.2.2
Coating for New Bolts and Nuts	Nickel-phosphate Undercoating Blue Teflon or Xylan Fluoropolymer Coating	
Coating for Existing Bolts and Nuts	Anti-Seize Lubricant	Use on SAE Type 316 Stainless Steel hardware
Washers	Same material as bolt	Provide one washer for each nut

251-2.5.3 Flange, Coupling, and Harness Bolts, Nuts, and Washers for Above-Ground Ferrous or Plastic Piping in Corrosive, High-Chloride, or Saltwater Environments. Unless otherwise specified, flange bolts, nuts and washers for above-ground ferrous or plastic piping shall conform to Table 251-2.5.3.

TABLE 251-2.5.3

Item	Material	Specification
Bolts for Above-Ground Ferrous Installations	SAE Type 316 Stainless Steel	ASTM A193 B8M T-316 Heavy hexagon series ANSI B1.1 Class 2A fit Class 3A fit may be used for holes tapped for studs. Project bolt ¼” to ½” through tightened nut. Threads may be either cut or cold-formed Threading per ANSI/ASME B18.2.1 Bolt-Head Identification Mark – “B8M”

Nuts for Above-Ground Ferrous Installations	SAE Type 316 Stainless Steel	ASTM A194 8M316, Grade 1 or 2 ASTM Heavy hexagon series ANSI B1.1 Class 2B fit Threading per ANSI/ASME B18.2.2
Lubrication for Above-Ground or Vault-Enclosed Steel Bolt Threads	Oil and Graphite, Blue Fluoropolymer Coating or Accepted Valve Manufacturer's Anti-seize Coating	
Coating for Buried Nuts and Bolts	Commercially Available Coating Expressly Manufactured for Buried Applications	2 coats minimum 15 mils per coat
Washers	Same material as bolt.	Provide one washer for each nut.

251-2.5.4 Flange, Coupling, and Harness Bolts and Nuts where Heavy Hexagon Heads will not fit valves. Where heavy hexagon series bolts and nuts will not fit an accepted manufacturer's cast flanges, finished SAE type 316 stainless steel finished hex bolts and nuts meeting ASTM F593 Grade G or H and ASTM F594 Grade G or H shall be substituted.

251-2.5.5 Flange, Coupling, and Harness Bolts, Nuts, and Washers for Above-Ground Bronze Piping. Unless otherwise specified, flange bolts, nuts and washers for above-ground bronze piping shall conform to Table 251-2.5.5.

TABLE 251-2.5.5

Item	Material	Specification
Bolts for Above-Ground Bronze Installations	Low-Silicon Bronze Grade C65100 or Grade C63000	ASTM B98 or ASTM F468 Finished hexagon series ANSI B1.1 Class 2A fit Project bolt ¼" to ½" through tightened nut Threads may be either cut or cold-formed Threading per ANSI/ASME B18.2.1 Bolt-Head Identification Mark – "651," "SB," or unmarked
Nuts for Above-Ground Bronze Installations	Low-Silicon Bronze Grade C65100 or Grade C63000 to match bolt material	ASTM B98 or ASTM F467 Finished hexagon series ANSI B1.1 Class 2B fit Project bolt ¼" to ½" through tightened nut Threads may be either cut or cold-formed Threading per ANSI/ASME B18.2.1
Washers	Same material as bolt	Provide one washer for each nut

251-2.6 Bonnet Bolts, Cover Bolts, and Cap Screws. Bonnet bolts, cover bolts, and cap screws shall use the same materials specified for flange bolts.

251-2.7 Flange Gaskets. Flange gaskets on metallic flanges shall comply with ANSI B16.21. Acceptable manufacturers as required in Table 251-2.7:

TABLE 251-2.7

Item	Manufacturer
NSF 61-Listed Flange Gaskets	Bluegard Div. Garlock, Inc. Style 98206
	PSI (Pipeline Seal and Insulator, Inc.) "Linebacker 61"
	U.S. Pipe and Foundry "Flange-Tyte"
Flange Gaskets – Cloth-Inserted	Bluegard Div. Garlock, / Inc. Style 5000
	John Crane (Cranite)
	Johns Manville 60
	Richard Klinger C4400
	Tripac Style 5000
Flange Gaskets – Neoprene	Bluegard Div. Garlock, Inc. Style 2000
	John Crane (Cranite)
	Johns Manville 60
	Richard Klinger C4400
	Tripac Style 2000

Thickness shall be 1/8-inch minimum, except PTFE gaskets may be 1/16-inch thick.

Gaskets for working pressures up to 300 psi shall have a working pressure rating of 350 psi at 180°F. Gaskets shall be full-face type with pre-punched bolt holes where both flanges are flat-face. Ring flange gaskets extending to the inner edge of the bolt circle may be used where a raised-face flange is present.

251-2.7.1 Materials. Gasket material shall be asbestos-free and conform to Table 251-2.7.1.

TABLE 251-2.7.1

Application	Allowable Flange Gasket Materials
Water or Wastewater Piping in Normal Soils	<ol style="list-style-type: none"> 1. Styrene butadiene rubber (SBR) with cloth insert 2. EPDM (ethylene propylene) 3. Neoprene polychloroprene (CR) 4. Nitrile (NBR) (acrylonitrile butadiene) 5. PTFE (Teflon) GoreTex (GR) 6. SBR-Fiber Non-Asbestos Composite
Water or Wastewater Piping in Contaminated Soils or Hydrocarbon Piping in Normal Soils	<ol style="list-style-type: none"> 1. Nitrile (NBR) (acrylonitrile butadiene) 2. FLUOREL or Viton (FKM) (fluorocarbon)

251-2.8 Dissimilar Metals. Dissimilar metals, when used in conjunction with each other shall have suitable insulation provided between adjoining surfaces to eliminate direct contact and resultant current.

Dissimilar metal pipe connections shall conform to Table 251-2.8 where insulation is required.

TABLE 251-2.8

		Pipe Material				
Contacting Pipe Material		Existing Steel	New Steel	Cast Iron or Ductile Iron	Stainless Steel	Copper, Brass or Bronze
	Existing Steel	(NR)	Insulation is required	Insulation is required	Insulation is required	Insulation is required
	New Steel	Insulation is required	(NR)	Insulation is required	Insulation is required	Insulation is required
	Cast Iron or Ductile Iron	Insulation is required	Insulation is required	(NR)	Insulation is required	Insulation is required
	Stainless Steel	Insulation is required	Insulation is required	Insulation is required	(NR)	Insulation is required
	Copper, Brass or Bronze	Insulation is required	Insulation is required	Insulation is required	Insulation is required	(NR)

Notes: (NR) = Not required

Insulating kits or bushings are not required in the following cases:

- a) Where indicated as not required (NR) in the table above or in these Special Provisions.
- b) Where connecting any pipe material to plastic, fiberglass, clay or concrete pipe.
- c) Where new steel pipe is welded to existing steel pipe.

251-2.8.1 Insulation of Threaded Connections. Provide threaded insulating bushings where dissimilar threaded piping materials come into contact.

251-2.8.2 Flange Insulating Kits. Provide flange insulating kit where flanges of dissimilar metals mate. Acceptable manufacturers are specified in Table 251-2.8.2.

TABLE 251-2.8.2

Item	Manufacturer
Flange Insulation Kit Products	APS Advance Products & Systems, Inc
	Calpico, Inc.
	Central Plastics Company
	Corrpro Corrosion Div Control Products Company
	Farwest Corrosion Control
	PSI (Pipeline Seal and Insulator, Inc.)
Insulating Reducing Bushings	Christy's
Insulating Gaskets	Calpico, Inc.
	PSI Linebacker "Type E"

251-2.8.2.1 Materials. Flange insulating kits shall conform to Table 251-2.8.2.1.

TABLE 251-2.8.2.1

Item	Material	Specification
Insulating Gaskets	Dielectric Phenolic	500 V/mil dielectric strength 25 ksi compressive strength
Gasket Seal Element	Nitrile	ASTM A194 8M T-316 Heavy hexagon series ANSI B1.1 Class 2B fit Project bolt ¼" to ½" through tightened nut Nickel-phosphate undercoating Blue Teflon or Xylan fluoropolymer coating
Insulating Sleeves	Mylar	4000 V/mil dielectric strength <0.8% water absorption
Insulating Washers for Bolts	Phenolic	500 V/mil dielectric strength 33 ksi compressive strength <1.6% water absorption
Steel Washers over Insulating Washers	Stainless Steel	SAE Type 316

251-2.8.2.2 Design Options. design options required for flange insulating kits shall conform to Table 251-2.8.2.

TABLE 251-2.8.2.2

Item	Option	Specification
Insulating Gaskets	Gaskets	Full faced with bolt holes
	Thickness	⅛" minimum
	Drilling	Match adjacent flanges
Flange Isolation Kits	Type	Double-insulating (2 steel washers + 2 insulating washers + 1 full-length insulating sleeve per bolt)
Insulating Washers	Dimensions	⅛" minimum thickness ID of washer shall fit over isolating sleeve
Steel Washers over Insulating Washers	Dimensions	⅛" minimum thickness Steel and isolating washer shall have same ID and OD

251-2.9 Mastic and Tape-Wrap Systems. Where required by Contract Documents, apply 3-stage mastic tape-wrap system in addition to required polyethylene encasement. Mastic and tape wrap systems shall cover appurtenant flanges, bolts, nuts, tie-rods, turnbuckles, restraint devices, couplings and appurtenances.

Acceptable manufacturers are specified in Table 251-2.9.

TABLE 251-2.9

Item	Manufacturer
AWWA C217 Petrolatum Primer	Denso North America Div Winn & Coates “Denso-Paste”
	Tapecoat Company
	Tek-Rap, Inc.
	Trenton Corporation Wax-Tape Primer
AWWA C217 Profiling Mastic Paste	Denso North America Div Winn & Coates “Denso Profiling Mastic”
	Tapecoat Company
	Tek-Rap, Inc.
	Trenton Corporation
AWWA C217 Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines	Denso North America Div Winn & Coates “Densyl Tape”
	Tapecoat Company
	Tek-Rap, Inc.
	Trenton Corporation #1 Wax Tape (below ground) and #2 Wax Tape (above ground) and Poly-Ply Wrapper

251-2.9.1 Materials. Mastic and tape-wrap systems shall conform to Table 251-2.9.1.

TABLE 251-2.9.1

Item	Material	Specification
AWWA C217 Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines	Surface Preparation	SSPC SP1 Solvent cleaning. Remove weld spatter, sharp points and edges On pipe with rust, paint or foreign matter, surface prep per SSPC SP2 Hand-tool cleaning or SSPC SP3 Power-tool cleaning requirements. High pressure wash of 3,000-7,000 psi is also suitable.
	Petrolatum Primer	AWWA C217 primer containing moisture displacing corrosion-inhibiting compounds
	Mastic	After priming, use product of manufacturer supplying petrolatum primer and wax tape to mold mastic into a rounded configuration to fill irregular shapes and reduce sharp-edge surfaces
	Petrolatum Tape	AWWA C217 Petrolatum and Petroleum Wax Tape Coating
	Tape Width – 4” Pipe and under	4”
	Tape Width – 6” to 12” Pipe	9”

	Tape Width – 14” Pipe and larger	12”
	Thickness	40-mil minimum
	Minimum Tape Overlap	1”
	Outer Wrap	1.5 mil (150-gauge) clear metallocene resin tape

251-3 PIPE HANGERS AND SUPPORTS, CASING SPACERS, AND WALL PENETRATIONS

251-3.1 Pipe Hangers and Supports. Pipe hangers and supports shall be provided as required by Section 314 of the California Plumbing Code with hanger rod sizes conforming to Table 3-1. Support spacing and frequency shall comply to Table 3-2.

Acceptable manufacturers are specified in Table 251-3.1.

TABLE 251-3.1

Item	Manufacturer
Concrete Anchors – Epoxy Adhesive Anchor Systems	Hilti Corp.
	Simpson Strong Tie Co. “Epoxy-Tie”
	Reynolds
Pipe and Conduit Hangers	Grinnell Corporation “Anvil”
	Tripac Inc.
	Unistrut Corporation
Metal Bolted Framing Strut Systems	Tripac Inc.
	Unistrut Corporation
Fiberglass Channel Framing Systems	Champion Fiberglass “Champion Strut”
	Strut Tech Engineered Support Systems
	Unistrut Corporation

251-3.1.1 Materials. Pipe hangers and supports shall conform to Table 251-3.1.1.

TABLE 251-3.1.1

Item	Option	Specification
Bolts (Connection Bolts and Anchor Bolts) – Stainless Steel	Stainless Steel	ASTM A193 Grade B8M bolts with ASTM A194 Grade 8M nuts Alternate ASTM F593 Type 316 bolts with ASTM F594 SAE Type 316 nuts Washers – same material as nuts
Bolts – Embedded Eyebolts	Stainless Steel	SAE Type 316 Welded eye type
Concrete Anchors – Epoxy Adhesive Anchor Systems	Stainless Steel	SAE Type 316
Concrete Anchors – Expansion Bolt Systems	Not Allowed	

Fiberglass Channel Framing System	Fiber-Reinforced Plastic	Flame-spread rating of 25 or less per ASTM #84 Dimensional Tolerance per ASTM D3917 and D4385 with Ultraviolet Stabilizer
Powder Actuated Fastening Systems	Not Allowed	
Pipe and Conduit Hangers (Above Ground)	Steel	SAE Type 316
	Galvanized Coating	Not Allowed
Pipe and Conduit Hangers (Below Ground or Exposed to Water)	Stainless Steel	SAE Type 316
	Fiberglass	
Welding Electrode – Steel	Steel Electrodes	AWS D1.1 E70xx except E7024 rods or electrodes shall not be used
Welding Electrode – Stainless Steel	Steel Electrodes	Type 347

Zinc coatings shall be applied by the hot-dipped or electro-depositing process. Zinc shall comply with ASTM B6.

Before leaving shop, all steel not shown or specified to be galvanized or stainless shall receive one coat of pigmented primer recommended by Manufacturer of final paint system. Parts inaccessible after assembly shall receive second coat of same primer. Final painting shall be as stipulated in these Special Provisions or shown on the Plans.

251-3.2 Casing Spacers. Acceptable manufacturers are specified in Table 251-3.2.

TABLE 251-3.2

Item	Manufacturer
Casing Insulators - Metallic	APS Advance Products & Systems, Inc./Model SSI
	Calpico/Model PX
	CCI Pipeline Systems
	Pipeline Seal and Insulator, Inc. (PSI)
	Smith Blair "800" Series
Casing Insulators – Non-Metallic	Pipeline Seal and Insulator, Inc. (PSI) "Ranger"
Casing End Seals Rubber	Advance Products & Systems, Inc./ Model AC
	Calpico/Model C
	Pipeline Seal and Insulator, Inc. (PSI) Model S
	Powerseal Pipeline Products Corp
Casing End Seals Heat Shrinkable	Caseal
	Raychem

251-3.2.1 Metallic Casing Spacers. Metallic casing spacers (casing insulators or pipe skids) shall conform to Table 251-3.2.1.

TABLE 251-3.2.1

Item	Material	Specification
Casing Spacer Band	Stainless Steel	AISI Type 304 14-gauge minimum 8" minimum width with 2 runners on top and 2 on bottom for carrier pipe <14" diameter 12" minimum width with 2 runners on top and 4 on bottom for carrier pipe 14" diameter and greater Center-restrained, position type
Liner	PVC	0.090" thick
Risers	Stainless Steel	AISI Type 304 10-gauge minimum Welded to band
Anti-Friction Runners	Polyethylene, Polypropylene or Glass-Reinforced Polymer	Heavy-duty, 2" minimum width at ends
Studs, Nuts and Washers	Stainless Steel	5/16" AISI Type 304

251-3.2.2 Non-Metallic Casing Spacers. Non-metallic casing spacers (casing insulators or pipe skids) shall conform to Table 251-3.2.2.

TABLE 251-3.2.2

Item	Material	Specification
Casing Spacer Band and Risers	Polypropylene	Center-restrained, position type

251.3.2.3 Casing End Seal. Casing end seal shall be in conformance with Table 251-3.2.3.:

TABLE 251-3.2.3

Item	Material	Specification
Casing End Seal	Butadiene Rubber Sheet	¼" thick
	Heat-shrinkable sleeve	Minimum 2500 psi tensile strength Use thixotropic adhesive sealant
Bands and Hardware	Stainless Steel	AISI Type 316

251-3.2.4 Casing Spacer Dimensions. Casing insulators shall be of such dimensions to center carrier pipe within casing and prevent it from flotation. There shall be at least 1 inch but no more than 2 inches clearance between top runner and soffit of casing.

251-3.3 Wall Pipes, Seep Rings, and Penetrations Provide wall pipes or sleeves, and seep rings (collars) at all pipe and conduit penetrations of new concrete walls, floors, slabs, and ceilings.

Acceptable manufacturers are specified in Table 251-3.3.

TABLE 251-3.3

Item	Manufacturer
PVC Pipe	Calpico, Inc.
Penetration Sleeve with Weep Ring	Pipeline Seal and Insulator, Inc. (PSI) "Century Line" (Type S-316)
PVC Wall Sleeve with Weep Ring	Pipeline Seal and Insulator, Inc. (PSI) "WS" Steel Wall Sleeve
Polyethylene Foam Filler for Pipe Penetrations	Dow Chemical Company "Ethaform"
	Hercules Inc Plastic Products Group Industrial Systems Department (Minicel backer rod)
	Pipeline Seal and Insulator, Inc. (PSI) "Cell-Cast"

251-3.3.1 Materials. Wall pipes and seep rings shall be constructed in conformance with Table 251-3.3.1.

TABLE 251-3.3.1

Item	Material	Specification
Fabricated Wall Sleeves Containing Pipe	Steel Pipe	ASTM A53 Type E or S Grade B or ASTM A135 Grade B or ASTM A139 Grade B or API 5L or 5LX Standard Weight Thickness per ANSI B36.10
	PVC	Schedule 40 minimum
Fabricated Steel Wall Sleeves Connecting to Steel Pipe	Steel Pipe	Material and thickness to match connecting pipe Provide with ends as shown for connection to adjacent steel pipes
Wall Collar on Steel Wall Sleeve	Steel	ASTM A105, A181 or A182
Polyethylene Foam Filler for Pipe Penetrations	Extruded closed-cell polyethylene foam rod or disc	Rod or disc shall be ½" larger in diameter than annular space

251-3.4 Rubber Annular Hydrostatic Sealing Devices. Rubber annular hydrostatic sealing devices shall be modular mechanical type using interlocking synthetic rubber links shaped to continuously fill the annular space between a wall sleeve and passing pipe or conduit. Assembled links shall form a continuous rubber belt around the pipe or conduit, with a pressure plate under each bolt head and nut. Minimum sealing width shall be 4 inches.

Acceptable manufacturers include the following:

TABLE 251-3.4

Item	Manufacturer
Rubber Annular Hydrostatic Sealing Devices	Calpico, Inc. "Pipe Linx"
	CCI Pipeline Systems "Wrap-it Link" (Type WL-SS)
	Pipeline Seal and Insulator, Inc. (PSI) "Link Seal" (Type S-316)

251-3.4.1 Materials. Rubber annular hydrostatic sealing devices shall conform to Table 251-3.4.1.

TABLE 251-3.4.1

Item	Material	Specification
Pressure Plate	Carbon Steel or Glass Reinforced Plastic Composite	
Bolts and Nuts for Links	Stainless Steel	ASTM F593 Type 316 Rod shall be ½" larger in diameter than annular space.
Sealing Element	EPDM Rubber (for Water, Wastewater or Treatment Chemical Applications)	Black
	Nitrile Rubber (for Oil and Fuel Applications)	Green
	Silicone Rubber for Fire Wall Applications	Gray

251-4 VALVE ACTUATORS, EXTENSIONS, AND VALVE BOXES.

251-4.1 Direction of Operation. Valves and hydrants shall open by turning the nut, lever actuator, or handwheel counterclockwise.

251-4.2 Valve Operators for Buried or Submerged Valves. Buried valves and valves within manholes or pipe trenches shall have standard 2-inch AWWA actuator nuts. Shaft seals, valves, and actuator cover gaskets shall be watertight, totally enclosed, and designed for buried service.

251-4.2.1 Valve Extension Stems. Provide extension stems on valves where valve centerline is more than 4 feet below finish grade or water surface. Extension stem shall bring nut to within 6 inches below finished surface or water surface. Stem extensions shall be pinned to the valve operating nut.

Extension stem diameters shall conform to Table 251-4.2.1.

TABLE 251-4.2.1

Valve Size	Minimum Extension Stem Diameter
3" or 4"	7/8"
6"	1"
8"	1 1/8"
10" to 12"	1 1/4"
14"	1 3/8"
16" to 18"	1"
20" to 36"	1 3/4"
42" to 54"	2"

251-4.2.2 Valve Can and Cover for Buried Valves. Provide valve can and cover for all buried valve operators not in manholes or buried. Acceptable manufacturers are specified in Table 251-4.2.2.

TABLE 251-4.2.2

Item	Manufacturer
Valve Boxes and Covers	Christy's G-5
	Eisel Enterprises, Inc.
	Jensen Precast
	J & R Concrete Products
Valve Box Covers	Alhambra Foundry Company Ltd.
	Long Beach Iron Works, Inc.
	Neenah Foundry
	South Bay Foundry
	U S Foundry and Manufacturing Corp

251-4.2.2.1 Materials. Unless otherwise specified, valve boxes shall be traffic rated and constructed in conformance with Table 251-4.2.2.1.

TABLE 251-4.2.2.1

Item	Material	Specification
Valve Boxes	PVC	AWWA C900 DR 14, color as appropriate for conveyed fluid
Valve Box Covers	Cast Iron	ASTM A126 Class B Solid skirt 20-lb minimum weight
Extension Pipes	Cast Iron	ASTM A126 Class B

251-4.2.3 Valve Position Indicator for Buried Valves. Provide position indicator designed to fit standard 5 1/4-inch valve box. Indicator shall show valve position and direction, and number of turns required to fully open or close valve.

251-4.3 Valve Operators for Above-Ground Valves. Above-ground valves shall have 2-inch operating nuts with position indicators and a locking cap over the operating nut.

251-4.3.1 Stem Position for Valve Operators for Above-Ground Valves. Unless otherwise shown or directed by Engineer, install valve stems in positions conforming to Table 251-4.3.1.

TABLE 251-4.3.1

Valve Location	Stem Position
Horizontal pipe runs with centerline elevations no higher than 54 inches above floor	Install stems vertical
Horizontal pipe runs with centerline elevations higher than 4'-8", but less than 6'-9" above floor	Install stems horizontal
Manually Operated Valves 6'-9" or More above Floor or Finish Surface	Provide chain-wheel and guide actuators with position indicator.
Vertical pipe runs next to walls	Install stems horizontal and facing away from wall

251-4.4 Gear Actuators. Gear actuators shall be enclosed and grease-lubricated, with seals on shafts to prevent entry of dirt and water into actuator. Buried service gears shall be 90% minimum grease packed. Provide stop limiting devices in actuators for open and closed positions. Where possible, actuators shall be self-locking to prevent disc or plug from creeping. Actuator gearing shall conform to Table 251-4.4.

TABLE 251-4.4

Application	Gearing
Actuators on Manual Butterfly, Ball and Plug Valves 4" through 30"	Enclosed worm and gear or enclosed traveling-nut-type gear actuators with position indicator
Actuators on Manual Butterfly, Ball and Plug valves 36" and Larger	Enclosed worm and gear type gear actuators with position indicator
Actuators on All Motorized Butterfly, Ball and Plug valves	Enclosed worm and gear type gear actuators with position indicator

251-4.5 Floor Stands and Extension Stems. Floor stands shall be cast- or ductile-iron base non-rising stem indicating type with SAE type 316 stainless steel extension stems, couplings and stem guide brackets spaced such that L/R does not exceed 150. Anchor bolts shall be SAE type 316 stainless steel.

251-4.6 Chain-wheels and Guides. Chain-wheels and guides shall be galvanized or zinc-plated, or aluminum, extending to within 4 feet of the operating floor elevation. Chains shall be galvanized steel, SAE type 316 stainless steel, or zinc-plated steel. Anchor bolts shall be SAE type 316 stainless steel.

251-4.7 Valve Operator Torque. Where operating torque requirements for valve operators are not stipulated by AWWA standards, valves shall open with a maximum pull of 80 pounds on the hand-wheel, lever, chain-wheel or crank and a maximum torque input of 150 ft-lbs when differential pressure across valve is equal to rated pressure class of valve. Actuator components shall be designed to withstand, without damage, a pull of 200

pounds on the hand-wheel, lever, chain-wheel or crank and a maximum torque input of 300 foot-pounds when operating against stops.

Actuators shall be sized to produce torque no less than 1.25 times the valve torque required to operate the valve at full rated pressure and a velocity of 16 feet per second.

251-4.8 Minimum Turns to Open Valve. For gate valves, the minimum number of turns to open shall be as shown in AWWA C515 Table 7. For other valves with traveling nut or worm gear operators, the minimum number of turns to open the valve shall be 1.5 times the valve diameter in inches, but no fewer than 30 turns.

251-5 VALVES.

251-5.1 Resilient Wedge Gate Valves. Gate valves shall be reduced-wall resilient-wedge type, complying with AWWA C515.

Acceptable manufacturers are specified in Table 251-5.1.

TABLE 251-5.1

Item	Manufacturer
Resilient Wedge Gate Valves (Potable Water AWWA C515)	ACIPCO American Flow Control Series 2500
	Clow Valve Series 2600
	Kennedy Valve Div., McWane, Inc. Kenseal II
	M&H Valve Div. McWane Inc Style 7000
	Mueller Co. Series 2360

251-5.1.1 Materials. Gate valves shall conform to Table 251-5.1.1.

TABLE 251-5.1.1

Item	Material	Specification
Body	Ductile Iron	ASTM A536 Grade 65-45-12
Trim	Stainless Steel	SAE Type 316
Stem and Stem Nut	Low-Zinc Bronze	Maximum 7% zinc, 2% aluminum Minimum tensile strength = 70,000 psi Minimum yield strength = 40,000 psi Elongation >15 percent in 2-inches Visibly mark stem to show compliance with above.
Wedge – Potable Water Applications	Ductile Iron with Vulcanized Rubber Coating	Fully Encapsulated
Wedge – Recycled Water Applications	Ductile Iron with Ethylene-propylene diene monomer (EPDM) Coating	Fully Encapsulated ASTM D429 Peroxide-cured
O-Rings	Synthetic Rubber	ASTM D2000

251-6.1.2 Design Options. Design options for resilient-wedge gate valves shall conform to Table 251-6.1.2.

TABLE 251-5.1.2

Item	Option	Specification
Resilient Wedge Gate Valves	Stem Seal	Double O-Ring Type
	Stem	Non Rising Stem unless otherwise shown
	Actuator	2" AWWA stem nut required on buried and above-ground operators
	Handwheel	Required on valves in vaults unless otherwise shown
	Resilient Wedge	Fully Encapsulated
	Markings	Manufacturer's name or logo, size of valve, year of manufacture, and working pressure shall be cast in valve bonnet or body Body shall have arrow cast in metal to show direction of opening
	Ends	Flange x Flange, Flange x Mechanical Joint or Mechanical Joint x Mechanical Joint unless otherwise shown
<u>Polyethylene Encasement</u>	<u>Polyethylene Film</u>	See 251-12.1.1 Color per 251-12.2

251-5.1.3 Tapping Valves. Tapping valves shall be resilient wedge valves as described above with a tapping valve flanged end. Tapping valves shall be sized to accept tapping machine shell cutters used in field.

Acceptable manufacturers are specified in Table 251-5.1.3.

TABLE 251-5.1.3

Item	Manufacturer
Tapping Valves	ACIPCO American Flow Control Series 2500
	Clow Valve Series F-6000
	Kennedy Valve Div., McWane, Inc. Kenseal II
	M&H Valve Div. McWane Inc Style 3751
	Mueller Co. Series H600 or H700

251-5.1.4 Tapping Sleeves. Tapping sleeves shall be stainless steel. Gasketing shall provide a full circumferential seal on both sides of the tap capable of withstanding specified test pressures or a positive-seal gasket capable of withstanding specified test pressures. Flanges shall match adjacent valves.

Acceptable manufacturers are specified in Table 251-5.1.4.

TABLE 251-5.1.4

Item	Manufacturer
Stainless Steel Tapping Sleeves 12" and smaller	Dresser Piping Specialties (620 Series)
	Romac Industries (Style SSTIII)
	Smith Blair, Inc. (Model 663)
Stainless Steel Tapping Sleeves Greater than 12" in Diameter	Romac Industries (Style SSTIII)
	Smith Blair, Inc. (Model 663)

Size-on-size stainless-steel-type tapping sleeves will not be permitted. Outlet taps larger than 67 percent of tapped pipe size will not be permitted unless accepted in writing by the Engineer.

Tapping sleeves may be used for working pressures up to 150 psi. At higher pressures, tapping sleeves may only be used if express written approval is obtained from the DWP General Manager or designee.

251-5.2 Butterfly Valves. Butterfly valves shall be short-body-type, complying with AWWA C504. Acceptable manufacturers are specified in Table 251-5.2.

TABLE 251-5.2

Item	Manufacturer
Butterfly Valves for Buried Service (Class 150B)	DeZurik "BAW"
	Henry Pratt Co. "Groundhog II"
Butterfly Valves for Use Above Ground with resilient seat on valve body (Class 150B)	DeZurik "BAW" with hand lever up to 4" with M series handwheel actuator 6" and larger
	Henry Pratt Co. Model 2FII with hand lever up to 4" with Pratt MDT operator 6" and larger

251-5.2.1 Materials. Butterfly valves shall conform to Table 251-5.2.1.

TABLE 251-5.2.1

Item	Material	Specification
Body	Ductile Iron	ASTM A536 Grade 65-45-12
Valve Shaft	SAE Type 316 Stainless Steel	ASTM A276
Disc	Cast Iron or	ASTM A48, Class 40 or ASTM A136 Class B
	Ductile Iron	ASTM A536 Grade 65-45-12 or 70-50-05
Valve Disc Edge	SAE Type 316 Stainless Steel	ASTM A276

Valve Seat	EPDM Rubber	ASTM D412 Peroxide-cured
Exposed Body Cap Screws, Bolts, and Nuts including Squeeze Pins	SAE Type 316 Stainless Steel	ASTM A276 with anti-seize lubricant or blue fluoropolymer coating

251-5.2.2 Design Options. Design options for butterfly valves shall conform to Table 251-5.2.2.

TABLE 251-5.2.2

Item	Option	Specification
Butterfly Valves	Stem and Stem Nut	Non Rising Stem
	Seat Mounting	Secure Resilient Seat to Valve Body
	Valve Shaft Sealing	Self-Adjusting and Wear Compensating Do not use manually adjustable packing glands on buried valves
	Ends	Flange x Flange unless otherwise shown
Polyethylene Encasement	Polyethylene Film	See 251-12.1.1 Color per 251-12.2

251-5.3 Plug Valves. Plug valves shall be resilient-seated cast-iron eccentric type complying with AWWA C517. Acceptable manufacturers are specified in Table 251-5.3.

TABLE 251-5.3

Item	Manufacturer
Eccentric Plug Valves and Actuators – Rectangular Port	DeZurik PEF
Eccentric Plug Valves and Actuators – Round Port	Henry Pratt Company “Ballcentric /Milliken Valve 3”-18”

251-5.3.1 Materials. Plug valves shall conform to Table 251.5.3.1.

TABLE 251-5.3.1

Item	Material	Specification
Body	Cast Iron Iron or	ASTM A126 Class B
	Ductile Iron	ASTM A536 Grade 65-45-12
Body Seat	Nickel	
Plug	Ductile Iron	ASTM A536 Grade 65-45-12
Bearings	SAE Type 316 Stainless Steel	SAE 841 Sintered
Grit Seals	PTFE	
Thrust Washers – Top and Bottom	PTFE	

251-5.3.2 Design Options. Design options for plug valves shall conform to Table 251-5.3.2.

TABLE 251-5.3.2

Item	Option	Specification
Plug Valve	Design	Eccentric Type
	Port Size	80% minimum on valves 36" or less, 70% on valves 42" and larger
	Ends	Flange x Flange unless otherwise shown

251-5.4 Ball Valves. Ball valves shall comply with AWWA C507. Acceptable manufacturers are specified in Table 251-5.4.

TABLE 251-5.4

Item	Manufacturer
Ball Valves – Metal Seated	APCO Willamette Valve and Primer Corporation List 26 Series 2600
	Henry Pratt Company Bulletin BV-90
Ball Valves – Resilient Seated	APCO Willamette Valve and Primer Corporation List 26 Series 2600
	Henry Pratt Company Bulletin BV-90
	Val-Matic Valve and Manufacturing Company "Ener-G" Series 4000

251-5.4.1 Materials. Ball valves shall conform to Table 251-5.4.1.

TABLE 251-5.4.1

Item	Material	Specification
Body	Ductile Iron	ASTM A536 Grade 65-45-12
Valve Ball	Ductile Iron	ASTM A536 Grade 65-45-12
Valve Shaft	SAE Type 304 or SAE Type 316 Stainless Steel	ASTM A276
Valve Seat	EPDM Rubber	Mount to body ASTM D429 Peroxide cured

251-5.4.2 Design Options. Design options for ball valves shall conform to Table 251-5.4.2.

TABLE 251-5.4.2

Item	Option	Specification
Ball Valves	Design	AWWA C507
	Port Size	100%
	Ends	Flange x Flange unless otherwise shown

251-5.5 Check Valves.

251-5.5.1 Swing-Check Valves. Swing check valves shall comply with AWWA C508.

Acceptable manufacturers are specified in Table 251-5.5.1.

TABLE 251-5.5.1

Item	Manufacturer
Swing Check Valves	M&H Valve Div McWane Inc. Style 159 (4"-12")

251-5.5.1.1 Materials. Swing check valves shall conform to Table 251-5.5.1.1.

TABLE 251-5.5.1.1

Item	Option	Specification
Body and Cover	Cast Iron	ASTM A126 Grade B
Body and Cover for Pressures over 250 psi	Ductile Iron	ASTM A536 Grade 65-45-12
Disc and Disc Arm	Ductile Iron	ASTM A536 Grade 65-45-12
Seat	SAE Type 316 Stainless Steel	ASTM A276
Pivot Shaft	SAE Type 316 Stainless Steel	ASTM A276

251-5.5.1.2 Design Options. Design options for swing check valves shall conform to Table 251-5.5.1.2.

TABLE 251-5.5.1.2

Item	Option	Specification
Swing Check Valves	Design	AWWA C508 Outside Lever and Weight
	Position Indicator	Required on Valves 6" and Larger
	Ends	Flange x Flange unless otherwise shown

251-5.5.4 Slanting-Disc Check Valves. Acceptable manufacturers are specified in Table 251-5.5.4.

TABLE 251-5.5.4

Item	Manufacturer
Slanting Disc Check Valves with Controlled Opening and Closing –14"- 60"	APCO Willamette Valve and Primer Corp Series 800

251-5.5.4.1 Materials. Slanting-disc check valves shall conform to Table 251-5.5.4.1.

TABLE 251-5.5.4.1

Item	Option	Specification
Body	Cast Iron or	ASTM A126 Grade B
	Ductile Iron	ASTM A536 Grade 65-45-12
Body for Pressures over 250 psi	Ductile Iron	ASTM A536 Grade 65-45-12
Disc and Seat	Ductile Iron or	ASTM A536 Grade 65-45-12
	Bronze	NSF 372-Compliant for Potable Water
Hinge Pin	SAE Type 304 or SAE Type 316 Stainless Steel	ASTM A276
Spring	SAE Type 304 or SAE Type 316 Stainless Steel	ASTM A276

251-5.5.4.2 Design Options. Design options for slanting-disc check valves shall conform to Table 251-5.5.4.2.

TABLE 251-5.5.4.2

Item	Option	Specification
Slanting-Disc Check Valves	Design	Two-piece construction bolted at center to hold seat at approximate 55° angle.
	Position Indicator	Required on Valves 6" and Larger
	Top-Mounted Dashpot	Valve shall be configurable to accept a top-mounted dashpot
	Ends	Flange x Flange unless otherwise shown

251-5.6 Air Release, Air/Vacuum, and Combination Air Valves. Air Release, Air/Vacuum and Combination Air Valves shall comply with AWWA C512, except where listed acceptable manufacturers include patented air release, air vacuum and combination air valves similar in function, but not design to AWWA C512. Said products shall be capable of passing all tests described in AWWA C512 Section 5.

Acceptable manufacturers are specified in Table 251-5.6.

TABLE 251-5.6

Item	Manufacturer
Air Release Valves (for working pressures to 175 psi)	ARI Flow Control Accessories D-040-C Series 1"- 2" D-015 Series 3"- 8"
Air Release Valves (for working pressures over 175 psi)	ARI Flow Control Accessories D-065 HF Series

Well Service Air Valves 3-inch and smaller	ARI Flow Control Accessories D-070 Series
Air and Vacuum Valves	ARI Flow Control Accessories D-040-C Series 1"- 2" S-015 Series 3"- 8"
Combination Air and Vacuum Valves	ARI Flow Control Accessories D-040-C Series 1"- 2" S-015 Series 3"- 8"
Vacuum Breaker Valve with Controlled Air Release	ARI Flow Control Accessories D-040-C Series
Air Release Valves for Wastewater	ARI Flow Control Accessories S-020
Air and Vacuum Valves for Wastewater	ARI Flow Control Accessories D-020 or D-025
Combination Air and Vacuum Valves for Wastewater	ARI Flow Control Accessories D-020 or D-025
Combination Air and Vacuum Valves for Wastewater (All Stainless Steel)	ARI Flow Control Accessories

Note: ARI Flow Control Accessories products are manufactured in Israel.

251-5.6.1 Materials. Air release, air/vacuum, and combination air valves shall conform to Table 251-5.6.1.

TABLE 251-5.6.1

Item	Material	Specification
Body and Cover (Potable and Recycled Water)	Cast Iron	ASTM A126 Grade B
Body and Cover for Pressures over 250 psi (Potable and Reclaimed Water)	Ductile Iron	ASTM A536 Grade 65-45-12
Body and Cover (Sewage)	Stainless Steel	SAE Type 316
Float, Linkage and Internal Parts	Stainless Steel or	ASTM A240 SAE Type 316
	Polycarbonate	NSF 61 Certified
Seats	Buna N or Viton for Potable Water or Sewage	
	EPDM for Reclaimed Water	

251-5.7 Diaphragm-Actuated Pilot-Control Valves. Diaphragm-actuated pilot-control valves shall comply with AWWA C530.

Acceptable manufacturers are specified in Table 251-5.7.

TABLE 251-5.7

Item	Manufacturer
Diaphragm Valves	Cla-Val Company (no exceptions)

251-5.7.1 Materials. Diaphragm-actuated pilot-control valves shall comply with Table 251-5.7.1.

TABLE 251-5.7.1

Item	Material	Specification
Main Valve Body and Cover, Disc Retainer and Diaphragm Washer	Ductile Iron (for pressures 0-300 psi)	ASTM A536
Main Valve Trim:, Stem, Seat and Bonnet Spring	SAE Type 316 Stainless Steel	ASTM A276 or A351
Stem Guide Bearings, Upper and Lower	SAE Type 316 Stainless Steel	ASTM A276
Disc	Buna-N Rubber or EPDM for Reclaimed Water	
Diaphragm	Nylon-Reinforced Buna-N Rubber or EPDM for Reclaimed Water	
Pilot Control System	Cast Bronze with SAE Type 316 Stainless Steel Trim	Lead free for potable water applications ASTM A276
Piping and Tubing	SAE Type 316 Stainless Steel	

251-5.7.1.2 Design Options. Design options for diaphragm-actuated pilot control valves shall conform to Table 251-5.7.1.1.

TABLE 251-5.7.1.2

Item	Option	Specification
Diaphragm-Actuated Control Valves	Manufacturer's Standard Internal Cavitation Trim	Where pressure drop across valve exceeds 40 psi, submit cavitation calculations per 251-1.1 and letter requesting variance if applicable.
	Isolation Valves on Pilot Lines	Required on both sides of pilot.

	Opening and Closing Speed Control	Required
	In-Line Y Strainer on Pilot Line	Required
	Stem	Self-Cleaning
	Ends	Flange x Flange unless otherwise shown

251-6 HYDRANTS

251-6.1 Fire Hydrants. With the exception of service areas subject to freezing, fire hydrants shall be “California” wet-barrel-type, UL-listed and FM-approved, complying with AWWA C503.

Acceptable manufacturers are specified in Table 251-6.1

TABLE 251-6.1

Item	Manufacturer
Wet Barrel Fire Hydrants (Residential Bronze 4" x 2½")	Clow Valve Model F2050
	James Jones Company Model J3710
Wet Barrel Fire Hydrants (Residential Cast Iron 4" x 2½")	Clow Valve Model F850
	James Jones Company Model J4040B
Wet Barrel Fire Hydrants (Commercial Bronze 4" x 2½" x 2½")	Clow Valve Model F2060
	James Jones Company Model J3765
Wet Barrel Fire Hydrants (Commercial Cast Iron 4" x 2½" x 2½")	Clow Valve Model F860
	James Jones Company Model J4060B
Wet Barrel Fire Hydrants (Commercial Bronze 4" x 4" x 2½" Double Steamer)	Clow Valve Model F2065
	James Jones Company Model J3775
Wet Barrel Fire Hydrants (Commercial Cast Iron 4" x 4" x 2½" Double Steamer)	Clow Valve Model F865

Color scheme shall comply with City of Corona standards. If no such standards exist, hydrants shall be painted per Table 251-12.2.

Outlet threads shall comply with AWWA C503 Appendix A.

251-6.1.1 Materials. Fire hydrants shall conform to Table 251-6.1.1.

TABLE 251-6.1.1

Item	Material	Specification
Body	Bronze	AWWA C503 and NSF 372 Lead-Free
	Cast Iron	AWWA C503
Outlet Nozzles	Bronze	AWWA C503 and NSF 372 Lead-Free
	Cast Iron	AWWA C503
Outlet Nozzle Caps	Bronze, Cast Iron or Plastic	AWWA C503 and NSF 372 Lead-Free
Exposed Body Cap Screws, Bolts, and Nuts including Squeeze Pins	SAE Type 316 Stainless Steel	ASTM A276 with anti-seize lubricant or blue fluoropolymer coating
Flanges	Cast Iron or Ductile Iron	Raised or Plain-faced

251-6.1.2 Design Options. Design options for hydrants shall conform to Table 251-6.1.2.

TABLE 251-6.1.2

Item	Option	Specification
Design	“California” or Wet-Barrel Type	AWWA C503
Body	6” inlet	AWWA C503 §4.6
Outlets – Residential Hydrants	One 4” Pumper Outlet plus One 2½” Hose Outlet	AWWA C503
Outlets – Commercial/Industrial Hydrants	One 4” Pumper Outlets plus Two 2½” Hose Outlets	AWWA C503
Outlets – Commercial/Industrial Double-Steamer Hydrants	Two 4” Pumper Outlets plus One 2½” Hose Outlets	AWWA C503
Outlet Nozzle Cap Chain and Cap Gasket	Required	AWWA C503 §4.6.10
Threads	Conform to National Standard for Fire Hose Connections	ANSI B26 and NFPA Standard 1963
Hydrant Flange	6” Flange with Standard 8-hole drilling	AWWA C503 §4.6
Hydrant Bolts	Hollow Metal Bolts at Junction of Hydrant and Hydrant Spool	ASTM A307 Grade A Heavy hexagon series ANSI B1.1 Class 2A fit 5/8-inch bolt with 11/32” hole drilled 23/8” deep into shank and 100% silicon-filled to

		prevent internal corrosion. Project ¼-inch to ½-inch through tightened nut Threading per ANSI/ASME B18.2.1 Bolt-Head Identification Mark – “A 307 A”
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251-7 BACKFLOW PREVENTION

251-7.1 General. Backflow prevention devices shall comply with California Code of Regulations Title 17 and Title 24 Part 5 (California Plumbing Code.)

251-7.2 Double Check Valve (DC) Backflow Prevention Assemblies. Double check valve backflow prevention assemblies shall comply with AWWA C510, and shall be IAPMO listed, FM approved, UL classified, and approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California. Acceptable manufacturers and models are listed in the City of Corona Appendix B – Approved Backflow Prevention Devices for Service Isolation as described in the City of Corona Department of Water and Power Design Policy, latest edition.

251-7.3 Reduced-Pressure (RP) Backflow Prevention Assemblies. Reduced-pressure backflow prevention assemblies shall comply with AWWA C511 and shall be IAPMO listed, FM approved, UL classified, and approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California. Acceptable manufacturers and models are listed in the City of Corona Appendix B – Approved Backflow Prevention Devices for Service Isolation as described in the City of Corona Department of Water and Power Design Policy, latest edition.

251-8 COUPLINGS

251-8.1 Bolted Sleeve Type Couplings. Bolted sleeve type couplings shall comply with AWWA C219.

Acceptable manufacturers are specified in Table 251-8.1.

TABLE 251-8.1

Item	Manufacturer
Couplings – Steel Bolted Sleeve Type, for Identical Pipe Materials on each side	Dresser Piping Specialties (Style 38)
	Romac Industries (400)
	Smith Blair, Inc. (Style 411)
	Total Piping Solutions (Hymax)
Couplings – Steel Bolted Transition Sleeve Type, for Different Pipe Materials on each side	Dresser Piping Specialties (Style 162) or (Style 62TY.1)
	Romac Industries (TC400)
	Smith Blair, Inc. (Style 413)
	Total Piping Solutions (Hymax)
Couplings – Ductile Iron Bolted Sleeve Type System, for	Romac Industries (501) or (XR501)
	Smith Blair, Inc. (Style 461 Quantum)

Identical or Different Pipe Materials on Each Side	
Couplings – Ductile Iron Bolted Sleeve Extended Range Type for Identical or Different Pipe Materials on Each Side	Romac Industries (501)
	Smith Blair, Inc. (Style 462 Quantum)

251-8.1.1 Materials. Bolted sleeve type couplings shall conform to Table 251-8.1.1.

TABLE 251-8.1.1

Item	Material	Specification
Sleeve	Steel	ASTM A283 Grade C or carbon steel with 30-ksi minimum yield
	Ductile Iron	ASTM A536 Grade 65-45-12
Gasket		AWWA C111
Coupling and Harness Bolts	Stainless Steel	See 251-2.5
Polyethylene Encasement	Polyethylene Film	See 251-12.1.1 Color per 251-12.2

251-8.2 Flanged Coupling Adaptors. Flanged coupling adaptors shall comply with AWWA C219.

Acceptable manufacturers are specified in Table 251-8.2.

TABLE 251-8.2

Item	Manufacturer
Couplings, Flanged Coupling Adaptor for Ductile Iron Pipe	Romac Industries (FCA 501)
	Smith Blair, Inc. (Style 912) 3”- 12”
	Smith Blair, Inc. (Style 913) 3”- 24”
Couplings, Flanged Coupling Adaptor (Restrained)	EBAA Iron Megaflange Series 2100 3”-24”
	Ford Meter Box Company (Restrained Flange Adaptor with UFR 1400) 3”- 24”

251-8.2.1 Materials. Flanged coupling adaptors shall comply with Table 251-8.2.1.

TABLE 251-8.2.1

Item	Material	Specification
Body	Ductile Iron or Steel to Match Adjacent Pipe	AWWA C219
Gasket		AWWA C111
Coupling and	Stainless Steel	See 251-2.5

Harness Bolts		
Polyethylene Encasement	Polyethylene Film	See 251-12.1.1 Color per 251-12.2

251-8.3 Coupling Restraint Systems. Coupling restraint systems for bolted-sleeve-type couplings or flanged coupling adaptors installed on ductile iron or PVC pipe shall comply with Table 251-8.3.

TABLE 251-8.3

Item	Material	Specification
Follower Gland	Ductile Iron	ASTM A536 65-45-12
Wedges	Ductile Iron	Single tooth, heat-treated for ductile iron applications
Actuating Bolts	Ductile Iron	ASTM A536 65-45-18
Breakaway Nuts	Carbon Steel	
	Cast Iron	
Tie Rods – Stainless Steel	Stainless Steel	SAE Type 316
Coating for New Bolts and Nuts	Nickel-Phosphate Undercoating Blue Teflon or Xylan Fluoropolymer Coating	See 251-2.5
Coating for Existing Bolts and Nuts	Antiseize Lubricant	See 251-2.5
Lubrication for Above-Ground or Vault-Enclosed Steel Tie-Rod or Bolt Threads	Oil and Graphite, Blue Fluoropolymer Coating or Accepted Valve Manufacturer's Anti-seize Coating	See 251-2.5
Gland Exterior Finish Coat	Fusion-Bonded Epoxy	See 251-12.1
Coating on Buried Bolts and Nuts	Mastic	See 251-2.9
Polyethylene Encasement	Polyethylene Film	See 251-12.1.1 Color per 251-12.2

251-8.4 Grooved and Shouldered Couplings and Joints. Grooved and shouldered couplings and joints shall comply with AWWA C606.

Acceptable manufacturers are specified in Table 251-8.4.4

TABLE 251-8.4

Item	Manufacturer
Couplings – Flexible Grooved Type for Steel Pipe 4” through 24”	Victaulic Company of America, Inc. (Style 77)
Couplings – Roll-Grooved Type for Steel Pipe 28” through 42”	Victaulic Company of America, Inc. (Style 770)
Couplings – Shouldered Type for Steel Pipe 4” through 60”	Victaulic Company of America, Inc. (Style 44 with Vic-Ring)
Couplings – Grooved Type for Ductile Iron Pipe 3 “ through 36”	Victaulic Company of America, Inc. (Style 31)

251-8.4.1 Materials. Grooved and shouldered couplings shall conform to Table 251-8.4.1.

TABLE 251-8.4.1

Item	Material	Specification
Body	Ductile Iron or Steel to Match Adjacent Pipe	AWWA C606
Coupling Bolts	Stainless Steel	See 251-2.5
Polyethylene Encasement	Polyethylene Film	See 251-12.1.1 Color per 251-12.2

251-8.4.2 Design Options. Design options for grooved and shouldered couplings shall conform to Table 251-8.4.2.

TABLE 251-8.4.2

Item	Option	Specification
Grooved Couplings – Mating Ductile Iron Pipe 4” through 24” in diameter	Radius Grooving	Minimum wall thickness of grooved DIP shall be Class 53. Groove dimensions per AWWA C606 Table 2 for flexible joints.
Grooved Couplings – Mating Steel Pipe 4” through 24” in diameter	Roll Grooving	Minimum wall thickness of grooved steel pipe shall be as shown in AWWA C606 Table 5. Groove dimensions per AWWA C606 Table 5.
Grooved and Shouldered Couplings – Mating Steel Pipe 4” through 64” in diameter	Shouldered	AWWA C606 Type C or D Dimensions per AWWA C606 Table 6

251-9 EXPANSION JOINTS

259-9.1 Double-Ball Expansion Joints. Double-ball expansion joints shall be capable of accommodating minimum design displacements for piping attachments to tanks and mechanical equipment shown in ASCE 7 Table 15.7-1, when unrestrained.

Unless otherwise shown in these Special Provisions or on the Plans, expansion joints shall be force-balanced, self-restraining type. If expansion joints are not force-balanced, Contractor shall make provisions for restraining joints from damaging adjacent tanks and piping during testing.

Acceptable manufacturers are specified in Table 251-9.1.

TABLE 251-9.1

Item	Manufacturer
Expansion Joints – Double-Ball Type with Telescoping Ductile Iron Sleeve	EBAA Iron (Flex-Tend)
Expansion Joints – Double Ball Type Force Balanced	EBAA Iron (Forced Balanced Flex-Tend)

251-9.1.1 Materials. Double-ball expansion joints shall conform to Table 251-9.1.1.

TABLE 251-9.1.1

Item	Material	Specification
Expansion Joints – Double Ball Type	Ductile Iron	ASTM A536 Grade 65-45-12
Polyethylene Encasement	Polyethylene Film	See 251-12.1.1 Color per 251-12.2

251-9.1.2 Design Options. Design options for double-ball expansion joints shall conform to Table 251-9.1.2.

TABLE 251-9.1.2

Item	Option	Specification
Expansion Joints – Double Ball Type	Minimum Expansion	8"
	Expansion/Contraction Pre-setting	50% expansion-50% contraction on horizontal installations. 75% expansion-25% contraction on vertical installations.
	Minimum Deflection	15 degrees per ball
	Self-Contained Restraint	Larger of 250 psi or rating of mating flanges

251-10 SERVICE LATERALS, METERS, AND METER BOXES

251-10.1 Copper Tubing. Copper tubing shall be seamless copper water tubing meeting the requirements of ASTM B88, Type K. Temper shall be annealed.

Size and form of furnished pipe shall conform to Table 251-10.1.

TABLE 251-10.1

Size	Form	Length	Temper
1"	Coils Minimum 24" ID	60' to 100' coils,	O60 annealed
2"	Flexible or rigid straight lengths	20' (rigid)	O50 annealed

251-10.2 HDPE Tubing. HDPE tubing shall meet the requirements of AWWA C901 for coiled or straight pipe.

Pressure class shall be either pressure class 160 or the pressure class shown the Plans for the adjacent pipe, whichever is greater.

251-10.3 Corporation Stops, Angle Meter Valves, Service Saddles and Other Service Materials. Service materials shall be NSF 372 brass complying with AWWA C800 and Standard Plans, except that service saddles shall use Type 304L stainless steel straps.

Acceptable manufacturers are specified in Table 251-10.3.

TABLE 251-10.3

Item	Manufacturer
Angle Meter Valves	Ford Meter Box Co. KV43-444W
	James Jones E-1966W
	Mueller Company B-24258
Brass Body Type 304L Stainless Steel Double-Strap Service Saddles for AC, CIP, DIP, and PVC Pipe	Ford Meter Box Co. Style 202BSD
	Mueller Company BR2S and BR2W Series
	James Jones J-969 Series
Brass Body Flattened Bronze Double-Strap Service Saddles for DIP Only	Ford Meter Box Co. Style 202B
	Mueller Company BR2B Series
	James Jones J-979 Series
Corporation Stops	Ford Meter Box Co. FB1100-4Q, FB1100-6Q or FB1100-7Q
	James Jones E1935SG
	Mueller B-25028
Customer Service Valves	Ford Meter Box Co. Style B13 with HB-34S lock on/off handle
	James Jones Style E1908DL with lock-on/off handle
Meter Bolts – Silicon Bronze	Tripac Fasteners
Meter Yokes	Ford Meter Box Co.
	Mueller Company. EZ Setter

251-10.4 Meters. Acceptable types of meters shall be as shown on the Plans or Standard Plans.

Acceptable manufacturers are specified in Table 251-10.4.

TABLE 251-10.4

Item	Manufacturer
Positive Displacement Flow Meters	Neptune Model T-10
Compound Flow Meters	Neptune Tru/Flow Compound
Magnetic Flow Meters	Endress + Hauser Promag 400

Registers shall be straight-reading type, hermetically sealed, having a register test hand. Registration shall be in gallons or cubic feet as shown in the Special Provisions. Registration accuracy shall comply with AWWA or these Special Provisions. Meters 5/8-inch through 2-inch in size shall provide remote read capabilities for remote meter reading system. Meters larger than 2-inch size shall be installed in above-ground locations. Magnetic meters shall provide local read with 4-20mA signal output where required by City.

Meters shall conform to Table 251-10.4.1.

TABLE 251-10.4.1

Type of Meter	Size Range	Case	Specification
Positive Displacement Meters	5/8" through 1-1/2"	Lead Free High Copper Alloy	Accuracy to 1.5% within normal operating flow range – remote read capable
Compound Meters	2"	Lead Free High Copper Alloy	Accuracy to 1.5% within normal operating flow range – remote read capable
Compound Meters	3" through 8"	Lead Free High Copper Alloy	Accuracy to 1.5% within normal operating flow range
Magnetic Meters	4" through 54"	Epoxy-Lined and Coated Steel	Accuracy to 0.5% within flow range having 20:1 minimum turndown ratio

251-10.6 Meter Boxes. Meter boxes and lids in parkways and areas not subject to traffic shall be polymer. Meter boxes and lids subject to traffic shall be concrete, H-20 traffic load rated. Provide remote read lid labeled "WATER".

Acceptable manufacturers are specified in Table 251-10.6.

TABLE 251-10.6

Item	Manufacturer
Polymer-Concrete Meter Box for 1" Meter and Smaller	J & R Concrete Products PW5 ½ (17" x 28")
Polymer-Concrete Meter Box for 1½" Meter and 2" Meter	J & R Concrete Products PW6B (17" x 30")
H-20 Load Rated Concrete Meter Box for 2" Meter and Smaller	J & R Concrete Products W6T (17" x 30")

251-10.6.1 Dimensions. Minimum meter box dimensions shall conform to Table 251-10.6.1.

TABLE 251-10.6.1

Size of Meter	Interior Length (Below Lip)	Interior Width (Below Lip)	Depth
¾" or less	25"	13"	12"
1"	25"	13"	12"
1½"	29"	16"	12"
2"	29"	16"	12"

251-11 PRESSURE GAUGES

251-11.1 Stem-Mount Pressure Gauges. Stem-mount pressure gauges may be used for water or recycled water applications and shall comply with ASME/ANSI B40.100,

Acceptable manufacturers are specified in Table 251-11.1.

TABLE 251-11.1

Item	Manufacturer
Pressure Gauges – Stem-Mounted Bourdon Tube Type	Ashcroft Type 1008S (0-300 psi)
	U.S. Gauge Company (Ametek)
	Wika Instrument Corporation Div Ryan Herco

251-11.1.1 Materials. Stem-mount pressure gauges shall conform to Table 251-11.1.1.

TABLE 251-11.1.1

Item	Material	Specification
Case	Stainless Steel	SAE Type 316
Process-Wetted Materials	Stainless Steel	SAE Type 316
Window	Polycarbonate	
Sleeve	Pure Gum Rubber	
Fill Fluid	Ethylene Glycol	

251-11.1.2 Design Options. Design options for stem-mount pressure gauges shall conform to Table 251-11.1.2.

TABLE 251-11.1.2

Item	Option	Specification
Dial	Calibrated Pressure Range	0-200 psi unless otherwise shown on plans or operating pressure exceeds 175 psi. 0-300 psi if operating pressure exceeds 175 psi.
Accuracy within Pressure Range	±0.25%	
Process Connection	¼" NPT	

251-11.2 Flanged In-Line Sensor Sleeve Style Pressure Gauges. Flanged in-line sensor sleeve style pressure gauges shall be used in wastewater applications.

Acceptable manufacturers are specified in Table 251-11.2.

TABLE 251-11.2

Item	Manufacturer
Pressure Sensors and Gauges – Flanged in-line Sensor Sleeve Style	Cla-Val Company CVPS
	Onyx Valve
	Red Valve Company (Series 40)

251-11.2.1 Materials. Stem-mount pressure gauges shall conform to Table 251-11.1.1.

TABLE 251-11.2.1

Item	Material	Specification
Body	Stainless Steel	SAE Type 316
Process-Wetted Materials	Stainless Steel	SAE Type 316
Sleeve	Pure Gum Rubber	
Fill Fluid	Ethylene Glycol	

251-11.2.2 Design Options. Design options for stem-mount pressure gauges shall conform to Table 251-11.1.2.

TABLE 251-11.2.2

Item	Option	Specification
Dial	Calibrated Pressure Range	0-150 psi unless otherwise shown on Plans
Accuracy within Pressure Range	±0.25%	

251-12 PAINTING, LINING, AND COATING.

251-12.1 Lining and Coating of Ferrous Valve, Hydrant, Valve Operator, Meter, Coupling, Expansion Joint, Spool, Fitting, and Backflow Preventer Surfaces. Ferrous exposed non-lubricated parts of valves, hydrants, valve operators, meters, couplings, spools, fittings, and backflow preventers shall be epoxy-coated conforming to Table 251-12.1.1 with the exception of stainless steel surfaces and bituminous or cement-mortar-lined or coated pipe or fitting surfaces. Non-stainless ferrous interior surfaces of valves, hydrants, operators, meters, couplings, expansion joints, spools, fittings, and backflow preventers 3-inch nominal diameter and larger shall be lined with a suitable epoxy meeting the requirements of AWWA C550. Linings for surfaces contacting potable water shall be NSF 61-listed.

In addition to required painting, buried ductile or cast iron pipe, fittings, couplings, tie rods, expansion joints, valves and hydrant runs shall be encapsulated in polyethylene encasement.

Acceptable manufacturers are specified in Table 251-12.1.

TABLE 251-12.1

Item	Manufacturer
NSF-Approved Fusion-Bonded Epoxy Linings and Coatings	3M Scotchkote 134, 206N or 6233
	Northtown Keysite 740
Fusion-Bonded Epoxy Linings and Coatings (Not NSF 61-Listed)	3M Scotchkote 134, 135, 203, 206, 206-N or 6233
	Gilpon
	Northtown Keysite 740
	Valspar "Pipe Clad" 1500 Red
Field-Applied Liquid Epoxy Linings and Coatings for Patching	3M Scotchkote 306
Field-Applied Liquid Epoxy Linings and Coatings for Patching Welded Steel Pipe	3M Scotchkote 302
NSF-Approved Liquid Epoxy Linings and Coatings	3M Scotchkote 323
	ICI Devoe - Sinclair - ICI Dulux Paint Div. Glidden Co. Bar Rust 233 series
	Tnemec Pota-Pox L140

Liquid Epoxy Linings and Coatings	3M Scotchkote 312 or 314
	ICI Devoe - Sinclair - ICI Dulux Paint Div. Glidden Co. Bar Rust 233 series
	Tnemec Pota-Pox L140 (For nonpotable water use Tnemec Series L69)
Polyethylene Encasement for Corrosion Protection	Christy's "AWWA Polywrap"
	Dupont Alathon
	Northtown Company
	Trumbull Industries, Inc.
Tape for Polyethylene Encasement	Berry Plastics "Polyken No 900"
	Plicoflex No 340
	Protecto Wrap No 200
	Scotchwrap (3M), No 50
	Tapecoat Co., CT

251-12.1.1 Lining and Coating Materials. Lining and coating material shall conform to Table 251-12.1.1.

TABLE 251-12.1.1

Item	Material	Specification
Interior Lining	Fusion-Bonded Epoxy or High-Solids Two-Part Epoxy	AWWA C550 12-mil nominal thickness Do not coat seating areas or bronze or stainless steel parts
Exterior Finish Coat	Fusion-Bonded Epoxy or Epoxy Urethane	AWWA C550 12-mil nominal thickness Do not coat bronze or stainless steel parts
Lubrication for Above-ground or Vault-enclosed Steel Bolt Threads	See 251-2.5	
Coating for Buried Nuts and Bolts	See 251-2.5	
Polyethylene PE Encasement on Buried Ductile or Cast Iron Pipe, Fittings, Couplings, Tie rods, Expansion Joints, Valves and Hydrant Runs	Standards	AWWA C105/ANSI A21.50
	Material	Polyethylene plastic tube
	Thickness	8-mil double layer on pipe 8-mil triple layer on fittings, valves and appurtenances Color per 251-12.2
	Adhesive Tape to Connect Polyethylene Film Tubes and Polyethylene Encasement at Fittings and Appurtenances	2" wide polyethylene adhesive tape

251-12.2 Color Scheme. Color of valves, polyethylene encasement, and appurtenances shall conform to Table 251-12.2.

TABLE 251-12.2

Item	Color	Items Included
Domestic Water	Blue	Valves, polyethylene encasement, appurtenances, and above-ground or vault-enclosed piping
	Chrome Yellow with Tops and Nozzle Caps colored per AWWA C503 Appendix B	Fire Hydrants
Reclaimed Water	Purple (Pantone 522)	Valves, fire hydrant blowoff drains, polyethylene encasement, appurtenances, and above-ground or vault-enclosed piping
Wastewater	Green	Valves, polyethylene encasement, appurtenances, and above-ground or vault-enclosed piping
Fire Water Systems	Blue	Valves, polyethylene encasement, appurtenances, and above-ground or vault-enclosed piping

SECTION 306 – UNDERGROUND CONDUIT CONSTRUCTION

SECTION 306-1.2.6 Field Jointing of Iron Pipe – *Delete entire subsection*

SECTION 306-1.4.5 Water Pressure Test – *Delete entire subsection*

SECTION 306-1.5.2 Permanent Resurfacing *Add the following after the last paragraph:*

Limits of AC overlay shall extend to edge of pavement or nearest lane line with a 2-foot minimum taper.

Disturbing more than one lane requires an overlay over the width of all lanes affected by the Work. For two-lane roadways, the requirement will be from centerline to edge of pavement overlay.

Add the following section:

SECTION 351 – PRESSURE PIPELINE CONSTRUCTION

351-1 TRANSPORTATION, DELIVERY STORAGE AND HANDLING OF PIPELINE MATERIALS, FITTINGS, VALVES, AND APPURTENANCES.

351-1.1 Delivery, Storage, Handling and Protection of Pipeline Materials, Fittings, Valves, and Appurtenances. Delivery, storage and handling of pipeline materials, fittings,

valves and appurtenances shall comply with the pipe-specific Installation Instructions in conformance with these Specifications. Installation instructions shall be submitted to the Engineer in accordance with 2.5.3.5.

TABLE 351-1.1

Pressure Pipe Material	Material Specification	Delivery Storage and Handling Specification
Ductile Iron Pipe	207-9	AWWA C600

351-1.1.1 Pipeline Product Shipment and Delivery. Products shall be shipped and delivered to jobsite in accordance with 7-8.4 and the following:

- a) Only new pipeline products of accepted manufacturers shall be delivered to or used on the site.
- b) Contractor shall not ship, accept delivery of, or store manufactured items on site for which applicable submittals have not been approved.
- c) Before shipping, the pipe, valves, motors, actuators and mechanical equipment shall be operated and tested at the factory to ensure products are complete and in working condition. Submit certified test results.
- d) Products shall be delivered to jobsite in the manufacturer's original, unbroken, unopened, labeled packaging, containers, or bundles. Packages, containers, or bundles shall be tagged or labeled as needed to identify contents and name of equipment of which contents form a part.
- e) Oil-lubricated gearing, bearings and other lubricated components shall be shipped with oil soluble protective coating as described in warranty requirements or recommended by manufacturer. For parts contacting potable water, coating shall be NSF-approved. Coating shall provide protection for one year after final acceptance.
- f) Submit records for Engineer's review of deliveries to show Contractor's order number, purchase order number, and equipment number. Include labeling or shipping tag in records.

351-1.1.2 Pipeline Product Storage. Pipeline products shall be stored at jobsite in accordance with the Installation Instructions. Where the Installation Instructions are silent, the following requirements shall be met:

- a) Products shall be stored in a protected dry area at a temperature between 35°F and 110°F.
- b) Exposed metals shall be protected from moisture, rust and corrosion, even when such items may be sandblasted or otherwise cleaned before painting. Any corrosion in evidence prior to final acceptance shall be removed, or the product shall be removed or replaced.
- c) Items not designed for outdoor exposure shall be stored off-ground and under cover. Items with factory-applied primers or non-cementitious coatings shall be stored off-ground to prevent abrasion or damage to primers or coatings.
- d) Fasteners and connectors shall be stored in their original unopened containers until used.

- e) Stored products shall be covered with a weather resistant tarpaulin or other covering to prevent soiling or exposure to weather. Fasten coverings to prevent removal by wind.
- f) Plastic and similar brittle items shall be covered to protect them from sun exposure and temperature extremes.

Products shall be stored so as to preserve their quality and fitness for the Work in a location facilitating prompt inspection. Contractor shall be responsible for damage or loss of products until Final Acceptance. Products shall be protected against damage from improper handling, improper storage, vandalism or theft. Flammable products shall be stored in conformance with applicable safety codes for storage of flammable materials.

Stringing of pipe and appurtenances along right-of-way shall be done during working hours only in a manner that will not interfere with free passage of vehicles and only with prior written approval from the Engineer. No pipe or materials shall be left along right-of-way overnight.

The Contractor shall notify the Engineer in writing if any delivered or stored product is damaged. Exterior surfaces of delivered items shall be free from imperfections that render products unfit for service. Damaged products shall not be repaired without prior written approval from the Engineer.

351-1.1.3 Pipeline Product Handling. Products shall be handled with care, using proper equipment according to Installation Instructions. Large heavy items shall be lifted only at points designated by the manufacturer. Do not drop, drag, bump, bend, or handle products in a manner that causes abrasions, bruises, cracks, mars, scars, scratches, or other damage. Use padded slings and hooks for lifting as needed to prevent damage. Improper handling shall be cause to reject mishandled products.

Coated pipe, valves, and other products shall be lifted, lowered or suspended using rubber or canvas belt slings or pneumatic-tired cradles. Sling width shall equal or exceed the pipe or product diameter. Do not handle coated products using ropes, hooks, chains, calipers, or cables. Store such materials on padded or wooden skids.

Inspect each product item for damage, defects, completeness, and correct operation before installing. Before installation, swab joints and interiors of piping materials, fittings, valves, and appurtenances to remove foreign matter and contaminants. Machined surfaces and shafting shall be kept clean and protected from corrosion using the proper type and amount of coating as described in the manufacturer's warranty requirements to assure protection to one year after final acceptance.

351-1.1.4 Protection of Pipe Openings. To prevent intrusion or contamination, pipe ends, fitting ends, valve ends, and equipment openings shall be covered with rubber, plastic, or canvas during shipping, storage, and staging for installation. Pipes and fittings without openings covered will not be accepted for delivery. Close open ends of pipe with tight-fitting caps or plugs sufficient to prevent entrance of foreign contaminants into pipe at all times when pipe installation is not in progress. These provisions shall apply during noon hour or other work breaks in excess of 40 minutes, as well as overnight. Do not use pipeline as a drain for removing water that has infiltrated into the trench. Maintain inside of pipe free from foreign materials and in a clean and sanitary condition until final acceptance.

If ends are not covered on potable water pipes, the Engineer may require additional bacteriological testing per 351-1.5.5.1.

351-1.1.5 Protection of Existing Pipelines. Work requiring the shut-down of an existing pipeline for the Contractor's benefit shall be performed by forces employed by the City of Corona or affected utility if not City-owned. Under no circumstances shall the Contractor operate valves, hydrants or other appurtenant equipment on existing public utilities.

The City, or utility owner, will make a concerted effort to isolate pressure pipelines as planned. However, the Contractor shall be prepared to employ pumping and dewatering equipment if a watertight seal cannot be achieved by City or utility forces. The Agency will not be responsible for any delays or expenses due to difficulties with system shutdown and isolation.

All emergency situations shall be reported immediately to the affected utility.

Where long-term main shutdown is required, the City, or affected utility, will determine what temporary bypasses or service connections may be required. The Contractor shall furnish all necessary hose, piping, valves, water trucks, disinfection, and labor to provide and maintain temporary service. All piping, hoses and associated equipment used for temporary potable water service shall be flushed and disinfected in accordance with 351-4.

351-1.1.6 Connections to Existing Pipelines. When connections are to be made to any existing pipe, conduit, or other appurtenances where the Plans require verification, or where the actual elevation, size, material, joint type, or position is not shown on the Plans or cannot be ascertained without excavation, the Contractor shall excavate for and expose the existing improvement before ordering materials or laying any pipe or conduit. Contractor shall provide advance notice to the Engineer to allow the Engineer a minimum two-hour window acceptable to the Engineer so the Engineer may inspect the existing pipe or conduit before connection materials are ordered. The Contractor shall prepare a sketch of the materials found at the proposed point of connection and review any required changes or unusual construction requirements with the Engineer before ordering materials. Any resultant changes necessary to the lines and grades shown on the Plans shall be approved by the Engineer.

351-1.2 Trench Excavation Trench excavation shall be comply with 306-2.

351-1.3 Backfill and Densification Except as modified herein, backfill and densification shall comply with 306-3.

351-1.3.1 Bedding. Bedding shall comply with the Installation Instructions but in no case shall be less than 4 inches below the pipe barrel or 1 inch below the projecting bell.

351-1.3.3 Jetted Backfill. Jetting of backfill shall not be permitted for potable water main construction.

351-1.4 (not used)

351-1.5 Prefabricated Pressure Pipe Unless otherwise shown, water pipe, fittings, and appurtenances used in the City of Corona shall be fully self-restrained ductile iron pipe. PVC pressure pipe shall not be used in the City of Corona.

Except for short runs, sections of pipe shall be laid in a sequence moving in an upgrade direction on grades exceeding 10 percent. Pipe laid in a downgrade direction shall be secured to prevent movement.

Closure and correction pieces shall be provided as required to adjust the pipe laying to conform to the pipe alignment and stationing shown.

Installation of pipeline materials, fittings, valves and appurtenances shall comply with the pipe-specific Installation Instructions in conformance to these Specifications. Installation Instructions shall be submitted to the Engineer in accordance with 2.5.3.5.

TABLE 351-1.5

Pressure Pipe Material	Material Specification	Installation Instruction Reference Standard
Ductile Iron Pipe	207-9	AWWA C600 and 351-1.5.1
Valves and Appurtenances	251	Manufacturer's Installation Instructions

Pressure pipe shall be laid to the lines and grades shown on the Plans.

All pipe shall be constructed using joint restraint using welds, flanges, mechanical joints or manufactured joint restraints as shown on the Plans and in the Special Provisions.

After the joints have been constructed, the pipe shall not be disturbed in any manner.

Pipe will be inspected in the field before and after laying. Pipe which is not in true alignment or shows any undue settlement after laying shall be removed and re-laid. If any cause for rejection is discovered in a pipe after it has been laid, it shall be subject to rejection. Corrective work shall be approved by the Engineer.

351-1.5.1 Ductile Iron Pipe Laying.

351-1.5.1.1 Ductile Iron Pipe Push-on Joints. Push-on joints shall be assembled per AWWA C600 and in conformance with these Specifications.

- a) On long radius curves, excavate trench wider than normal to allow for straight-line assembly before deflection.
- b) Cut and machine pipe per AWWA C600, AWWA M41, and manufacturer's standard procedures. Do not cut pipe with cold chisel, standard iron pipe cutter, or any other method that may fracture pipe or produce ragged, uneven edges.
- c) Clean groove and bell socket of pipe or fitting and plain end of mating pipe. Joint shall be dirt-free.
- d) Lubricate plain end, socket and gasket using soapy water or accepted pipe lubricant as recommended in AWWA C600. Lubrication for spigot and instruction for lubricant use shall be supplied by pipe manufacturer.
- e) Insert rubber ring into groove making sure ring is completely seated.
- f) Spigot and bell shall slide together without displacement of rubber gasket. Where possible, install pipe with bell facing in direction of laying.

- g) Insert spigot into bell and force slowly into position, using large bar lever and wood block across pipe end. For large pipe, a come-along (with padding that will not scratch pipe) may be used.
- h) After assembling pipe in a straight line, make horizontal or vertical deflections at joints to comply with alignment shown on Plans.

Push-on restrained joints shall incorporate locking gasket type restraint, and shall be installed in accordance with the manufacturer's installation and warranty instructions for the joint design used.

Allowable joint deflections for push-on joints shall conform to Table 351-1.5.1.1.

TABLE 351-1.5.1.1

Pipe Nominal Diameter	Allowable Push-on-Joint Deflection	Allowable Restrained Joint Deflection
3" through 4"	4.0°	n/a
6" through 12"	4.0°	3.2°
14" and larger	2.4°	1.6°

Values shown above are based on 80% of that recommended by AWWA M41 Table 11-4 and 11-5 or manufacturers.

351-1.5.1.2 Ductile Iron Pipe Mechanical Joints. Mechanical joints shall be assembled per AWWA C600 and in conformance with these Specifications.

- a) On long radius curves, excavate trench wider than normal to allow for straight-line assembly before deflection.
- b) Cut and machine pipe per AWWA C600, AWWA M41, and manufacturer's standard procedures. Do not cut pipe with cold chisel, standard iron pipe cutter, or any other method that may fracture pipe or produce ragged, uneven edges.
- c) Lubricate plain end, socket and gasket using soapy water or accepted pipe lubricant as recommended in AWWA C600. Lubrication for spigot and instruction for lubricant use shall be supplied by pipe manufacturer.
- d) Insert rubber ring into groove making sure ring is completely seated.
- e) Spigot and bell shall slide together without displacement of rubber gasket. Joint shall be dirt free. Where possible, install pipe with bell facing in direction of laying.
- f) Insert spigot into bell and force slowly into position using large bar lever and wood block across pipe end. For large pipe, a come-along (with padding that will not scratch the pipe) may be used.
- g) Push gland toward socket and center around pipe with gland lip against gasket. Insert bolts and hand-tighten nuts.
- h) After assembling pipe in straight line, make horizontal or vertical deflections at joints to comply with alignment shown on Plans.

Allowable joint deflections for joints shall conform to Table 351.1.5.1.2.

TABLE 351-1.5.1.2

Pipe Nominal Diameter	Allowable Push-on-Joint Deflection	Allowable Mechanical Joint Deflection	Allowable Restrained Joint Deflection
3" to 4"	4.0°	6.6°	n/a
6"	4.0°	5.7°	3.2°
8" to 12"	4.0°	4.3°	3.2°
14" to 16"	2.4°	2.9°	1.6°
18" to 20"	2.4°	2.4°	1.6°
24"	2.4°	1.8°	1.6°
30" to 64"	2.4°	n/a	1.6°

Values shown above are based on 80 percent of that recommended by AWWA M41 Table 11-4 and 11-5 or manufacturer's installation and warranty instructions.

After making joint deflection, tighten bolts to normal range of bolt torque recommended by manufacturer or AWWA M41 Table 11-3.

351-1.5.1.3 Flanged Joints. Flanged joints shall be assembled as follows:

- a) Clean flange surfaces to mate with gasket, removing loose dirt, scale and detritus.
- b) Repair pits, corrosion, dents or scratches which may interfere with proper sealing.
- c) Inspect gasket to verify gasket is of proper material and style, free of defects or damage.
- d) Inspect flange bolts and studs for proper material, size, threading and length.
- e) Clean and lubricate bolt threads and nut contact surfaces using lubricant chemically compatible with all materials involved.
- f) Center gasket on flange.
- g) With gasket centered in place, align mating flange bolt holes. Make sure mating flange faces are flush against gasket prior to bolt-up.
- h) Insert bolts, nuts and washers. Tighten by hand until snug.
- i) Before tightening bolts beyond hand-tight, operate adjacent valves through full range of motion to ensure clear unobstructed operation of discs and other internal parts.
- j) Tighten bolts in sequence by 5lb. increments following a 180-degree opposing sequence.
- k) Since gaskets relax after seating, retighten 24 hours after installation and pressure testing to compensate for any relaxation.
- l) Flange bolt torques shall be as recommended by valve or pipe manufacturer.

351-1.5.1.4 Installation of PE Encasement on Iron Fittings. Provide PE encasement on buried ductile iron and cast iron pipe, fittings, valves and appurtenances in accordance with AWWA C105 and in conformance with these Specifications.

- a) Wrap film snugly around all exterior ferrous surfaces and 8 inches beyond bells, overlapping at least 2 inches at each seam.

- b) Completely encase pipe and prevent contact between pipe and surrounding soil. Prevent soil or bedding material from becoming trapped between pipe and polyethylene.
- c) Do not install polyethylene encasement on pipe sections or fittings to be concrete encased, installed within casing or installed through concrete slope anchors.
- d) Secure polyethylene wrap in place using 2-inch wide plastic tape.
- e) At least 3 circumferential turns of plastic tape shall seal encasement ends over pipe and above valve bonnets.
- f) Place circumferential wraps of tape at 2-foot intervals along pipe barrel to minimize space between polywrap and pipe.
- g) Repair cuts, tears, punctures or damage to polyethylene with adhesive tape or with short length of polyethylene tube cut open, wrapped around pipe and secured in place.

In addition to wrapping ductile iron pipe with polyethylene, wrap service lines of dissimilar metals and the attendant corporation stop with polyethylene or a suitable dielectric tape for a minimum clear distance of 3 feet from the main.

351-1.5.2 through 351-1.5.5 (not used)

351-1.5.6 Valves and Appurtenances. Valves and appurtenances shall be constructed in accordance with the City of Corona Standard Plans and submitted Installation Instructions. Valves and appurtenances shall be pressure tested at the same time connecting pipelines are pressure tested. Valves, operators, or control and instrumentation elements whose pressure rating is less than the test pressure shall be protected or isolated during pressure testing.

351-1.5.7 Service Connections. Service connections shall be constructed in accordance with the City of Corona Standard Plans. Minimum service connection size shall be 1 inch. Where mains are laid in paved streets, service connections 2 inches and smaller shall be installed by boring rather than by cutting the pavement unless prior written approval from the Engineer is obtained to avoid conflict with other utilities.

Service laterals shall be placed under curbs and gutters by boring rather than by open trenching. The letter "W" shall be inscribed in the center of the curb face in line with each meter installation. The "W" shall be approximately 1½ inches high and 1/16 inch deep. No kinks, flats, crushes or other reductions in the diameter of service laterals will be permitted.

351-1.5.8 Fire Hydrant Installation. Fire hydrants shall be constructed in accordance with the City of Corona Standard Plans. The hydrant lateral shall be flushed through each fire hydrant with a City of Corona Fire Department Representative present to test for maximum fire flow capabilities. The Contractor shall notify the Fire Department 72 hours in advance of such test.

351-1.6 Verification Testing

351-1.6.1 not used

351-1.6.2 Testing Pressure Pipelines.

351-1.6.2.1 Pressure Test Preparation. Four-hour hydrostatic pressure test shall proceed prior to placing permanent surfacing, but after the following have occurred:

- a) Pipe appurtenances and permanent thrust blocks shall be installed and backfilled sufficiently to provide the required bearing area.
- b) Trench backfill involving compactive effort using heavy-duty compacting equipment weighing more than 100 pounds shall be completed.
- c) Thrust blocks and other field-placed concrete and mortar in contact with the pipe shall have been in place and allowed to cure for at least 14 days.
- d) Valves shall be verified by the Contractor to be bubble-tight and closed where available.
- e) Butterfly valves or other valves having a working pressure rating less than the test pressure shall be braced and blocked by the Contractor to provide a minimum back-pressure on these devices equal to the difference between the test pressure the valve or device's rated working pressure.
- f) Temporary bulkheads shall be placed in the pipe where valves are not available.
- g) Air test gauges shall be laboratory calibrated no more than one year prior to test.
- h) Contractor shall make arrangements to meter, pay for, deliver and dispose of test water.
- i) At least 24 hours before the test the pipeline shall be filled slowly with the air vents open and maintained at operating pressure for at least 24 hours to satisfy any system water absorption.
- j) Air shall be expelled from the pipeline to the best of the Contractor's ability.
- k) Bulkheads, valves, and connections shall be examined for leaks and corrective measures shall be taken to eliminate any leaks discovered.
- l) The Engineer shall be present to verify testing and record results.
- m) The Engineer shall be allowed to verify all intermediate valves are in the open position so "short-sheeting" cannot occur during pressure testing.

351-1.6.2.2 Pressure Testing. Pressure testing shall conform to Table 351-1.6.2.2.

TABLE 351-1.6.2.2

Item	Test for	Test Standard
Water Pipelines	4-hour Hydrostatic Pressure Test	AWWA C600 Section 5 as amplified below Unless otherwise shown, test at 200 psi or 50 psi in excess of working pressure shown on Plans, whichever is greater. Measure pressure at lowest point on pipeline Maximum length of pipe included in one pipe shall be 2,500 lineal feet or the distance between valves, whichever is greater.
Force Mains or Pressure Sanitary Sewers		AWWA C600 Section 5 as amplified below Unless otherwise shown, test at 120% of maximum working pressure shown on Plans. Measure pressure at lowest point on pipeline.

	Maximum length of pipe included in one pipe shall be 2,500 lineal feet or the distance between valves, whichever is greater.
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Pump pressure in pipeline to specified test pressure following 24-hour soak period. When test pressure has been reached, discontinue pumping until line pressure has dropped 10 psi, at which time line pressure shall again be pumped up to test pressure. Repeat procedure until 4 hours have elapsed from time test pressure was first applied. At end of this period, pump pressure up to test pressure for the last time.

Leakage shall be computed as the total quantity of water pumped into the pipeline during the test period, including water added to reach specified test pressure for final time. Leakage shall not exceed rate specified for type of pipe tested. Repeat testing until leakage does not exceed specified leakage rate. Repair all visible leaks regardless of amount of leakage.

When leakage exceeds the amount allowed by the Specifications, the Contractor shall locate the leaks and make the necessary repairs or replacements in accordance with the Specifications to reduce the leakage or infiltration to the specified limits. Individual detectable leaks shall be repaired, regardless of the results of the tests.

351-1.6.2.3 Allowable Leakage. No pipe installation will be accepted if leakage exceeds that determined by the following formula (taken from AWWA C600 or AWWA C605):

$$L = (SD\sqrt{P}) / 148,000$$

in which:

L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average observed test pressure of the pipe being tested, as shown, in pounds per square inch gauge, based on elevation of lowest point in line or section under test and corrected to elevation of test gauge.

When testing against closed valves, an allowance of 0.0078 gallons per hour per inch of nominal valve size may be added to that computed using the formulas above to account for leakage around seals.

Allowable leakage shall conform to Table 351-1.6.2.2.

TABLE 351-1.6.2.2

Allowable Leakage in Pipe (Gallons per Hour per 1000 feet of Pipe)					Additional Allowable Leakage through Seals of Closed Valves (Gallons per Valve)
Pipe Diameter	Test Pressure				All Pressures
	150 psi	200 psi	250 psi	300 psi	
3"	0.25	0.29	0.32	0.35	0.02
4"	0.33	0.38	0.43	0.47	0.03
6"	0.50	0.57	0.64	0.70	0.05
8"	0.66	0.76	0.85	0.94	0.06
10"	0.83	0.96	1.07	1.17	0.08
12"	0.99	1.15	1.28	1.40	0.09
14"	1.16	1.34	1.50	1.64	0.11
16"	1.32	1.53	1.71	1.87	0.12
18"	1.49	1.72	1.92	2.11	0.14
20"	1.66	1.91	2.14	2.34	0.16
24"	1.99	2.29	2.56	2.81	0.19
30"	2.48	2.87	3.21	3.51	0.23
36"	2.98	3.44	3.85	4.21	0.28
42"	3.48	4.01	4.49	4.92	0.33
48"	3.97	4.59	5.13	5.62	0.37
54"	4.47	5.16	5.77	6.32	0.42
60"	4.97	5.73	6.41	7.02	0.47
64"	5.30	6.12	6.84	7.49	0.50

351-1.6.2.4 Test Water Disposal. Test or flushing water may be discharged to sanitary sewer system rather than discharging to storm drain, provided Contractor obtains and submits to Owner a copy of written permission to discharge from sanitary sewer owner including supplementary information described above under Submittals. Schedule discharges to sewers during off-peak periods as recommended by sewer owner.

351-1.6.2.5 Capping of Test Outlets. Upon satisfactory test completion, permanently cap or plug any outlets used for flushing, testing or air release.

351-1.6.3 Testing of Valves and Appurtenances. Field testing of valves and appurtenances shall conform to Table 351-1.6.3.

TABLE 351-1.6.3

Item	Test for	Test Standard
Valves and Appurtenances	Installation and Leakage	Visual Inspection for drip-tight service under pressure for all joints and for all valves in closed position.
	Anchorage and Support of Exposed Pipe	Visual inspection of finished installation. support per California Plumbing Code Table 3-1 and 3-2
	Pressure Test	See 351-1.6.2.5

	Bacteriological Test	See 351-1.6.4
	Valve Actuators	Operate valve through 10 full cycles of opening and closing. Valve shall operate from full open to full close without sticking, or binding and without required operating torque exceeding 150 ft-lbs at any point
	Field Performance	Demonstrate compliance to Contract Documents, AWWA standards and manufacturer's printed literature
	11-month Warranty Inspection	See 351-1.6.5

351-1.6.4 Disinfection, Testing, Flushing and Dechlorinating.

351-1.6.4 Disinfection of Potable Water Facilities. Disinfect all potable water facilities in accordance with AWWA C651 and these Specifications. Where the City's standard is more stringent than the associated AWWA standards, the City's standard shall supersede the AWWA standard.

Disinfection operations shall be scheduled by the Contractor as late as possible during the Contract time period to assure the maximum degree of sterility of the facilities at the time the Work is accepted by the City.

351-1.6.4.1 Submittals. Submittals required as part of the disinfection, testing, flushing and dechlorinating process shall conform to Table 351-1.6.4.1.

TABLE 351-1.6.4.1

Submittal	Description
Disinfection, Testing, Flushing and Dechlorinating Plan	<p>Submit detailed plan showing how Contractor intends to test, disinfect and flush pipeline and dechlorinate discharge from flushing operation. The plan shall include:</p> <ol style="list-style-type: none"> 1. Schematic drawing of project showing sampling points, points of connection, and flushing points. 2. Make and model number of backflow prevention devices and flow meter used to connect to the water system for flushing and testing 3. Calculations for sizing of source water connections, flushing velocities and total quantity, of water, chlorine compounds and dechlorinating chemicals proposed. 4. Detailed work plan and schedule listing each activity required to complete disinfection, flushing, dechlorinating and disposal, and the approximate dates on which each activity will occur. 5. Detailed procedures for each activity. 6. NPDES permit and compliance procedures for initial flushing and flushing during dechlorination of pipelines 7. The appropriate certifications of the laboratory and the disinfection and dechlorination contractor. 8. Emergency contact information.

Written Permission to Discharge into Sewer or Storm Drain	Required from owner of any sanitary sewer or storm drain prior to discharge of flushing water into sewer. Submittal shall include any special requirements for treatment of flushing water prior to sewer discharge, an estimate of expected maximum discharge rate of flushing flow and an analysis of sewer's capacity.
Laboratory Report for Disinfection Testing	Submit report from Engineer-accepted testing laboratory

351-1.6.4.2 Initial Flushing. No entity or agent other than City of Corona DWP staff shall operate any valve or facility of the approved distribution system without the written consent and direct supervision of the DWP Chief Water Operator or designated representative.

Initial flushing shall occur at a minimum flushing velocity of 5.0 fps. The backflow device and metered connection to the potable supply will be sized to meet this minimum flow requirement. Supporting calculations shall be submitted with the disinfection, testing, flushing and dechlorination plan.

The Contractor shall secure and adhere to the NPDES permit. If the Contractor is allowed to operate under the City's Minimis Discharge permit, the Contractor will be charged for the hours necessary to supervise the preparation of lagoons, sampling, and laboratory analysis necessary to ensure compliance. The Contractor shall bear all direct and indirect costs.

All pipelines shall be flushed for sufficient time to achieve 2 exchanges of the total volume of the pipeline as a minimum and until the flushing water exits the pipe in a clear condition having not more than 2 NTU turbidity as measured with a potable turbidity meter and not more than 0.5 mg/L suspended solids as measured in an eimhoff cone at all outlets.

351-1.6.4.3 Disinfecting Pipelines. All potable water pipelines except those appurtenant to hydraulic structures shall be disinfected in accordance with the requirements of ANSI/AWWA C651 using the Continuous-Feed Method as modified herein. Preliminary and final flushing shall be done at the ends of mains, which have been hydrostatically tested.

Disinfection shall not be combined with any other activity such as pressure testing or flushing. Disinfection shall be against a capped or plugged line. The new main will be accepted as a whole and not in portions as they pass inspection. The only exception will be for very large projects where physical separations or test plates are used at predetermined locations and the procedures are clearly detailed in the pre-approval plan.

Contractor shall not allow chlorinated water to remain in contact with internal waterway ports of pumps, valves, and sensor line assemblies for longer than required to perform disinfection process.

All chemicals for chlorination, temporary valves, temporary blow-offs, bulkheads, backflow devices to prevent the strong chlorine solution in the line being disinfected from backflowing into the line supplying the water, or other necessary devices, chemicals or materials shall be furnished by the Contractor. No materials shall be used which would be injurious to the pipeline or its future function. Contractor shall keep adequate chlorine residual testing and indicating apparatus available on site during the entire disinfection period.

Unless otherwise indicated, potable water for testing and disinfecting water pipelines shall be furnished by the Contractor. Contractor shall also make all necessary arrangements for conveying the water to the points of use.

Chlorine for disinfection shall be in the form of liquid chlorine or sodium hypochlorite solution. Liquid chlorine shall be used only:

- a) In combination with appropriate gas flow chlorinators and ejectors;
- b) Under the direct supervision of an experienced technician;
- c) When all safety practices are observed.

Disinfection shall be accomplished by chlorination. Chlorinating and testing operations shall be performed in the presence of the Engineer.

A chlorine-water mixture shall be uniformly introduced into the pipeline by means of a solution-feed chlorinating device. The chlorine solution shall be introduced at one end of the pipeline through a tap in such a manner that as the pipeline is filled with water, the dosage applied to the water entering the pipe shall be 100 mg/l. Contractor shall make 24-hour chlorine residual tests and notify the Engineer of all chlorine test results.

Chlorinated water shall be retained in the pipeline for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual at the pipeline extremities and at other representative points shall be at least 50 mg/l free chlorine.

Placing of HTH capsules or powder in pipe sections during the laying process will not be considered adequate disinfection. After final flushing, Contractor shall plug flushing fittings with devices intended for this purpose at pressure class of pipe. Where water main is coated for disinfection, plugs and outlets shall be similarly coated.

Contractor shall keep and provide accurate documentation of dosing rate (ppm), time of dosing and duration. Dosing agent's name, contact information and signature shall be provided.

Disinfection testing procedure shall be repeated if the initial tests fail to produce satisfactory results. Two consecutive satisfactory test results shall be required after any unsatisfactory test. The tablet method shall not be used for repeated disinfection.

During disinfection, all valves, hydrants, and other accessories shall be operated. All appurtenances shall be disinfected.

351-1.6.4.4 Disinfection of Connections. Pipe and appurtenances used to connect the newly installed water main shall also be disinfected in accordance with AWWA C651.

351-1.6.4.5 Final Flushing. Final Flushing shall be done by the Contractor after satisfactory chlorine residual test results have been returned from the laboratory and accepted by the Engineer. After the applicable retention period, the heavily chlorinated water shall be flushed from the pipeline until chlorine measurements show the concentration in the water leaving the pipeline is no higher than that generally prevailing in the system or is acceptable for the intended use. A reducing agent shall be applied to the water to neutralize thoroughly the chlorine residual remaining in the water.

The following are parameters for flushing after disinfection:

- a) High chlorine concentration water will be flushed completely from the main.

- b) NPDES general discharge permit requires neutralization of the chlorine before it contacts the “waters of the State.” How this will be achieved shall also be covered in the approved flushing and disinfection plan. A field test kit may be used to adjust the neutralization. Samples shall be collected and analyzed by the titration method to demonstrate the effectiveness of the neutralization.
- c) Total chlorine residual will be measured in the source water. A field test kit that measures total and free chlorine and is approved for potable water reporting purposes shall be used. Pool kits are not acceptable. When the same total chlorine residual as measured in the source water is detected at all outlets and no free chlorine is present, then the flushing is complete.
- d) The pipeline shall sit undisturbed for 24 hours before bacteriological sampling.

351-1.6.4.6 Sampling. Sampling shall be accomplished by a certified treatment/distribution operator or an employee of a certified laboratory. This certification shall be evidenced in the approved plan.

The certified treatment/distribution operator or employee of a certified laboratory shall collect a minimum of 2 sets of samples at least 24 hours apart after completion of final flushing. Samples shall be taken at locations indicated in ANSI/AWWA C651.

Samples of water for bacteriologic testing shall be taken from each end of the disinfected main (located downstream of point of introduction of chlorine disinfectant), all branches of the new main and at intermediate points at intervals no greater than 300-feet.

If trench water has entered the new main during construction, or if, in the Engineer’s opinion, excessive dirt or debris have entered the new main, bacteriological samples shall be taken at intervals no greater than 200 feet to the extent such sampling is possible.

Sample points shall conform to those submitted in the approved disinfection plan. After a 24-hour period, a second set of samples shall be collected from the same sample points.

Source water shall also be sampled, or the nearest water quality sample station’s most recent results shall be used to determine the baseline water quality. Source water sampling shall be under the supervision of the City’s Water Production and Distribution Division staff.

Temperature and total chlorine residual shall be measured with a field test kit and recorded by the sampler on the “chain of custody” form. Both sample sets shall be analyzed for total and fecal coliform presence/absence and heterotrophic plate count. The Contractor may choose to request resample to verify or discredit laboratory results when one or two of many are unsatisfactory and a sampling error is suspected. The City of Corona reserves the right to sample for bacteria at its own discretion with notice.

351-1.6.4.7 Bacteriological Testing. The certified treatment/distribution operator or employee of a certified laboratory shall deliver bacteriological samples to a laboratory designated by the Engineer. Passing bacteriological tests on two consecutive days shall be achieved prior to placing the pipeline into service.

Testing procedures shall follow the current edition of the Standard Methods for the Examination of Water and Wastewater. Satisfactory bacteriological results shall be as follows:

- a) No total or fecal coliform,
- b) heterotrophic plate count less than 100CFU and
- c) Cl₂ residual shall be no less than 50 percent of the source water

In the event disinfection fails to produce satisfactory results, the pipe shall be reflashed and shall be resampled and retested. If counts from analysis of the second samples exceed the above criteria, the pipe shall be re-disinfected and shall be resampled and retested until satisfactory results are obtained. The Contractor shall be responsible for all repeat bacteriological testing costs.

351-1.6.4.8 Laboratory Report. Lab results shall be reported on a chain of custody, lab work sheet, or summary letter imprinted with the laboratory's name, address, and phone number. The report will include the field tests and laboratory analysis. The report will be signed by the laboratory director.

The laboratory report shall be submitted for approval to the Engineer. The City will reject the report if any data is missing or suspect due to conflicting indications.

351-1.6.4.9. Dechlorination and Flushing Water Disposal. After chlorination, Contractor shall flush water from line at its extremities until replacement water tests are equal chemically and bacteriologically to those of permanent source of supply.

Contractor shall dechlorinate and remove pollutants from water flushed from water mains in accordance with AWWA C655 and the NPDES Permit applicable for the Water Quality Region in which the discharge occurs. Flushing water may be discharged to the sanitary sewer system as an alternative to discharging to a storm drain, provided the Contractor obtains and submits to the Engineer a copy of written permission to discharge from sanitary sewer owner, including supplementary information described above under Submittals. Contractor shall schedule discharges to sewers during off-peak periods as recommended by the sewer owner.

351-1.6.4.10. Pipeline Commissioning. Pipelines passing disinfection bacteriological testing shall be placed into service within four weeks from date of sampling, or shall be resampled and tested prior to commissioning.

351-1.6.11. Reclaimed Water System Disinfection Procedures. Disinfection of recycled water system components shall proceed as for potable water system components, except calcium hypochlorite tablets or granules may be used to disinfect reclaimed water mains and services.

351-1.6.5 Eleven-Month Anniversary Warranty Inspection. Warranty inspection shall be conducted during the 11th month following completion of Work. The Agency will establish the date for the warranty inspection and will notify the Contractor at least 30 days in advance. If notification of inspection date does not occur within twelve months after final acceptance, the first anniversary inspection shall be considered to be waived.

The following occurrences will be considered to be system failures:

- a) Locations found in warranty inspection where replaced paving has settled below matching grade.
- b) Locations found in warranty inspection where coatings, or paint has peeled, bubbled or cracked, or locations where rusting is evident.
- c) Locations found in warranty inspection where furnished products show visible leakage.

- d) Locations found in warranty inspection where valves or other pipeline equipment fail to perform as described in applicable AWWA standards and manufacturer's printed literature.

The Contractor shall repair defective paving, coating, or painting work identified during warranty inspection by removing deteriorating paving, coating or paint system, cleaning surface, and repaving, recoating or repainting with the same system. Electrically test repaired painted areas. If area of failure exceeds 25 percent of total paved, coated or painted surface for pavement, coating or paint system on any structure or surface, the Contractor shall remove and replace the entire paving, coating or paint system per the original specification.

The Contractor shall repair or replace piping and appurtenances showing visible leakage or failing to perform as described in applicable AWWA standards and manufacturer's printed literature.