The City of SAN DIEGO
Public Utilities Department

NOTE:
This waiver submission may include references to proprietary items and brand name products. These references have been retained in order to provide context for the waiver submission. EPA does not evaluate a waiver based on a proprietary item but reviews the performance-based specifications for the project/products. As such, any references to brand or proprietary items are reviewed on an "or equal" basis by EPA.

Items and pages may have been intentionally redacted or excluded by the EPA. Contact CWSRFWaiver@epa.gov for more information if necessary.

March 11, 2022

Mr. Taetaye Shimeles
Portfolio Manager, Credit Analysis Branch
WIFIA Management Division
Office of Wastewater Management
U.S. Environmental Protection Agency

Subject: Request for Waiver of AIS Provisions for 316SS Stainless-Steel Flanges & Stainless-Steel Butt Weld Elbows for the Pure Water San Diego Program Phase 1: North City Project Water Infrastructure Finance and Innovations Act (WIFIA) Project No. N17125CA

Dear Mr. Shimeles:

The City of San Diego (City) is requesting a product-specific project waiver of AIS provisions be issued for the Pure Water San Diego Program Phase 1: North City Project due to lack of availability for:

- 2-inch to 48-inch 316SS Stainless Steel Flanges (both 150# and 300#) for Slip-On, Weld-Neck, Plate AWWA, Blinds, and Stub-End/Lap Joints
- 3-inch to 18-inch 316SS Stainless Steel Butt Weld Elbows Schedule 10

In accordance with the United States Environmental Protection Agency (USEPA) memorandum, *Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014*, the information required for a waiver to be processed is included below and in the attached documents.

The City believes the State has received other waiver requests for the materials described in the waiver request, for comparable projects. We look forward to hearing from you soon regarding your approval of this waiver request. Please feel free to contact me at (619) 527-7473 if you have any questions or need additional information on this project.

Sincerely,

Michael Marks, P.E.
Senior Civil Engineer
Engineering & Capital Project Department

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Program Background

The San Diego Pure Water San Diego Program Phase 1: North City Project will clean recycled water to produce 30 million gallons per day(mgd) of high-quality purified water, reducing the City's dependence on imported water. The Pure Water San Diego Phase 1 program will provide nearly one-half of San Diego's water supply locally by 2035. The Pure Water Program will include a system of treatment facilities, pump stations, and pipelines to be constructed in multiple phases and will offer a cost-effective investment for San Diego's water demand.

The Project is funded by a loan through WIFIA and the State Water Resources Control Board under the California Water State Revolving Fund (CASRF) program. The Consolidated Appropriations Act of 2014 includes an "American Iron and Steel" (AIS) provision that requires recipients of CASRF assistance to use iron and steel products produced in the United States.

The Project is an important step toward securing a local, drought-resilient water supply for San Diegans for generations to come. Construction of major water infrastructure including pipelines, pump stations, and treatment facilities is taking place in the Morena, Bay Park, Clairemont, University City, Miramar, and Scripps Ranch communities.

The project includes the installation of Stainless-Steel Flanges (2-inch to 48-inch) as well as Stainless-Steel Butt Weld Elbows (3-inch to 18-inch) required as piping joints to assemble the SS piping systems (e.g., SS pipe spooling) together. This network of SS pipes is part of various water purification systems (e.g., Biological Active Carbon (BAC), Ozone, and others). The installation of such products is an integral part of the plant that will supply water to the residents of San Diego.

Table 1: List of Manufacturers

3-inch to 18-inch 316SS Stainless Steel Butt Weld Elbows	2-inch to 48-inch - 316SS Stainless Steel Flanges (both 150# and 300#)
Energy Metals	Texas Flange
Allied Fittings	Scott Forge
Felker Bros	Felker Bros
Ta Chen	Alaskan Copper
Core Pipe	Core Pipe

A detailed justification for the use of foreign construction materials

Based on lead times and pandemic-related conditions, the City's Contractor has reached various manufacturers (see Table 1 for manufacturers) and has not been able to obtain the Stainless-Steel Flanges (2-inch to 48-inch) as well as Stainless-Steel Butt Weld Elbows (3-inch to 18-inch) mentioned above in a timely manner. The current lead times to obtain domestic components are far beyond schedule and will impact the progress significantly. The AIS-compliant components will delay the project by at least eight weeks on the critical path for flanges and elbows.

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General

1. Description of the foreign and domestic construction materials
    a. See table 2 below.
    b. Material: 316 Stainless steel
2. Unit of measure
    a. The unit of measurement is linear feet.
3. Quantity
    a. Refer to Exhibits and Table 2 below.

Table 2: Summary of Products/Quantities/Sizes

Product description	Size(s)	Quantity (Total)
316SS Stainless Steel Flanges (both 150# and 300#)	2"-48"	See Exhibits C
316SS Stainless Steel Butt Weld Elbows	3"-18"	See Exhibits D

4. Price
    a. The total price for 316 Stainless Steel Flanges is shown in Exhibit C.
    b. The total price for 316 Stainless Steel Butt Weld Elbows Schedule 10 is shown in Exhibit D.
5. Time of delivery or availability
    a. The estimated delivery time for the Non-AIS complaint 2-inch to 48-inch 316SS Stainless Steel Flanges is four (4) weeks after an approved submittal.
    b. The estimated delivery time for the Non-AIS complaint 3-inch to 18-inch 316SS Stainless Steel Butt Weld Elbows Schedule 10 is four (4) weeks after an approved submittal.
6. Location of the construction project
    a. The NCPWF & NCPWPS Project is located at:
    4940 and 4960 Eastgate Mall

San Diego, CA 92121

7. Name and address of the proposed supplier
    Santa Fe Winwater Company
    10244 Freeman Avenue
    Santa Fe Springs, CA 90607
8. Project schedule
    a. The project is under construction and is projected to complete by Fall 2025.

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Attachments:

- Exhibit A- Specification Section 40 05 23.01 – Excerpts
- Exhibit B- Specification Section 40 27 02 – Excerpts
- Exhibit C- List of Materials and Prices from Shimmick/Stainless Steel Flanges
- Exhibit D- List of Materials and Prices from Shimmick/Stainless Steel Butt Weld Elbows

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SECTION 40 05 23.01
STAINLESS STEEL PIPE AND TUBING

PART 1 GENERAL

1.01 SUMMARY

A. This section includes: Stainless steel piping and tubing.

B. Related sections:

1. It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor's Work.
2. The following Sections are related to the Work described in this Section. This list of Related Sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the Contractor to see that the completed Work complies accurately with the RFP.
   a. Section 01 33 00, Submittal Procedures.
   b. Section 01 91 14, Equipment Testing and Facility Start-Up.
   c. Section 40 27 00, Process Piping - General.

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME):

1. B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
2. B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24.
3. B16.11 - Forged Fittings, Socket-Welded and Threaded.
4. B31.3 - Process Piping.
5. B36.19 - Stainless Steel Pipe.

B. American Water Works Association (AWWA):

1. AWWA C220 - Stainless Steel Pipe, 1/2 In. and Larger.
2. AWWA C651 - Disinfection of Water Mains.
3. AWWA C652 - Disinfection of Water Storage Facilities.

C. American Welding Society (AWS):

1. D1.6 - Structural Welding Code - Stainless Steel.

D. ASTM International (ASTM):

1. A 182 - Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

2. A 193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
3. A 194 - Standard Specification for Carbon and Alloy Steel Nuts and Bolts for High Pressure or High Temperature Service, or Both.
4. A 240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
5. A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
6. A 276 - Standard Specification for Stainless Steel Bars and Shapes.
7. A 312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
8. A 351 - Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
9. A 380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
10. A 403 - Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings.
11. A 743 - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
12. A 744 - Standard Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service.
13. A 774 - Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Services at Low and Moderate Temperatures.
14. A 778 - Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.
15. A 789 - Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service.
16. A 790 - Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe.
17. A 928 - Standard Specification for Ferritic/Austenitic (Duplex) Stainless Steel Pipe Electric Fusion Welded with Addition of Filler Metal.
18. A 967 - Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.
19. B 622 - Standard Specification for Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube.
20. B 912 - Standard Specification for Passivation of Stainless Steels Using Electropolishing.
21. F 593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

E. NSF International (NSF):

1. Standard 61 - Drinking Water System Components - Health Effects.

1.03 DESIGN REQUIREMENTS

A. Piping layout: Lay out and fabricate piping systems with piping sections as long as possible, while still allowing shipment, so that joints are minimized.

1. Piping design indicated on the Drawings illustrates piping layout and configuration and does not indicate the location of every joint and flexible coupling that may be needed to connect piping sections fabricated in the shop.
2. Add joints and flexible couplings in a manner that achieves intent of maximizing size of individual piping sections.

B. Shop fabrication: Fabricate piping sections in the shop and pickle and passivate at point of manufacture.

C. Field assembly:

1. Field welding is prohibited.
2. Assemble shop-fabricated piping in the field using the joints designed into the piping layout or by using flexible couplings.

1.04 SUBMITTALS

A. Submit as specified in Section 01 33 00, Submittal Procedures.

B. Shop Drawings:

1. Detailed layout drawings:
   a. Dimensions and alignment of pipes.
   b. Location of valves, fittings, and appurtenances.
   c. Location of field joints.
   d. Location of pipe hangars and supports.
   e. Connections to equipment and structures.
   f. Location and details of shop welds.
2. Thickness and dimensions of fittings and gaskets.
3. Photographs, drawings, and descriptions of pipe, fittings, welding procedures, and pickling and passivating procedures.
4. Material specifications for pipe, gaskets, fittings, and couplings.
5. Data on joint types and components used in the system including stub ends, backing flanges, flanged joints, grooved joint couplings and screwed joints.

C. Provide Manufacturer’s Certificate of Source Testing as specified in Section 01 91 14, Equipment Testing and Facility Startup.

D. Provide Manufacturer’s Certificate of Installation and Functionality Compliance as specified in Section 01 91 14, Equipment Testing and Facility Startup.

PART 2 PRODUCTS

2.01 STAINLESS STEEL PIPE

A. General:

1. Pipe sizes specified in the Specifications and indicated on the Drawings are nominal.

B. Wall thickness:

1. Piping 3 inches in nominal diameter and greater:
   a. For general service applications with pressures less than 250 pounds per square inch gauge, pipe diameter 24-inches or less, minimum wall thickness corresponding to Schedule 10S.
   b. For general service applications with pressures less than 250 pounds per square inch gauge, pipe diameter over 24-inches, minimum wall thickness corresponding to the Barlow formula as provided in equation 4-1 of AWWA M11 Steel Pipe: A Guide for Design and Installation, Fourth Edition.
   c. For pressures exceeding 250 pounds per square inch gauge, minimum wall thickness corresponding to Schedule 40S or 80S (depending on test pressure requirement).
2. Piping less than 3 inches in nominal diameter:
   a. Piping with threaded or grooved joints:
      1) Minimum wall thickness corresponding to Schedule 40S.
3. Piping with threaded or grooved joints (24" diameter and smaller):
   a. For general service applications for piping 24" and smaller and with pressures less than 250 pounds per square inch gauge, minimum wall thickness corresponding to Schedule 40S.
4. For general service applications for piping greater than 24" and with pressures less than 250 pounds per square inch gauge, utilize flanged connections, bolted split sleeve couplings, or Vic-Ring (or equal) type grooved coupling systems that maintain full pipe wall thickness.

C. Piping material and manufacturing:

1. Comply with the stainless steel pipe materials as scheduled in the Pipe Materials Schedule on the Drawings.

2. Comply with the requirements outlined in the following table:

Service	Stainless Steel Grade	Pipe Manufacturing Process
Digester Gas, Oxygen and Ozone Service, Membrane and Reverse Osmosis Filtration System Stage 1 Feed, Stage 1-2 Interstage, Permeate Piping, and CIP piping (where indicated) with chloride concentrations less than 1,000 parts per million and/or free chlorine less than 4 parts per million at ambient temperatures.		
Piping 3 inches in nominal diameter and larger	Type 316L or LDX 2101 stainless steel in accordance with ASTM A 240	Type 316L in accordance with ASTM A 778
		Type LDX 2101 in accordance with ASTM A 790
Piping less than 3 inches in nominal diameter	Type 316L or LDX 2101 stainless steel in accordance with ASTM A 240	Type 316L in accordance with ASTM A 312
		Type LDX 2101 in accordance with ASTM A 790
RO System Stage 2-3 Interstage Piping, including Booster Pump/Turbine inlet/outlet/bypass piping, and system concentrate piping upstream of concentrate control valve.		
All piping diameters	Austenitic or duplex grades of material with PREN greater than 33	In accordance with ASTM A 312, ASTM A 778, ASTM A 790, or ASTM A 928
PREN: Pitting Resistance Equivalency Number PREN = Cr% + (3.3 x Mo%) + (16 x N%)		

UNS #	ALLOY	Cr%	Mo%	N%	Other	PREN
N10276	C-276	14.5-16	15-17	-	W 3-4.5	64
S32750	Alloy 2507	24-26	6-8	0.24-0.32	-	48
S32654	654SMO	24-25	7-8	-	-	47
N06625	Alloy 625	20-23	8-10	-	Cb 3.25-4.15	46
N08366	AL6XN	20-22	6-7	-	-	40
N06985	Alloy G	21-23.5	5.5-7.5	-	-	39
S32760	Zeron 100	24-26	3-4	0.2-0.3	W 0.5-1.0	37

UNS #	ALLOY	Cr%	Mo%	N%	Other	PREN
S32205	Alloy 2205	22-23	3-3.5	0.14-0.20	-	34
N08904	904L	19-23	4-5	-	-	32
S31726	317LNM	17-20	4-5	0.1-0.2	-	32
N08825	Alloy 825	19-23.5	2.5-3.5	-	-	27
S32101	LDX-2101	21.5	0.3	0.22	-	26
S31603	316L	16-18	2-3	-	-	23
S30403	304L	18-20	-	-	-	18

D. Fittings for piping 3 inches in nominal diameter and greater:

1. Material: In accordance with ASTM A 240 stainless steel, grade to match the pipe.
2. Manufacturing standard: In accordance with ASTM A 774.
3. Wall thickness of fitting: In accordance with ASME B36.19 for the schedule of pipe specified. Flange pressure rating must meet or exceed pressure rating of adjoining pipe.
4. End configuration: As needed to comply with specified type of joint.
5. Dimensional standards:
   a. Fittings with weld ends: In accordance with ASME B16.11.
   b. Fittings with flanged ends: In accordance with ASME B16.5.

E. Fittings for piping less than 3 inches in diameter:

1. Material: In accordance with ASTM A 240 stainless steel, grade to match the pipe.
2. Manufacturing standard: In accordance with ASTM A 403, Class WP.
3. Wall thickness and dimensions of fitting: In accordance with ASME B16.11 and as required for the schedule of pipe specified.
4. End configuration: As needed to comply with specified type of joint.
5. Forgings in accordance with ASTM A 182, or barstock in accordance with ASTM A 276. Match forging or barstock material to the piping materials.

F. Piping joints:

1. Joint types, piping greater than 2 inches in diameter, general:
   a. Design and shop-fabricate piping sections utilizing any of the following joint types:
      1) Flanged joints.
      2) Grooved joints.
   b. Joints at valves and pipe appurtenances:

1) Provide flanged or lug style valves and flanged pipe appurtenances in stainless steel piping systems with flanged ends. Only welded flanges are allowed when mating with flanged or lug style valves.
2) Where required for installation, field fit, or disassembly, provide grooved connections and couplings, whether or not shown on the Drawings.
3) Design and fabricate piping sections to make connections with flanged valves and pipe appurtenances using flanged coupling adapters or flanged joints.
a) Flexible couplings and flanged coupling adapters: Provide stainless steel construction with materials matching the piping system.

c. Joints in membrane and reverse osmosis filtration systems for piping 24" diameter and less:
1) Aboveground piping: Welded, flanged, or grooved.
2) Underwater piping: Welded or flanged.
3) Buried piping: Flanged or mechanically restrained.

d. Joints in membrane and reverse osmosis filtration systems for piping greater than 24 inches in diameter:
1) Aboveground piping: Welded, flanged, or bolted split sleeve.
2) Underwater piping: Welded or flanged.
3) Buried piping: Flanged or mechanically restrained (i.e. bolted split sleeve).

2. Joints in piping 2 inches in diameter and smaller: Flanged, grooved, or screwed with Teflon tape thread lubricant.
3. Welded joints:
a. Pipe 12 inches and larger in diameter: Automatically weld joints using gas tungsten-arc procedures.
b. Piping 4 inches through 12 inches in diameter: Double butt welded joints.
c. Piping less than 4 inches in diameter: Single butt-welded joints.
d. Mark each weld with a symbol that identifies the welder.
4. Flanged joints: Conforming to the requirements in accordance with ASME B16.47 or ASME B16.5, Class 150, 300, or 600.
5. Piping stub ends and backing flanges for pipe 3 inches and larger:
a. Piping stub ends: Cast stainless steel to match the pipe material with machined gasket and wetted surfaces of stub ends free of crevices, pits, cracks and protrusions.
1) Manufacturers: The following or equal:
a) Alaskan Copper Works, Figure SK-38.

b. Backing flanges: Forged or plate stainless steel (type to match pipe material) with drilled bolt patterns in accordance with ASME B16.1 Class 125; ASME B16.47 or ASME B16.5, Class 150, 300 or 600, as scheduled.
1) Manufacturers: The following or equal:

a) Alaskan Copper Works, Figure SK-39 (tube) or SK-39P (pipe).

2) Stub ends and backing flanges are not allowed for use with wafer style or lugged style valves.

6. Flanges for Schedule 40S and Schedule 80S pipe:
   a. Provide forged stainless steel (type matching piping system) welding neck flanges or slip-on flanges in accordance with ASME B16.5 Class 150, 300 or 600.
   b. Material: In accordance with ASTM A 182.
7. Grooved joints:
   a. Pressure less than 500 pounds per square inch:
      1) Cut grooves from Schedule 40 or higher.
      2) Pressure greater than 500 pounds per square inch and less than 1,200 pounds per square inch:
         a) Cut grooves from Schedule 80.
   b. Heavier schedule pipe sections used for cut groove ends:
      1) Tapered inside diameter to transition from the inside diameter of the lighter schedule pipe.
   c. Butt welds connecting pipes of different schedules that leave an abrupt change in inside diameter are not allowed.
   d. Couplings:
      1) Rigid type, cast from ductile iron, Victaulic Style 07 or equal.
      2) Type 316 (Grade CF-8M) stainless steel in accordance with ASTM A 351, A 743, and A 744.
         a) Bolts: Stainless steel in accordance with ASTM F 593, Group 2, Condition CW.
         b) Nuts: Silicon bronze
         c) Manufacturers: The following or equal:
            (1) Piedmont Pacific Corporation.
            (2) Victaulic Style 489 Rigid Coupling.

G. Gaskets:

1. All service applications: chloramine resistant EPDM or nitrile, compatible with the process fluid.
2. Conforms to ASME B16.21.

H. Bolts for flanges and stub end/backing flanges:

1. Bolts and nuts: Type 316 stainless steel in accordance with ASTM A 193 heavy hex head.
   a. Bolt length such that after installation, end of bolt projects 1/8-inch to 3/8-inch beyond outer face of nut.
   b. Nuts: In accordance with ASTM A 194 heavy hex pattern.
2. For membrane and reverse osmosis applications: Bolts and nuts: Type 316 stainless steel in accordance with ASTM A 351, A 743 and A 744.
   a. Bolts: Stainless steel in accordance with ASTM F 593, Group 2, Condition CW.
   b. Nuts: Silicon bronze.

I. Fabrication of pipe sections:

1. Welding: Weld in accordance with ASME B31.3.
2. Weld seams:
   a. Full penetration welds, free of oxidation, crevices, pits and cracks, and without undercuts.
   b. Provide weld crowns of 1/16 inch with tolerance of plus 1/16 inch and minus 1/32 inch.
   c. Where internal weld seams are not accessible, use gas tungsten-arc procedures with internal gas purge.
   d. Where internal weld seams are accessible, weld seams inside and outside using manual shielded metal-arc procedures.

J. Cleaning (pickling) and passivation:

1. Following shop fabrication of pipe sections, straight spools, fittings, and other piping components, clean (pickle) and passivate fabricated pieces.
2. Clean (pickle) and passivate in accordance with ASTM A 380 or A 967.
   a. If degreasing is required before cleaning to remove scale or iron oxide, cleaning (pickling) treatments with citric acid are permissible.
      1) However, these treatments must be followed by inorganic cleaners such as nitric acid/hydrofluoric acid.
   b. Passivation treatments with citric acid are not allowed.
3. Finish requirements: Remove free iron, heat tint oxides, weld scale, and other impurities, and obtain a passive finished surface.

K. Electropolishing:

1. Required for the following stainless steel piping:
   a. Pipe interior: All piping.
   b. Pipe exterior: All piping except concrete encased piping.
2. For piping greater than 2-inches in diameter:
   a. Electropolish stainless steel pipe inside and out in accordance with ASTM B 912.
      1) Electropolish process: Remove no more than 5 micrometers from the surface.
   b. Following shop fabrication of pipe sections, straight spools, fittings, and other components, prepare surface using preparatory and cleaning procedures in accordance with ASTM A 380.
      1) Wipe all items with appropriate solvent to remove any marks, sugar, markers, or crayon.
   c. A post dip in room temperature 10 to 30 percent nitric acid solution is required to remove residuals from the electropolishing process and to provide a shine to the metal surface.
      1) Follow the post dip procedure by final rinsing with water to remove residual acid or any other materials that may affect the appearance or performance of the passivated part.
   d. Finished surfaces: Free of imperfections such as pitting, etches, burn marks or stains.
3. For piping less than 2-inches in diameter:

a. Following shop fabrication of piping sections, descale, clean and seal piping section in accordance with CGA Standard G-4.1.

2.02 STAINLESS STEEL TUBING

A. Stainless steel tubing:

1. For Sulfuric Acid: Seamless tubing made of Alloy 20 stainless steel and in accordance with ASTM B729, wall thickness not less than 0.035 inch.
2. For RO Trains:
   a. With chloride concentrations between 250 to 1,000 parts per million and free chlorine concentrations less than 4 parts per million at ambient temperatures: Seamless tubing made of Type 316L stainless steel in accordance with ASTM A 269, wall thickness not less than 0.035 inch.
   b. With chloride concentrations greater than 1,000 parts per million and less than 10,000 parts per million: Seamless tubing made of austenitic or duplex stainless steel with PREN greater than 33 in accordance with ASTM A 789 or B 622, wall thickness not less than 0.035 inch.
   c. With chloride concentrations greater than 10,000 parts per million: Seamless tubing made of austenitic or duplex stainless steel with PREN greater than 40 in accordance with ASTM A 789 or B 622, wall thickness not less than 0.035 inch.
3. For all other service: Seamless tubing made of Type 316L stainless steel and in accordance with ASTM A269, wall thickness not less than 0.035 inch.
4. For all chemical service: Tubing greater that ½” in diameter shall have welded fittings.

B. ½” Fittings: Swage ferrule design:

1. Components made of material to match tubing.
2. Double acting ferrule design, providing both a primary seal and a secondary bearing force.
3. Flare type fittings are not acceptable.
4. Manufacturers: One of the following or equal:
   a. Crawford Fitting Company, Swagelok.
   b. Hoke, Gyrolok.
   c. Parker, CPI.

C. ½” Valves for use with stainless steel tubing:

1. Ball type valves with swage ends to match tubing diameter.
2. Components made of material to match tubing.
3. Manufacturers: The following or equal:
   a. Crawford Fitting Company, Swagelok.

D. >1/2” Valves for use with stainless steel tubing:

1. Material components to match tubing material.
2. Manufactures: The following or equal:
   a. Conbraco, Apollo Valves

2.03 SPARE PARTS (NOT USED)

2.04 SOURCE QUALITY CONTROL

A. Visually inspect pipe for welding defects such as crevices, pits, cracks, protrusions, and oxidation deposits.

B. Provide written certification that the pipe as supplied are in accordance with ASTM A 778. Supplemental testing is not required.

C. Provide written certification that the fittings as supplied are in accordance with ASTM A 774.

D. Supplementary testing is not required.

E. Thoroughly clean any equipment before use in cleaning or fabrication of stainless steel.

F. Storage: Segregate location of stainless steel piping from fabrication of any other piping materials.

G. Shipment to site:

1. Protect all flanges and pipe ends by encapsulating in dense foam.
2. Securely strap all elements to pallets with nylon straps. Use of metallic straps is prohibited.
3. Cap ends of tube, piping, pipe spools, fittings, and valves with non-metallic plugs.
4. Load pallets so no tube, piping, pipe spools, fittings, or valves bear the weight of pallets above.
5. Notify Engineer when deliveries arrive so Engineer may inspect the shipping conditions.
6. Engineer may reject material due to improper shipping methods or damage during shipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping in such a manner as not to impart strain to connected equipment.

B. Slope horizontal lines so that they can be drained completely.

C. Provide valve drains at low points in piping systems.

D. Install eccentric reducers where necessary to facilitate draining of piping system.

E. Provide access for inspection and flushing of piping systems to remove sediment, deposits, and debris.

3.02 FIELD ASSEMBLY OF SHOP-FABRICATED PIPING SECTIONS

A. Join shop-fabricated piping sections together using backing flanges, flexible couplings, flanged coupling adapters, grooved couplings, or flanges.

3.03 FIELD QUALITY CONTROL

A. Test piping to pressure and by method as specified in Section 40 05 00.09, Piping Systems Testing.

1. If pressure testing is accomplished with water:
    a. Use only potable quality water.
    b. Piping: Thoroughly drained and dried or place immediately into service.

B. Visually inspect pipe for welding defects such as crevices, pits, cracks, protrusions, and oxidation deposits.

3.04 PROTECTION

A. Preserve appearance and finish of stainless steel piping by providing suitable protection during handling and installation and until final acceptance of the Work.

1. Use handling methods and equipment to prevent damage to the coating, include the use of wide canvas slings and wide padded skids.
2. Do not use bare cables, chains, hooks, metal bars, or narrow skids.
3. Store stainless steel piping and fittings away from any other piping or metals. Storage in contact with ground or outside without projection from bad weather is prohibited.
4. Protect stainless steel piping and fittings from carbon steel projections (when grinding carbon steel assemblies in proximity) and carbon steel contamination (do not contact stainless steel with carbon steel wire brush or other carbon steel tool).
5. Electropolished stainless steel:
    a. Do not handle with bare hands or gloves contaminated with oils, metals, or other materials. Use disposable latex gloves or equivalent with handling.
    b. Clean, repair, or replace damaged, stained, scarred or dirty electropolished stainless steel to restore shop-finish quality.

3.05 COMMISSIONING AND PROCESS START-UP REQUIREMENTS

A. As specified in Section 01 91 14, Equipment Testing and Facility Startup and this Section.

B. Manufacturer services:

1. Provide Manufacturer’s Certificate of Source Testing.
2. Provide Manufacturer’s Certificate of Installation and Functionality Compliance.

			Manufacturer Rep Onsite					
Source Testing (Witnessed or Non-witnessed)	Training Requirements		Installation Testing		Functional Testing		Process Operational Period	
	Maintenance (hrs per session)	Operation (hrs per session)	Trips	Days (each trip)	Trips	Days (each trip)	Trips	Days (each trip)
Non-witnessed	Not required		Not required		Not required		Not required	

END OF SECTION

SECTION 40 27 02
PROCESS VALVES AND OPERATORS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Gas Association (AGA): 3, Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids.
2. American National Standards Institute (ANSI): Z21.15, Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
3. American Society of Mechanical Engineers (ASME):
   a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
   b. B16.44, Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems up to 5 psi.
4. American Society of Sanitary Engineers (ASSE): 1011, Performance Requirements for Hose Connection Vacuum Breakers.
5. American Water Works Association (AWWA):
   a. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   b. C500, Metal-Seated Gate Valves for Water Supply Service.
   c. C504, Rubber-Seated Butterfly Valves, 3 In. (75 mm) Through 72 In. (1,800 mm).
   d. C508, Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS.
   e. C509, Resilient-Seated Gate Valves for Water Supply Service.
   f. C510, Double Check Valve Backflow Prevention Assembly.
   g. C511, Reduced-Pressure Principle Backflow Prevention Assembly.
   h. C512, Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
   i. C515, Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
   j. C541, Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates.
   k. C542, Electric Motor Actuators for Valves and Slide Gates.
   l. C550, Protective Interior Coatings for Valves and Hydrants.
   m. C606, Grooved and Shouldered Joints.
   n. C800, Underground Service Line Valves and Fittings.
6. ASTM International (ASTM):
   a. A276, Standard Specification for Stainless Steel Bars and Shapes.
   b. A351/A351M, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.

c. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
d. A564/A564M, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
e. B61, Standard Specification for Steam or Valve Bronze Castings.
f. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
g. B98/B98M, Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.
h. B127, Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
i. B139/B139, Standard Specification for Phosphor Bronze Rod, Bar and Shapes.
j. B164, Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.
k. B194, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.
l. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
m. D429, Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates.
n. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

7. Canadian Standards Association, Inc. (CSA): 9.1, Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
8. Chlorine Institute (CI): Pamphlet 6, Piping Systems for Dry Chlorine.
9. FM Global (FM).
10. Food and Drug Administration (FDA).
11. International Association of Plumbing and Mechanical Officials (IAPMO).
12. Manufacturers Standardization Society (MSS):
    a. SP-80, Bronze Gate, Globe, Angle, and Check Valves.
    b. SP-81, Stainless Steel, Bonnetless, Flanged Knife Gate Valves.
    c. SP-85, Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.
    d. SP-88, Diaphragm Valves.
    e. SP-110, Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
13. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
14. NSF International (NSF):
    a. NSF/ANSI 61, Drinking Water System Components - Health Effects.
    b. NSF/ANSI 372, Drinking Water System Components - Lead Content.
15. Underwriters Laboratories (UL).

16. USC Foundation for Cross-Connection Control and Hydraulic Research.

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Product data sheets for each make and model. Indicate valve Type Number, applicable Tag Number, and facility name/number or service where used.
   b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
   c. Certification for compliance to NSF/ANSI 61 and 372 for valves used for drinking water service.
   d. Power and control wiring diagrams, including terminals and numbers.
   e. For each power actuator provided, manufacturer's standard data sheet, with application specific features and options clearly identified for Engineer's approval.
   f. Orientation schedule showing confirmation that orientation shown on the Drawings meets installation requirements of the actuator and that handwheels and push button controls are visible from normal access corridor.
   g. Sizing calculations for open-close/throttle and modulating valves.
   h. Anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Manufacturer's Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements for:
   a. Electric actuators; full compliance with AWWA C542.
   b. Butterfly valves; full compliance with AWWA C504.
3. Component and attachment testing seismic certificate of compliance as required by Section 01 45 33, Special Inspection, Observation, and Testing.
4. Tests and inspection data.
5. Operation and Maintenance Data as specified in Section 01 78 23, Operation and Maintenance Data.
6. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.

PART 2 PRODUCTS

2.01 GENERAL

A. Valves to include operator, actuator, handwheel, chain wheel, extension stem, floor stand, operating nut, chain, wrench, and accessories to allow a complete operation from the intended operating level.

B. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.

C. Valve same size as adjoining pipe, unless otherwise called out on Drawings or in Supplements.

D. Valve ends to suit adjacent piping.

E. Resilient seated valves shall have no leakage (drip-tight) in either direction at valve rated design pressure. All other valves shall have no leakage (drip-tight) in either direction at valve rated design pressure, unless otherwise allowed for in this section or in stated valve standard.

F. Size operators and actuators to operate valve for full range of pressures and velocities.

G. Valve to open by turning counterclockwise, unless otherwise specified.

H. Factory mount operator, actuator, and accessories.

I. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.

1. Use or reuse of components and materials without a traceable certification is prohibited.

2.02 SCHEDULE

A. Additional requirements relative to this section are shown on Electric Motor Actuated Valve Schedule, Pneumatic Actuated Valve Schedule, and Self-Regulated Valve Schedule located at the end of this section.

2.03 MATERIALS

A. Bronze and brass valve components and accessories that have surfaces in contact with water to be alloys containing less than 16 percent zinc and 2 percent aluminum.

1. Approved alloys are of the following ASTM designations: B61, B62, B98/B98M (Alloy UNS No. C65100, C65500, or C66100),

B139/B139M (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164, B194, and B127.

2. Stainless steel Alloy 18-8 may be substituted for bronze.

B. Valve materials in contact with or intended for drinking water service to meet the following requirements:

1. Materials to comply with requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements.
2. Coatings materials to be formulated from materials deemed acceptable to NSF/ANSI 61 and 372.
3. Supply certification product is certified as suitable for contact with drinking water by an accredited certification organization in accordance with NSF/ANSI 61 and 372. Provide certification for each valve type used for drinking water service.

2.04 FACTORY FINISHING

A. General:

1. Interior coatings for valves and hydrants shall be in accordance with AWWA C550, unless otherwise specified.
2. Exterior coating for valves and hydrants shall be in accordance with Section 09 90 00, Painting and Coating.
3. Material in contact with potable water shall conform to NSF/ANSI 61 and 372.
4. Exposed safety isolation valves and lockout valves with handles, handwheels, or chain wheels shall be “safety yellow.”

B. Where epoxy lining and coating are specified, factory finishing shall be as follows:

1. In accordance with AWWA C550.
2. Either two-part liquid material or heat-activated (fusion) material except only heat-activated material if specified as “fusion” or “fusion bonded” epoxy.
3. Minimum 7-mil dry film thickness except where limited by valve operating tolerances.

2.05 VALVES

A. Gate Valves:

1. General:
   a. AWWA gate valves to be in full compliance with stated AWWA standard and the following requirements:
      1) Provide 2-inch operating nut and handwheel for AWWA gate valves 12 inches and smaller.
      2) Provide totally enclosed spur or bevel gear operator with indicator for AWWA gate valves 14 inches and larger.

3) Provide Affidavit of Compliance per the applicable AWWA standard for AWWA gate valves.
4) Mark AWWA gate valves with manufacturer's name or mark, year of valve casting, valve size, and working water pressure.
5) Repaired AWWA gate valves shall not be submitted or supplied.
6) Supply AWWA gate valves with stainless steel bolting.
7) AWWA C509 and AWWA C515 valves may be substituted for each other.

2. Type V100 Gate Valve 3 Inches and Smaller:
   a. All-bronze, screwed bonnet, packed gland, single solid wedge gate, non-rising stem, Class 125 rated 200 pounds per square inch CWP, complies with MSS SP-80 Type 1.
   b. Manufacturers and Products:
      1) Crane; Figure 438, NPT threaded ends.
      2) Stockham; Figure B103, NPT threaded ends.
      3) Crane; Figure 1324, soldered ends.
      4) Stockham; Figure B104, soldered ends.
      5) Or equal.
3. Type V101 Gate Valve 3 Inches and Smaller:
   a. All-bronze, screwed bonnet, packed gland, single solid wedge gate, rising stem, Class 125 rated 200 pounds per square inch CWP, complies with MSS SP-80 Type 2.
   b. Manufacturers and Products:
      1) Crane; Figure 428, NPT threaded ends.
      2) Stockham; Figure B-100, NPT threaded ends.
      3) Crane; Figure 1334, soldered ends.
      4) Stockham; Figure B-108, soldered ends.
      5) Or equal.
4. Type V102 Gate Valve 3 Inches and Smaller:
   a. All-bronze, screwed bonnet, packed gland, NPT threaded ends, single solid wedge gate, non-rising stem, Class 150 rated 150 pounds per square inch SWP/300 pounds per square inch CWP, complies with MSS SP-80 Type 1.
   b. Manufacturers and Products:
      1) Crane; Figure 437.
      2) Stockham; Figure B-128.
      3) Or equal.
5. Type V103 Gate Valve 3 Inches and Smaller:
   a. All-bronze, screwed bonnet, packed gland, NPT threaded ends, single solid wedge gate, rising stem, Class 150 rated 150 pounds per square inch SWP/300 pounds per square inch CWP, complies with MSS SP-80 Type 2.
   b. Manufacturers and Products:
      1) Crane; Figure 431.
      2) Stockham; Figure B122.
      3) Or equal.

6. Type V104 Gate Valve 3 Inches and Smaller:
   a. All-bronze, screwed bonnet, packed gland, NPT threaded ends, single solid wedge gate, non-rising stem, stainless steel seat rings, Class 200 rated 200 pounds per square inch SWP/400 pounds per square inch CWP, complies with MSS SP-80 Type 1.
   b. Manufacturers and Products:
      1) Crane; Figure 426.
      2) Stockham; Figure B-140.
      3) OR equal.
7. Type V105 Gate Valve 3 Inches and Smaller:
   a. All-bronze, screwed bonnet, packed gland, NPT threaded ends, single solid wedge gate, rising stem, Class 200 rated 200 pounds per square inch SWP/400 pounds per square inch CWP, complies with MSS SP-80 Type 2.
   b. Manufacturers and Products:
      1) Crane; Figure 424.
      2) Stockham; Figure B-132.
      3) Or equal.
8. Type V106 Gate Valve 2 Inches and Smaller:
   a. All-bronze, screwed bonnet, packed gland, NPT threaded ends, single solid wedge gate, non-rising stem, stainless steel seat rings, Class 300 rated 300 pounds per square inch SWP/1,000 pounds per square inch CWP, complies with MSS SP-80 Type 1.
   b. Manufacturers and Products:
      1) Crane; Figure 636E.
      2) Stockham; Figure B-147.
      3) Or equal.
9. Type V107 Gate Valve 2 Inches and Smaller:
   a. All-bronze, screwed bonnet, packed gland, NPT threaded ends, single solid wedge gate, rising stem, stainless steel seat rings, Class 300 rated 300 pounds per square inch SWP/1,000 pounds per square inch CWP, complies with MSS SP-80 Type 2.
   b. Manufacturers and Products:
      1) Crane; Figure 634E.
      2) Stockham; Figure B-145.
      3) Or equal.
10. Type V108 Gate Valve 2 Inches to 24 Inches:
    a. Iron body, bronze mounted, flanged ends, solid wedge gate, non-rising bronze stem, Class 125 rated 125 pounds per square inch SWP, 200 pounds per square inch CWP for 2 inches through 12 inches and 100 pounds per square inch SWP, 150 pounds per square inch CWP for 14 inches through 24 inches.
    b. Manufacturers and Products:
       1) Crane; Figure 461.
       2) Stockham; Figure G612.
       3) Or equal.
11. Type V110 Gate Valve 2 Inches to 24 Inches:

a. Iron body, bronze mounted, flanged ends, solid wedge gate, outside screw and yoke, Class 125 rated 125 pounds per square inch SWP, 200 pounds per square inch CWP for 2 inches through 12 inches and 100 pounds per square inch SWP, 150 pounds per square inch CWP for 14 inches through 24 inches.
b. Manufacturers and Products:
   1) Crane; Figure 465-1/2.
   2) Stockham; Figure G623.
   3) Or equal.

12. Type V120 Gate Valve 3 Inches to 48 Inches for Water Service:
   a. AWWA C500, iron body, bronze mounted, flanged ends, double-disc gate, non-rising bronze stem, working water pressure 200 pounds per square inch for 3 inches through 12 inches and 150 pounds per square inch for 14 inches through 48 inches.
   b. Manufacturers and Products:
      1) M&H Valve Company; Style 67.
      2) Clow Valve Company; AWWA C500.
      3) Or equal.
13. Type V122 Gate Valve 3 Inches to 48 Inches for Buried Water Service:
   a. AWWA C500, iron body, bronze mounted, mechanical joint ends, double-disc gate, non-rising bronze stem, 2-inch operating nut, and O-ring sealed stuffing box, working water pressure of 200 pounds per square inch for 3 inches through 12 inches and 150 pounds per square inch for 14 inches through 48 inches.
   b. Manufacturers and Products:
      1) M&H Valve Company; Style 67.
      2) Clow Valve Company; AWWA C500.
      3) Or equal.
14. Type V124 Gate Valve 16 Inches and Larger for Low Pressure Water Service:
   a. Iron body, bronze mounted, flanged ends, double disc gate, non-rising bronze stem, rated for 50 pounds per square inch, working water pressure, 125 pounds per square inch ASME B16.1 drilling.
   b. Manufacturer and Product: Ludlow-Rensselaer Valve Division of Patterson Industries, Inc.; List 11, or equal.
15. Type V128 Gate Valve 4 Inches Through 30 Inches for Buried High Pressure Water Service:
   a. Iron body, bronze mounted, mechanical joint ends, double disc gate, non-rising bronze stem, O-ring sealed stuffing box, 2-inch square wrench nut conforming to AWWA C500, rated 250 pounds per square inch nonshock cold water.
   b. Manufacturer and Product: M&H; Style 871, or equal.
16. Type V130 Resilient Seated Gate Valve 3 Inches to 12 Inches:
   a. Iron body, resilient seat, bronze stem and stem nut, ASME B16.1 Class 125 flanged ends, non-rising stem**,** in accordance with AWWA C509, minimum design working water

pressure 200 psig full port, fusion-epoxy coated inside and outside per AWWA C550, NSF/ANSI 61 and 372 certified.

b. Manufacturers and Products:
   1) M&H Valve; AWWA C509.
   2) U.S. Pipe; A-USPO.
   3) Or equal.

17. Type V132 Resilient Seated Gate Valve 3 Inches to 12 Inches, for Buried Service:
    a. Iron body, resilient seat, bronze stem and stem nut, mechanical joint ends, non-rising stem, in accordance with AWWA C509, 2-inch operating nut, minimum design working water pressure 200 psig, full port, fusion epoxy coated inside and outside per AWWA C550, NSF/ANSI 61 and 372 certified.
    b. Manufacturers and Products:
       1) M&H Valve; AWWA C509.
       2) U.S. Pipe; A-USPO.
       3) Or equal.
18. Type V134 Resilient Seated Ductile Iron Gate Valve 3 Inches to 36 Inches:
    a. Ductile iron body, resilient seat, bronze stem and stem nut, ASME B16.1 Class 125 flanged ends, A: non-rising stem, in accordance with AWWA C515, minimum design working water pressure C: 200 psig, full port, fusion epoxy coated inside and outside per AWWA C550, NSF/ANSI 61 certified.
    b. Manufacturers and Products:
       1) American Flow Control; Series 2500.
       2) M&H; Style 7000 and C515 Large RW Valves.
       3) Or equal.
19. Type V135 Resilient Seated Ductile Iron Gate Valve 3 Inches to 36 Inches:
    a. Ductile iron body, resilient seat, bronze stem and stem nut, mechanical joint ends, non-rising stem, in accordance with AWWA C515, minimum design working water pressure 200 psig, full port, fusion epoxy coated inside and outside per AWWA C550, NSF/ANSI 61 certified.
    b. Manufacturers and Products:
       1) American Flow Control; Series 2500.
       2) M&H; Style 7000 and C515 Large RW Valves.
       3) Or equal.
20. Type V136 Resilient Seated Gate Valve, Flanged Ends 4 Inches to 12 Inches:
    a. UL Listed and FM Approved, iron body, resilient seat, bronze mounted, ASME B16.1 Class 125 flanged ends, outside screw and yoke, handwheel operator, in accordance with AWWA C509, minimum design working water pressure 200 psig, full port, fusion-epoxy coated inside and outside per AWWA C550, NSF/ANSI 61 certified, Supervisory switch, as specified. Valve

supervised in OPEN position so closing results in actuation of alarm.

b. Manufacturers and Products:
   1) Kennedy Valve; Ken-Seal II.
   2) M&H Valve; Style 4068.
   3) Mueller; R-2360.
   4) Or equal.

21. Type V137 Resilient Seated Gate Valve 4 Inches to 12 Inches:
   a. UL Listed and FM Approved for fire protection, iron body, resilient seat, bronze mounted, ASME B16.1 Class 125 flanged ends, non-rising stem, 2-inch operating nut, in accordance with AWWA C509, design working water pressure 200 psig, full port, fusion-epoxy coated inside and outside per AWWA C550, NSF/ANSI 61 certified indicator post flange and indicator post assembly with lockable handle.
   b. Manufacturers and Products:
      1) Kennedy Valve; Ken-Seal II.
      2) M&H Valve; Style 4067.
      3) Mueller; P-2360.
      4) Or equal.
22. Type V155 Knife Gate Valve 30 Inches and Larger:
   a. Bonnetless wafer body type, outside stem and yoke, rated 50 pounds per square inch CWP minimum, handwheel or floor stand operator as required, self-cleaning, non-clogging, with round port, resilient neoprene seat, drip-tight shutoff.
   b. Wetted metal parts and stem Type 316 stainless steel, yoke sleeve bronze, gate finish ground both sides with a sharp knife edge.
   c. Packing system leak-tight seal around gate, valve superstructure and yoke designed for full peripheral access to gland bolts when valve is equipped with manual or power actuator.
   d. Manufacturers and Products:
      1) DeZurik; Series KGC.
      2) Tyco/Rovang; Model S20.
      3) ITT Fabri-Valve; Figure F37R.
      4) Or equal.

B. Globe Valves:

1. Type V200 Globe Valve 3 Inches and Smaller:
   a. All-bronze, union bonnet, packed gland, inside screw, rising stem, TFE disc, Class 150 rated 150 pounds per square inch SWP/300 pounds per square inch CWP, complies with MSS SP-80 Type 2.
   b. Manufacturers and Products:
      1) Stockham; Figure B-22T, NPT threaded end.
      2) Crane Co.; Figure 7TF, NPT threaded end.
      3) Milwaukee; Model 1590T, soldered ends.
      4) NIBCO; Figure S-235-Y, soldered ends.

5) Or equal.

2. Type V201 Angle Pattern Valve 2 Inches and Smaller:
   a. All-bronze, NPT threaded ends, union bonnet, packed gland, inside screw, rising stem, TFE disc, Class 150 rated 150 pounds per square inch SWP/300 pounds per square inch CWP, complies with MSS SP-80 Type 2.
   b. Manufacturers and Products:
      1) Stockham; Figure B-222T.
      2) Crane Co.; Figure 17TF.
      3) Or equal.
3. Type V202 Globe Valve 3 Inches and Smaller:
   a. All-bronze, union bonnet, packed gland, inside screw, rising stem, replaceable stainless steel tapered plug type disc and seat ring, Class 200 rated 200 pounds per square inch SWP/400 pounds per square inch CWP, complies with MSS SP-80 Type 3.
   b. Manufacturers and Products:
      1) Stockham; Figure B-62, NPT threaded end.
      2) Crane Co.; Figure 212P, NPT threaded end.
      3) Or equal.
4. Type V204 Globe Valve 2 Inches and Smaller:
   a. All-bronze, NPT threaded ends, union bonnet, packed gland, inside screw, rising stem, replaceable stainless steel tapered plug type disc and seat ring, Class 300 rated 300 pounds per square inch SWP/1,000 pounds per square inch CWP, complies with MSS SP-80 Type 3.
   b. Manufacturers and Products:
      1) Crane; Figure 382P.
      2) Stockham; Figure B-74.
      3) Or equal.
5. Type V205 Angle Pattern Valve 2 Inches and Smaller:
   a. All-bronze, NPT threaded ends, union bonnet, packed gland, inside screw, rising stem, replaceable stainless steel tapered plug type disc and seat ring, Class 300 rated 300 pounds per square inch SWP/1,000 pounds per square inch CWP, complies with MSS SP-80 Type 3.
   b. Manufacturers and Products:
      1) Stockham; Figure B-274.
      2) Crane; Figure 384P.
      3) Or equal.
6. Type V208 Needle Disc Type Globe Valve 1/8 Inch to 3/4 Inch:
   a. All-bronze, threaded bonnet, packed gland, rising stem, bronze body and stem, Class 200 rated 200 pounds per square inch SWP/400 pounds per square inch CWP, complies with MSS SP-80.
   b. Manufacturers and Products:
      1) Crane Cat.; No. 88.
      2) Stockham; B-64.
      3) Or equal.

7. Type V209 Needle Disc Type Globe Valve 1/8 Inch to 3/4 Inch:
   a. All-bronze, threaded bonnet, packed gland, rising stem, bronze body and stem, Class 200 rated 200 pounds per square inch SWP/400 pounds per square inch CWP, complies with MSS SP-80.
   b. Manufacturers and Products:
      1) Crane Cat.; No. 89.
      2) Stockham; B-264.
      3) Or equal.
8. Type V210 Globe Valve 2 Inches to 10 Inches:
   a. Iron body, bronze mounted, flanged ends, bronze seat, outside screw and yoke, bolted bonnet, Class 125 rated 125 pounds per square inch SWP/200 pounds per square inch CWP, complies with MSS SP-85 Type 1.
   b. Manufacturers and Products:
      1) Stockham; G-512.
      2) Crane; Figure 351.
      3) Or equal.
9. Type V234 Angle Type Hose Valve 1/2 Inch to 3/4 Inch:
   a. Bronze or manufacturer's standard brass, angle sillcock type body, threaded or solder inlet as applicable, pressure rating 125 pounds per square inch cold water.
   b. Manufacturer and Product: Nibco; QTX Series, or equal.
10. Type V235 Angle Type Hose Valve 3/4 Inch:
    a. 3/4-inch NPT female inlet, 3/4-inch male hose thread outlet, heavy rough brass body rated 125 pounds per square inch, lockshield bonnet, removable handle, atmospheric vacuum breaker conforming to ASSE 1011 and IAPMO code.
    b. Manufacturers and Products:
       1) Acorn; 8126, surface pipe mount valve, bent nose without flange.
       2) Acorn; 8121, surface mount through wall valve, bent nose with flange.
       3) Acorn; 8131, pipe and pedestal mounted valve located above 6 inches, straightnose.
       4) Acorn; 8136, pedestal mounted valve located lower than 6 inches, inverted nose.
       5) Or equal.
11. Type V236 Globe Style Hose Valve 1 Inch to 3 Inches:
    a. All-bronze, NPT threaded ends, inside screw-type rising stem, TFE disc, cast brass male NPT by male NHT adapter with hexagonal center wrench nut,brass cap with chain, complies with MSS SP-80, rated 300 WOG.
    b. Manufacturers and Products:
       1) Stockham; Figure B-22T.
       2) Crane Co.; Cat. No. 7TF.
       3) Nibco; Figure T-235-Y.
       4) Or equal.

12. Type V237 Angle Pattern Hose Valve 1 Inch to 2 Inches:
    a. All-bronze, NPT threaded ends, inside screw-type rising stem, TFE disc, cast brass male NPT by male NHT adapter with hexagonal center wrench nut,brass cap with chain, complies with MSS SP-80, rated 300 WOG.
    b. Manufacturers and Products:
        1) Stockham; Figure B-222T.
        2) Crane Co.; Cat. No. 17TF.
        3) Nibco; Figure T-335-Y.
        4) Or equal.

C. Ball Valves:

1. Type V300 Ball Valve 3 Inches and Smaller for General Water and Air Service:
    a. Two-piece, standard port, NPT threaded ends, bronze body and end piece, hard chrome-plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, adjustable packing gland, zinc-coated steel hand lever operator with vinyl grip, rated 600-pound WOG, 150-pound SWP, complies with MSS SP-110. For steam service, provide stainless steel ball and stem.
    b. Manufacturers and Products:
        1) Threaded:
            a) Conbraco Apollo; 70-100.
            b) Nibco; T-580-70.
            c) Or equal.
        2) Soldered:
            a) Conbraco Apollo; 70-200.
            b) Nibco; S-580-70.
            c) Or equal.
2. Type V301 Ball Valve 2 Inches and Smaller for General Water and Air Service:
    a. Two-piece, full port, NPT threaded ends, bronze body and end piece, hard chrome-plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, adjustable packing gland, zinc-coated steel hand lever operator with vinyl grip, rated 600-pound WOG, 150-pound SWP, complies with MSS SP-110. For steam service, provide stainless steel ball and stem.
    b. Manufacturers and Products:
        1) Threaded:
            a) Conbraco Apollo; 77-100.
            b) Nibco; T-585-70.
            c) Or equal.
        2) Soldered:
            a) Conbraco Apollo; 77-200.
            b) Nibco; S-585-70.
            c) Or equal.
3. Type V302 Actuator Ready Ball Valve 2 Inches and Smaller for General Water and Air Service:

a. Two-piece, standard port, NPT threaded ends, bronze body and end piece, actuator mounting pad, Type 316 stainless steel ball and stem, vented ball, reinforced PTFE seats and seals, adjustable packing nut, blowout-proof stem, rated 600-pound WOG, 150-pound SWP, complies with MSS SP-110.
b. Manufacturers and Products:
    1) Conbraco Apollo; 71-140.
    2) Milwaukee; 20BSOR-02.
    3) Or equal.

4. Type V303 Ball Valve 2 Inches and Smaller for Equipment Air System Shutoff:
    a. Two-piece, NPT threaded ends, bronze body and end piece, hard chrome-plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, adjustable packing gland, 125 psig rated, safety exhaust port to exhaust downstream side when valve is in closed position, zinc-coated steel locking handle with vinyl grip.
    b. Meets OSHA Regulation 29 CFR Part 1910.147 requirements.
    c. Manufacturers and Products:
        1) Conbraco Apollo; 75-100-41.
        2) Nibco; T-580-70-SV/T-585-70-SV.
        3) Or equal.
5. Type V304 Ball Valve 2 Inches and Smaller for General Water and Air Service:
    a. Three-piece, full port, NPT threaded ends, bronze body and end pieces, hard chrome plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, zinc-plated steel hand lever operator with vinyl grip, rated 600-pound WOG, 150 pounds per square inch SWP, complies with MSS SP-110. For steam service, provide stainless steel ball and stem.
    b. Manufacturers and Products:
        1) Threaded Ends:
            a) Conbraco Apollo; 82-100.
            b) Nibco; T-595-Y.
            c) Stockham; T-395 Series.
            d) Or equal.
        2) Solder Ends:
            a) Conbraco Apollo; 82-200.
            b) Nibco; S-595-Y.
            c) Stockham; S-395 Series.
            d) Or equal.
6. Type V305 Ball Valve 2 Inches and Smaller for Natural Gas Service:
    a. Two-piece bronze or forged brass body and end piece, NPT threaded ends, hard chrome-plated solid brass ball, RTFE seats and seal, blowout-proof stem, zinc-plated hand lever operator with vinyl grip, UL Listed: Guide YRPV for natural/manufactured gas, 600 WOG.
    b. Manufacturers and Products:
        1) Conbraco Apollo; 80-100.

2) Nibco; T-585-70-UL/T-580-70-UL.
3) Or equal.

7. Type V306A Stainless Steel Ball Valve 4 Inches and Smaller:
   a. Two-piece, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end piece, flanged ends, ASTM A276 Type 316 stainless steel ball, reinforced PTFE seats, seals, and packing, adjustable packing gland, blowout proof stainless steel stem, stainless steel lever operator with vinyl grip, actuator mounting pad, rated Class 150, complies with MSS SP-110, provide pressure relief hole on low pressure side of ball. Clean for oxygen/ozone service.
   b. Manufacturers and Products:
      1) Conbraco Apollo; 87A-200 Series.
      2) Milwaukee; F90SS150RN1.
      3) Or equal.
8. Type V306B Alloy 20 Ball Valve 3 Inches and Smaller:
   a. Two-piece, full port, A351-CN7M Alloy 20 body and retainer, ASTM B473 Alloy 20 ball, flanged ends, reinforced PTFE seats, seals and packing, adjustable packing gland, blowout proof stem, stainless steel lever with vinyl grip, actuator mounting pad, rated Class 300.
   b. Manufacturers and Products:
      1) Conbraco Apollo; 87A-500 Series.
      2) Or equal.
9. Type V306C Stainless Steel Ball Valve 1.5 Inches to 10 inches:
   a. Two-piece, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end piece, 300# RF flanged ends, ASTM A276 Type 316 stainless steel ball, reinforced PTFE seats, seals, and packing, adjustable packing gland, blowout proof stainless steel stem, stainless steel lever operator with vinyl grip, rated 700 psig minimum at 100F.
   b. Manufacturers and Products:
      1) Conbraco Apollo; 87A-700 Series.
      2) Milwaukee; F90SS300RN1.
      3) Or equal.
10. Type V307 Stainless Steel Ball Valve 2 Inches and Smaller:
   a. Three-piece, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end pieces, Type 316 stainless steel ball, NPT threaded ends, reinforced PTFE seats, seals, and packing, adjustable packing gland, blowout-proof stainless steel stem, stainless steel lever operator with vinyl grip, rated 800 psig to 1,000 psig CWP, complies with MSS SP-110.
   b. Manufacturers and Products:
      1) Conbraco Apollo; 86R-100/86-500 Series.
      2) Nibco; T-595-S6-R-66-LL.
      3) Or equal.

11. Type V307A Stainless Steel Ball Valve 2 Inches and Smaller:
    a. Three-piece, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end pieces, Type 316 stainless steel ball, NPT threaded ends, reinforced PTFE seats, seals, and packing, adjustable packing gland, blowout-proof stainless steel stem, stainless steel lever operator with vinyl grip, rated 800 psig to 1,000 psig CWP, complies with MSS SP-110.
    b. Manufacturers and Products:
        1) Conbraco Apollo; 86R-100/86-500 Series.
        2) Nibco; T-595-S6-R-66-LL.
        3) Or equal.
    c. Valves scheduled for oxygen or ozone service shall be specifically cleaned, sealed and packaged in compliance with CGA Standard G-4.1.
12. Type V308 Stainless Steel Ball Valve 2 Inches and Smaller:
    a. Two-piece, standard port, NPT threaded ends, ASTM A351/A351M GR CF8M stainless steel body and end pieces, actuator mounting pad, Type 316 stainless steel ball and stem, vented ball, reinforced PTFE seats and seals, adjustable packing nut, blowout-proof stem, rated 1,500 psig WOG minimum, 150 pounds per square inch SWP, complies with MSS SP-110.
    b. Manufacturers and Products:
        1) Conbraco Apollo; 76-100.
        2) Nibco; T-580-S6-R-66-LL.
        3) Milwaukee; 20SSOR-02.
        4) Or equal.
13. Type V308A Stainless Steel Ball Valve 2 Inches and Smaller:
    a. Two-piece, standard port, NPT threaded ends, ASTM A351/A351M GR CF8M stainless steel body and end pieces, Type 316 stainless steel ball and stem, standard ball, reinforced PTFE seats and seals, adjustable packing nut, blowout-proof stem, rated 1,500 psig WOG minimum, 150 pounds per square inch SWP, complies with MSS SP-110.
    b. Manufacturers and Products:
        1) Conbraco Apollo; 76-100-01.
        2) Nibco; T-580-S6-R-66-LL.
        3) Milwaukee; 20SSOR-02.
        4) Or equal.
14. Type V309 Instrument Air Shutoff Valve 1/8 Inch to 3/4 Inch:
    a. Stainless steel body ball valve, nylon handle, tube fitting ends, PTFE seats and seals, panel nut, rated 1,500 pounds per square inch minimum.
    b. Manufacturers and Products:
        1) Swagelok; 40 Series.
        2) Parker Hannifin; B Series.
        3) Or equal.

15. Type V310 Ball Valve for Chlorine Liquid and Gas:
    a. 600-pound WOG, carbon steel body, monel ball and stem, reinforced Teflon seat, Teflon seals, double stem seal, lever operator, screwed ends, nonlubricated, and comply with the requirements of Chlorine Institute Pamphlet 6.
    b. Manufacturer and Product:
        1) ITT Camtite.
        2) Or equal.
16. Type V318 Ball Valve 1 Inch and Smaller for In-Door Low Pressure Gas Service:
    a. Two-piece bronze or forged brass body and end piece, NPT threaded ends, hard chrome plated brass ball, PTFE seats and packing, yellow or red lever handle, rated pressure to 5 pounds per square inch.
    b. Fully comply with AGA 3 or ASME B16.44, ANSI Z21.15/CSA 9.1, and CR91-002 for manually operated valves.
    c. Manufacturers and Products:
        1) Conbraco Apollo; Series GB-10.
        2) Nibco; GB-10.
        3) Or equal.
17. Type V319 Ball Valve 2 Inches and Smaller for In-Door Main Burner Low Pressure Gas Service:
    a. Two-piece bronze or forged brass body and end piece, NPT threaded ends, hard chrome plated brass ball, PTFE seats and packing, plated steel lever handle with yellow vinyl grip, rated pressure to 5 pounds per square inch, with cast-in pilot tap and plug.
    b. CSA approved and in full compliance with AGA 3, ANSI Z21.15/CSA 9.1, and CR91-002for manually operated valves.
    c. Manufacturers and Products: Conbraco Apollo; Series GB-50 or equal.
18. Type V330 PVC Ball Valve 2 Inches and Smaller:
    a. Rated 150 pounds per square inch at 73 degrees Fahrenheit, with ASTM D1784, Type I, Grade 1 polyvinyl chloride body, ball, and stem, end entry, double union design, solvent-weld socket ends, elastomer seat, Viton or Teflon O-ring stem seals, to block flow in both directions. Provide pressure relief hole drilled on low pressure side of ball.
    b. Manufacturers and Products:
        1) Nibco; Chemtrol Tru-Bloc.
        2) ASAHI/America; Type 21.
        3) Spears; True Union.
        4) Or equal.
19. Type V330A PVC Ball Valve 2 Inches and Smaller:
    a. Rated 150 pounds per square inch at 73 degrees Fahrenheit, with ASTM D1784, Type I, Grade 1 polyvinyl chloride body, ball, and

stem, end entry, double union design, solvent-weld socket ends, elastomer seat, Viton or Teflon O-ring stem seals, to block flow in both directions.

b. Manufacturers and Products:
   1) Nibco; Chemtrol Tru-Bloc.
   2) ASAHI/America; Type 21.
   3) Spears; True Union.
   4) Or equal.

20. Type V331 PVC Ball Valve 3 Inches and 4 Inches:
   a. Rated 150 pounds per square inch at 73 degrees Fahrenheit, with ASTM D1784 Type I, Grade 1 PVC full port body, Teflon seat, Viton O-ring stem, face and carrier seals, end entry design with dual union, solvent-weld socket ends, or single union ball valve with flanged ends drilled to ASME B16.1. Provide pressure relief hole drilled on low pressure side of ball.
   b. Manufacturers and Products:
      1) Nibco; Chemtrol Tru-Bloc.
      2) ASAHI/America; Type 21.
      3) Or equal.
21. Type V335A CPVC Ball Valve 3 Inches and Smaller:
   a. Rated 150 pounds per square inch at 100 degrees Fahrenheit, 80 pounds per square inch at 140 degrees, with ASTM D1784, Type IV, Grade 1 chlorinated polyvinyl chloride (CPVC) body, ball, and stem, end entry, double union design, with solvent-weld socket ends or single union ball with flanged ends drilled to ASME B16.1, replaceable Teflon seat, Viton or Teflon O-ring stem seals, to block flow in both directions. Provide pressure relief hole drilled on low pressure side of ball.
   b. Manufacturers and Products:
      1) Nibco; Chemtrol Tru-Bloc.
      2) ASAHI/America; Type 21.
      3) Spears; True Union.
      4) Or equal.
22. Type V335B CPVC Ball Valve 3 Inches and Smaller:
   a. Type 21 chlorinated polyvinyl chloride body, ball and stem, NPT threaded connections, 115 VAC thermally protected, type 4X enclosed actuator. Provide pressure relief hole drilled on low pressure side of ball.
   b. Manufacturers and Products:
      1) ASAHI/America; Electromni T-27.
      2) Or equal.
23. Type V335C CPVC Ball Valve 3 Inches and Smaller:
   a. Rated 150 pounds per square inch at 100 degrees Fahrenheit, 80 pounds per square inch at 140 degrees, with ASTM D1784, Type IV, Grade 1 chlorinated polyvinyl chloride (CPVC) body, ball, and stem, end entry, double union design, with solvent-weld socket ends, replaceable Teflon seat, Viton or Teflon O-ring stem seals, to block flow in both directions.

b. Manufacturers and Products:
1) Nibco; Chemtrol Tru-Bloc.
2) ASAHI/America; Type 21.
3) Spears; True Union.
4) Or equal.

24. Type V340 3-way Ball Valves, 4 Inches and Smaller
a. Manufacturers: One of the following, or equal:
1) Flow-Tek Model MPF150.
2) Flowserve Series 18/19.
b. General:
1) Type: Non-lubricated and capable of sealing in either direction.
2) End Connections:
a) Class 150 flanged. Flanges shall conform to ANSI/ASME B16.1 standards.
3) 90-degree Diverter type T-port. Flow shall not be blocked when transitioning between positions.
4) Stem Packing: Manually adjustable while valve is under pressure.
5) Shafts: Rigidly connected to the ball by a positive means. The connection shall be designed to transmit torque equivalent to at least 75 percent of the torsional strength of the shaft.
6) Handles: Stainless steel latch lock handle with vinyl grip and stainless steel nut designed to open and close the valve under operating conditions.
7) Temperature Limits: Suitable for operation between minus 20 and 350 degrees Fahrenheit.
c. Materials:
1) 316 Stainless steel body.
2) Ball: Type 316 stainless steel.
3) Seats: TFE.
4) Stem Seals: TFE or Viton.
5) Bearings: Self-lubricated, corrosion resistant material that will not contaminate potable water.

D. Plug Valves:

1. Type V400 Eccentric Plug Valve 2 Inches and Smaller:
a. Non-lubricated type rated 175 psig CWP, drip-tight shutoff with pressure from either direction, cast-iron body, threaded ends, lever operator, cast-iron plug with round or rectangular port, plug coated with Buna-N, stem bearing lubricated stainless steel or bronze, stem seal multiple V-rings, or U-cups with O-rings of nitrile rubber.
b. Manufacturers and Products:
1) Pratt; Ballcentric.
2) DeZurik; Style PEC.
3) Milliken; Millcentric Series 603.

4) Or equal.

2. Type V400A Eccentric Plug Valve 2 Inches and Smaller:
   a. Non-lubricated type rated 175 psig CWP, drip-tight shutoff with pressure from either direction, 316 SST body, flanged ends, lever operator, 316 SST plug with rectangular port (no round ports allowed), plug coated with Buna-N, stem bearing lubricated stainless steel, stem seal multiple V-rings, or U-cups with O-rings of nitrile rubber.
   b. Manufacturers and Products:
      1) DeZurik; Style PEC.
3. Type V405 Eccentric Plug Valve 3 Inches to 12 Inches:
   a. Non-lubricated type rated 175 psig CWP, drip-tight shutoff with pressure from either direction, cast-iron body, exposed service flanged ends per ASME B16.1 or grooved ends in accordance with AWWA C606 for rigid joints, buried service mechanical joint ends, unless otherwise shown.
   b. Plug cast iron with round or rectangular port of no less than 80 percent of connecting pipe area and coated with Buna-N, seats welded nickel, stem bearings lubricated stainless steel or bronze, stem seal multiple V-rings, or U-cups with O-rings of nitrile rubber, grit seals on both upper and lower bearings.
   c. For buried service, provide external epoxy coating.
   d. Operators:
      1) 3-Inch to 4-Inch Valves: Wrench lever manual.
      2) 6-Inch to 12-Inch Valves: Totally enclosed, geared, manual operator with handwheel, 2-inch nut or chain wheel. Size operator for 1.5 times maximum operating shutoff pressure differential for direct and reverse pressure, whichever is higher. For buried service, provide completely sealed operator filled with heavy lubricant and 2-inch nut.
   e. Manufacturers and Products:
      1) Pratt; Ballcentric.
      2) DeZurik; Style PEC.
      3) Milliken; Millcentric Series 600.
      4) Or equal.
4. Type V405A Eccentric Plug Valve 3 Inches to 12 Inches:
   a. Non-lubricated type rated 175 psig CWP, drip-tight shutoff with pressure from either direction, 316 stainless steel body, exposed service flanged ends per ASME B16.1.
   b. Plug 316 stainless steel rectangular port (round ports prohibited) of no less than 80 percent of connecting pipe area and coated with Buna-N, seats welded nickel, stem bearings lubricated stainless steel, stem seal multiple V-rings, or U-cups with O-rings of nitrile rubber, grit seals on both upper and lower bearings.
   c. Operators:
      1) 3-Inch to 4-Inch Valves: Wrench lever manual.
      2) 6-Inch to 12-Inch Valves: Totally enclosed, geared, manual operator with handwheel, 2-inch nut or chain wheel. Size

operator for 1.5 times maximum operating shutoff pressure differential for direct and reverse pressure, whichever is higher.

d. Manufacturers and Products:
   1) DeZurik; Style PEC.
   2) Or equal.

5. Type V405B Eccentric Plug Valve 3 Inches to 12 Inches:
   a. Non-lubricated type rated 175 psig CWP, drip-tight shutoff with pressure from either direction, cast-iron body, exposed service flanged ends per ASME B16.1.
   b. Plug cast iron with round or rectangular port of no less than 80 percent of connecting pipe area and coated with Buna-N, seats welded nickel, stem bearings lubricated stainless steel or bronze, stem seal multiple V-rings, or U-cups with O-rings of nitrile rubber, grit seals on both upper and lower bearings.
   c. Provide external epoxy coating.
   d. Operators:
      1) 3-Inch to 4-Inch Valves: Wrench lever manual.
      2) 6-Inch to 12-Inch Valves: Totally enclosed, geared, manual operator with handwheel, 2-inch nut or chain wheel. Size operator for 1.5 times maximum operating shutoff pressure differential for direct and reverse pressure, whichever is higher.
   e. Manufacturers and Products:
      1) Pratt; Ballcentric.
      2) DeZurik; Style PEC.
      3) Milliken; Millcentric Series 600.
      4) Or equal.

6. Type V406 Eccentric Plug Valve 14 Inches to 20 Inches:
   a. Non-lubricated type rated 150 psig CWP, drip-tight shutoff with pressure from either direction, cast-iron body, exposed service flanged ends per ASME B16.1 or grooved ends in accordance with AWWA C606 for rigid joints, buried service mechanical joints ends, unless otherwise shown, plug cast iron with round or rectangular port of no less than 80 percent of connecting pipe area and coated with Buna-N, seats welded nickel, stem bearings lubricated stainless steel or bronze, stem seal multiple V-rings or U-cups with O-rings of nitrile rubber, grit seals on both upper and lower bearings.
   b. Totally enclosed, geared, manual operator with handwheel, 2-inch nut or chain wheel. Size operator for 1.5 times maximum operating shutoff pressure differential for direct and reverse pressure, whichever is higher. For buried service, provide completely sealed operator filled with heavy lubricant and 2-inch nut.
   c. For buried service, provide external epoxy coating.
   d. Manufacturers and Products:
      1) Pratt; Ballcentric.

2) DeZurik; Style PEC.
3) Milliken; Millcentric Series 600.
4) Or equal.

7. Type V407 Eccentric Plug Valve 24 Inches to 48 Inches:
   a. Non-lubricated type rated 150 psig CWP, drip-tight shutoff with pressure from either direction, cast-iron body, exposed service flanged ends per ASME B16.1, buried service mechanical joints ends unless otherwise shown, plug cast iron port opening of no less than 70 percent of connecting pipe area and coated with Buna-N, seats welded nickel, stem bearings lubricated stainless steel or bronze, stem seal multiple V-rings or U-cups with O-rings of nitrile rubber, grit seals on both upper and lower bearings.
   b. Totally enclosed, geared, manual operator with handwheel, 2-inch nut, or chain wheel. Size operator for 1.5 times maximum operating shutoff pressure differential for direct and reverse pressure, whichever is higher. For buried service, provide completely sealed operator filled with heavy lubricant.
   c. For buried service, provide external epoxy coating.
   d. Manufacturers and Products:
      1) Pratt; Ballcentric.
      2) DeZurik; Style PEC.
      3) Milliken; Millcentric Series 600.
      4) Or equal.
8. Type V408 Eccentric Plug Valve 3 Inches to 12 Inches for Digester Gas Service:
   a. Non-lubricated type rated 175 psig working pressure, bubble-tight shutoff with gas pressure from one direction, body cast iron with flanged ends, plug cast iron with round or rectangular port of no less than 80 percent of connecting pipe area and coated with Buna-N, seats welded nickel, stem bearing lubricated stainless steel, stem seal multiple V-rings or U-cups with O-rings of nitrile rubber.
   b. Internal surfaces of valve body epoxy lined (except seat).
   c. Operators:
      1) 3-Inch and 4-Inch Valves: Wrench lever manual.
      2) 6-Inch through 12-Inch Valves: Totally enclosed, geared, manual operator, with handwheel, 2-inch nut, or chain wheel.
   d. Manufacturers and Products:
      1) Pratt; Ballcentric.
      2) DeZurik; Style PEC.
      3) Milliken; Millcentric Series 600.
      4) Or equal.
9. Type V410 Three-Way, Nonlubricated, Tapered Plug Valve 3 Inches to 16 Inches:
   a. Cast-iron body with Buna-N-coated plug, multiple V-rings or U-cups with O-ring seals, lubricated stainless steel bearings, and

nickel- or epoxy-coated seat, rated 125 pounds per square inch CWP minimum, flanged to ASME B16.1.

b. Operator: Gear type, totally enclosed and lubricated, with handwheel.

c. Manufacturers and Products:
   1) DeZurik; Style PTW, Combination.
   2) Milliken; Millcentric Series 600, Style.
   3) Or equal.

10. Type V420 Non-lubricated Plug Valve 2 Inches and Smaller:
    a. Ductile iron or carbon steel body, Type 316 stainless steel plug with straight-way rectangular ports, Teflon sleeves, screwed ends, wrench operator.
    b. Class: 150.
    c. Rating: 275 pounds per square inch WOG.
    d. Manufacturers and Products:
       1) Duriron Co.; Figure No. G432.
       2) Xomox Tufline
       3) Or equal.
11. Type V462 Gauge Cock 1/8 Inch to 1/4 Inch:
    a. 1/4-inch bronze body, hexagon end pattern, tee head, male ends, rated 125-pound SWP.
    b. Manufacturer and Product: United Brass Works; Figure 973.
12. Type V464 Corporation Stop 1/2 Inch to 2 Inches:
    a. AWWA C800 type, tapered threaded inlet, except when connecting to tapped fittings which require IPS tapered threads, outlet compression connection or IPS threads to suit connecting pipe, stops 1 inch and smaller rated 100 pounds per square inch, larger stops rated 80 pounds per square inch.
    b. Manufacturers and Products:
       1) Ford Meter Box Co.
       2) Mueller Co.
       3) Or equal.
13. Type V466 Buried Service Natural Gas Plug Valve 2 Inches and Smaller:
    a. UL Listed, iron body type, rated 125 pounds per square inch, screwed ends, drilled key head for permanent pinned operating rod.
    b. Manufacturers and Products:
       1) DeZurik; Figure 425.
       2) Mueller; (gas) curb stop H-11104.
       3) Or equal.
14. Type V470 Combination Balancing and Shutoff Valve 2-1/2 Inches and Smaller for Heating, Chilled, and Cooling Water Service:
    a. Non-lubricated plug valve, cast-iron body, NPT threaded ends, cast-iron plug with FKM resilient plug facing, PTFE packing, dual stainless steel bearings, PTFE thrust seal, adjustable memory stop, rated 175 pounds per square inch CWP, lever operator, upstream

and downstream 1/8-inch flow taps with air valve fittings and sealing caps.

b. Manufacturer and Product: DeZurik; Style PEC.

15. Type V472 Combination Balancing and Shutoff Valve 3 Inches to 24 Inches for Heating, Chilled, and Cooling Water Service:
    a. Non-lubricated plug valve, cast-iron body, ASME B16.1 Class 125 flanged ends, cast-iron plug with FKM resilient plug facing, PTFE packing, dual stainless steel bearings, PTFE thrust seal, adjustable memory stop, rated 150 pounds per square inch CWP minimum, lever operator for 3-inch and 4-inch valves, totally enclosed and sealed heavy-duty gear operator for 6-inch and larger valves, upstream and downstream 1/8-inch flow taps with air valve fittings and sealing caps.
    b. Manufacturer and Product: DeZurik; Style PEC, or equal.

E. Butterfly Valves:

1. General:
    a. In full compliance with AWWA C504 and following requirements:
        1) Suitable for throttling operations and infrequent operation after periods of inactivity.
        2) Elastomer seats which are bonded or vulcanized to the body shall have adhesive integrity of bond between seat and body assured by testing, with minimum 75-pound pull in accordance with ASTM D429, Method B.
        3) Bubble-tight with rated pressure applied from either side. Test valves with pressure applied in both directions.
        4) No travel stops for disc on interior of body.
        5) Self-adjusting V-type or O-ring shaft seals.
        6) Isolate metal-to-metal thrust bearing surfaces from flowstream.
        7) Provide traveling nut or worm gear actuator with handwheel. Valve actuators to meet the requirements of AWWA C504.
        8) Buried service operators shall withstand 450 foot-pounds of input torque at fully open and fully closed positions.
        9) Provide linings and coatings per AWWA, unless otherwise indicated on Drawings or specified herein.
        10) Valves to be in full compliance with NSF/ANSI 61 and 372. Provide NSF/ANSI 61 and 372 certificate for each valve.
        11) All EPDM shall be peroxide-cured.
    b. Non-AWWA butterfly valves to meet the following actuator requirements:
        1) For above ground installations, provide handle and notch plate for valves 6 inches and smaller and heavy-duty, totally enclosed gearbox type operators with handwheel, position

indicator and travel stops for valves 8 inches and larger, unless otherwise indicated on Drawings or specified herein.

2. Type V500A Butterfly Valve Water Works Service 3 Inches to 72 Inches:
   a. AWWA C504, Class 150B.
   b. Short body type, flanged ends.
   c. Cast-iron body, cast or ductile iron disc, Type 304 stainless steel shafts, EPDM rubber seat bonded or molded in body only, and stainless steel seating surface.
   d. Provide epoxy lining and coating in compliance with AWWA C550.
   e. Manufacturers and Products:
      1) Pratt; Model 2FII or Triton XR-70.
      2) DeZurik; AWWA Valve.
      3) Or equal.
3. Type V500B Butterfly Valve Water Works Service 3 Inches to 72 Inches:
   a. AWWA C504, Class 150B.
   b. Short body type, flanged ends with lifting lugs placed perpendicular to shaft on the valve centerline.
   c. Cast-iron body, cast or ductile iron disc, Type 304 stainless steel shafts, EPDM rubber seat bonded or molded in body only, and stainless steel seating surface.
   d. Provide epoxy lining and coating in compliance with AWWA C550.
   e. Manufacturers and Products:
      1) Pratt; Model 2FII or Triton XR-70.
      2) DeZurik; AWWA Valve.
      3) Or equal.
4. Type V501A Butterfly Valve Water Works Service 30 Inches to 72 Inches:
   a. AWWA C504, Class 125.
   b. Short body type, flanged ends.
   c. Cast-iron body, ductile iron disc with Type 316 stainless steel seating edge, Type 316 stainless steel shafts, EPDM rubber seat.
   d. Provide epoxy lining in compliance with AWWA C550.
   e. Manufacturers and Products:
      1) Pratt; Model Triton XR-70.
      2) DeZurik; AWWA Valve.
      3) Or equal.
5. Type V502 Butterfly Valve General Service 3 Inches to 20 Inches:
   a. AWWA C504, Class 150B.
   b. Wafer style type.
   c. Buna-N rubber seat.
6. Type V504 Butterfly Valve General Service 4 Inches to 48 Inches:
   a. AWWA C504, Class 150B.
   b. Mechanical joint end type.

c. Cast-iron body, cast or ductile iron disc, Type 304 stainless steel shafts, EPDM rubber seat bonded or molded in body only, and stainless steel seating surface.
d. Provide epoxy lining and coating in compliance with AWWA C550.
e. Manufacturers and Products:
1) Pratt; Groundhog.
2) DeZurik; Buried AWWA Valve.
3) Or equal.

7. Type V506 Butterfly Valve High Pressure Service 4 Inches to 48 Inches:
a. AWWA C504, Class 250B.
b. Short body type, Class 250flanged ends.
c. Cast or ductile iron body, cast or ductile iron disc with Type 316 stainless steel disc edge, ASTM A564/A564M Type 630 Condition H-1100/1150 or Type 316 stainless steel shaft, Buna-N rubber seat bonded or molded in body only, self-adjusting V-type multi-ring seals.
d. Provide epoxy lining and coating in compliance with AWWA C550.
e. Manufacturers and Products:
1) Pratt; Triton HP-250.
2) DeZurik; AWWA Flanged Class 250.
3) Mueller; Lineseal XP Class 250.
4) Or equal.

8. Type V507 Butterfly Valve High Pressure Service 4 Inches to 48 Inches:
a. AWWA C504, Class 250B.
b. Mechanical joint ends.
c. Cast or ductile iron body, cast or ductile iron disc with Type 316 stainless steel disc edge, ASTM A564/A564M Type 630 Condition H-1100/1150 or Type 316 stainless steel shaft, Buna-N rubber seat bonded or molded in body only, self-adjusting V-type multi-ring seals.
d. Provide epoxy lining and coating in compliance with AWWA C550.
e. Manufacturers and Products:
1) Pratt; Triton HP-250.
2) DeZurik; AWWA Mechanical Joint Class 250.
3) Mueller; Lineseal XP250.
4) Or equal.

9. Type V510 Lug Style Butterfly Valve, Resilient Seated, 2 Inches to 20 Inches for Low Pressure Process Air Service:
a. Lug style cast-iron body, aluminum bronze discs, Type 316 stainless steel one-piece stem, self-lubricating sleeve type bushings, EPDM replaceable resilient seat suitable for operating temperatures up to 250 degrees Fahrenheit, 150 pounds per square inch working pressure rating, bubble-tight at 50 pounds per square

inch differential pressure, valve body to fit between ASME B16.1 Class 125/150 flanges.

b. Manufacturers and Products:
   1) Bray Controls; Series 31.
   2) Tyco/Keystone; Model AR2.
   3) Or equal.

10. Type V511 Flanged Style Butterfly Valve, Resilient Seated, 24 Inches to 48 Inches for Low Pressure Process Air Service:
    a. Flanged style cast-iron body, aluminum bronze discs, Type 304 stainless steel one-piece stem, self-lubricating bronze sleeve type bearing, EPDM replaceable resilient seat suitable for operating temperatures up to 250 degrees Fahrenheit, 150 pounds per square inch working pressure, rating, bubble-tight at 50 pounds per square inch differential pressure, externally adjustable bronze packing gland with Buna-N packing, valve body to fit between ASME B16.1 Class 125/150 flanges.
    b. Manufacturers and Products:
       1) Bray Controls; Series 35.
       2) Tyco/Keystone; Figure 106.
       3) Or equal.
11. Type V512 Lug Butterfly Valve 2 Inches to 20 Inches for Digester Gas:
    a. Lug style, two-piece cast-iron body, one-piece Type 316 stainless steel thin-profile disc and stem, heavy-duty stem bushing, NBR stem seal, FKM (Viton) replaceable resilient seat, 50 pounds per square inch pressure bi-directional bubble-tight rating, suitable for temperatures up to 250 degrees Fahrenheit, valve body to fit between ASME B16.1 Class 125/150 flanges. Supply reduced disc diameter, if available.
    b. Manufacturers and Products:
       1) Bray Controls; Model 21.
       2) Tyco/Keystone; Model 920.
       3) Or equal.
12. Type V513A Butterfly Valve 2 Inches to 20 Inches:
    a. Lug style, cast-iron body, Type 316 stainless steel disc, Type 316 or Type 18-8 stainless steel one-piece stem, EPDM replaceable resilient seat, heavy-duty self-lubricating sleeve type bushings, NBR stem seal, 150 pounds per square inch working pressure rating, valve body to fit between ASME B16.1 Class 125/150 flanges.
    b. Manufacturers and Products:
       1) Bray Controls; Series 30/31.
       2) Tyco/Keystone; Model AR1/AR2.
       3) Crane/Centerline; Series 200.
       4) Or equal.
13. Type V514A High Performance Butterfly Valve 2 Inches to 48 Inches:
    a. ASME B16.1 Class 150 lug style, high performance type, Type 316 stainless steel body, Type 316 stainless steel single or double offset disc, Type 316 stainless steel shaft and taper pins,

EPDM seat, PTFE stem packing, stainless steel with RTFE thrust washer.

b. Manufacturers and Products:
   1) Tyco/Keystone; K-Lok Series.
   2) DeZurik; BHP Series.
   3) Or equal.

14. Type V514B High Performance Butterfly Valve 2 Inches to 36 Inches:
   a. ASME B16.1 Class 300 lug style, high performance type, Type 316 stainless steel body, Type 316 stainless steel single or double offset disc, Type 316 stainless steel shaft and taper pins, PTFE seat, PTFE stem packing, stainless steel with RTFE thrust washer.
   b. Manufacturers and Products:
      1) Tyco/Keystone; K-Lok Series.
      2) DeZurik; BHP Series.
      3) Or equal.
   c. Cleaning and handling: Clean, seal, package, and handle valves for oxygen and ozone service in strict accordance with CGA Standard G-4.1.
15. Type V514C High Performance Butterfly Valve 2 Inches to 36 Inches:
   a. ASME B16.1 Class 300 lug style, high performance type, Type 2205 stainless steel body, Type 2205 stainless steel single or double offset disc, Type 2205 stainless steel shaft and taper pins, EPDM seat, PTFE stem packing, stainless steel with RTFE thrust washer.
   b. Manufacturers and Products:
      1) Tyco/Keystone; K-Lok Series.
      2) DeZurik; BHP Series.
      3) Or equal.
16. Type V520 Solid Polyvinyl Chloride Butterfly Valve 1-1/2 Inches to 8 Inches:
   a. Wafer body type, pressure rated 150 pounds per square inch at 70 degrees Fahrenheit CWP, solid ASTM D1784, Type I, Grade 1, PVC body and contoured PVC or polypropylene valve disc, stainless steel valve stem, Viton seat, lever operator.
   b. Manufacturers and Products:
      1) ASAHI/America; Type 57.
      2) Spears.
      3) Or equal.
17. Type V530 Butterfly Valve 4 Inches to 20 Inches for Fire Protection Service:
   a. UL Listed and FM Approved, B: flanged style, AWWA C504 Class 150B valve with cast-iron body, aluminum-bronze disc, stainless steel stem, EPDM seat, geared operator with highly visible position indicator and detachable crank handle.
   b. For buried service, provide post indicating assembly with detachable crank handle.
   c. Manufacturer and Product: Pratt; IBV or equal.

F. Check and Flap Valves:

1. Type V600 Check Valve 2 Inches and Smaller:
   a. All bronze, threaded cap, threaded or soldered ends, swing type replaceable bronze disc, rated 125-pound SWP, 200-pound WOG.
   b. Manufacturers and Products:
      1) Stockham; Figure B-319, threaded ends.
      2) Milwaukee; Figure 509, threaded ends.
      3) Stockham; Figure B-309, soldered ends.
      4) Milwaukee; Figure 1509, soldered ends.
      5) Or equal.
2. Type V602 Check Valve 2 Inches and Smaller:
   a. All bronze, threaded cap, threaded ends, swing type replaceable Teflon disc and bronze disc holder, rated 150-pound SWP, 300-pound WOG.
   b. Manufacturers and Products:
      1) Walworth; Figure 3412.
      2) Milwaukee; Figure 510.
      3) Or equal.
3. Type V604 Check Valve 2-1/2 Inches to 12 Inches:
   a. Flanged end, cast-iron body, bronze mounted swing type, solid bronze or cast-iron disc, bronze seat ring, rated 125-pound SWG, 200-pound WOG.
   b. Manufacturers and Products:
      1) Stockham G-931; List 37, Clearway check valve.
      2) Crane Co.; Cat. No. 373.
      3) Or equal.
4. Type V606 Check Valve 2 Inches to 12 Inches:
   a. Flanged end, cast-iron body, bronze mounted swing type, solid bronze or cast-iron disc, bronze seat ring, outside lever and weight, spring, rated 125-pound SWP, 200-pound WOG.
   b. Manufacturers and Products:
      1) Stockham; G-931.
      2) Crane Co.; Cat. No. 383.
      3) Or equal.
5. Type V608A Swing Check Valve 2 Inches to 24 Inches:
   a. AWWA C508, 125-pound flanged ends, cast-iron body, bronze body seat, bronze mounted cast-iron clapper with bronze seat, stainless steel hinge shaft.
   b. Valves, 2 inches through 12 inches rated 175-pound WWP and 14 inches through 24 inches rated 150-pound WWP. Valves to be plain fitted. Increasing-pattern body valve may be used where increased outlet piping size is shown.
   c. Manufacturers and Products:
      1) M&H Valve; Style 59, 159, or 259.
      2) Mueller Co.; No. A-2600 Series.
      3) Or equal.
6. Type V609A Stainless Steel Swing Check 2 Inches and Smaller:

a. ASTM A351 CF8M Stainless Steel body, disc, hinge and cover, flanged ends.
b. 150 Class rating.
c. Manufacturers:
1) Crane Chem Pharma, Aloyco.
2) Or equal.

7. Type V609B Alloy 20 Swing Check 2 Inches and Smaller:
a. Alloy 20 Steel body, disc, hinge and cover, flanged ends
b. 300 Class rating.
c. Manufacturers:
1) Crane Chem Pharma, Aloyco.
2) Or equal.

8. Type V609C PVC Swing Check 3/4” to 8”:
a. PVC body, disc, flanged ends, Viton seat and seal
b. 150 psig rating
c. Manufacturers:
1) Asahi/America.
2) Or equal.

9. Type V610 Swing Check Valve 2-1/2 Inches to 12 Inches for Fire Protection Service:
a. UL Listed, FM Approved, iron body, bronze-mounted, rated 175 pounds WOG, self-adjusting bronze disc, ends ASME B16.1 flanged, with a 1-inch NPT tapped and plugged boss.
b. Manufacturers and Products:
1) Kennedy; Figure 126.
2) Mueller; A-2120-6.
3) Or equal.

10. Type V612A Double Disc Swing Check Valve 2 Inches to 48 Inches:
a. Wafer style, spring loaded, cast-iron body, aluminum-bronze discs, EPDM resilient seats, and Type 316 stainless steel spring, hinge pin, and stop pin.
b. Valves 2 inches through 12 inches rated 200 pounds per square inch non-shock working pressure and valves 14 inches through 48 inches rated 150 pounds per square inch non-shock working pressure.
c. Manufacturers and Products:
1) APCO; Series 9000.
2) Val-Matic; Dual Disc.
3) Crane/Stockham; WG-970.
4) Tyco; Gulf MB Series.
5) Or equal.

11. Type V614 Slanting Disc Check Valve 2 Inches to 60 Inches:
a. Slanting or tilting disc design, off-center pivot, body ductile iron two-piece design, bronze seat on 55 degree angle, disc bronze or ductile iron, pivot pin and bushing Type 304 stainless steel, Class 125, 150 pounds per square inch rating, Class 125 flange drilling, bottom mounted buffer cylinder for cushion closing valve disc position indicator.

b. Manufacturers and Products:
   1) APCO; Series 800.
   2) Val-Matic; Series 9800.
   3) Or equal.

12. Type V615 Slanting Disc Check Valve 2 Inches to 60 Inches:
   a. Slanting or tilting disc design, off-center pivot, body ductile iron two-piece design, bronze seat on 55 degree angle, disc bronze or ductile iron, pivot pin and bushing Type 304 stainless steel, Class 250, 300 pounds per square inch rating, Class 250 flange drilling, flat face, bottom mounted buffer cylinder for cushion closing valve disc position indicator.
   b. Manufacturers and Products:
      1) APCO; Series 800.
      2) Val-Matic; Series 9700.
      3) Or equal.
13. Type V616 Slanting Disc Check Valve 2 Inches to 36 Inches:
   a. Off-center pivoting disc design, wafer style, cast-iron body, ductile iron discs, Type 316 stainless steel pivot pin, spring pin, and bushing, Buna-N disc seal, Type 316 stainless steel or Monel spring, Class 125.
   b. Manufacturers and Products: Daniel Flow Products; Chexter 1600 Series, Type D, or equal.
14. Type V617A Wafer Style Check Valve 2 Inches to 36 Inches:
   a. Wafer style, swing check, one-piece body design, full resilient seal in machined body groove. Type 316 stainless steel body, ASME B16.1 Rated for a minimum pressure of 125 pounds per square inch, pressure loss shall not exceed 10 inches of water column at maximum gas flow, pressure differential to open check valve shall not exceed 10 inches of water column. Type 316 stainless steel disc, Type 316 stainless steel spring and other internals, Buna-N seal.
   b. Manufacturers and Products:
      1) Tyco; Prince Figure 800 Series.
      2) Crane; Uni-Chek II.
      3) Or equal.
15. Type V617B Wafer Style Check Valve 2 Inches to 36 Inches:
   a. Wafer style, swing check, one-piece body design, full resilient seal in machined body groove. Type 316 stainless steel body, ASME B16.1 Rated for a minimum pressure of 125 pounds per square inch, cleaned for oxygen service, pressure loss shall not exceed 10 inches of water column at maximum gas flow, pressure differential to open check valve shall not exceed 10 inches of water column. Type 316 stainless steel disc, Type 316 stainless steel spring and other internals, Buna-N seal.
   b. Manufacturers and Products:
      1) Tyco; Prince Figure 800 Series.
      2) Crane; Uni-Chek II.
      3) Or equal.

16. Type V620 Silent Check Valve 2 Inches to 10 Inches:
    a. Wafer style, iron body, center guided valve, bronze trim, Buna-N seat, stainless steel springs, rated 150-pound WOG.
    b. Manufacturers and Products:
        1) Mueller; Steam Specialty 91AP.
        2) APCO; Series 300.
        3) Or equal.
17. Type V622 Silent Check Valve 3 Inches to 24 Inches:
    a. Globe style, center guided, 125-pound flanges, cast-iron body, bronze trim, Buna-N seat, stainless steel spring. Valves to be FM Approved in sizes up to and including 12 inches.
    b. Manufacturers and Products:
        1) APCO; Series 600.
        2) Val-Matic; 1800 Series.
        3) Cla-Val; Series 581.
        4) Or equal.
18. Type V622A Silent Check Valve 3 Inches to 24 Inches:
    a. Globe style, center guided, 125-pound flanges, cast-iron body, bronze trim, EPDM seat, stainless steel spring. Valves to be FM Approved in sizes up to and including 12 inches.
    b. Manufacturers and Products:
        1) APCO; Series 600.
        2) Val-Matic; 1800 Series.
        3) Cla-Val; Series 581.
        4) Or equal.
19. Type V624 Silent Check Valve 4 Inches to 12 Inches for Fire Protection Service:
    a. UL Listed or FM Approved, center-guided wafer style valve, iron body, bronze trim, stainless steel spring, rated 175-pound non-shock, CWP.
    b. Manufacturers and Products:
        1) Mueller; Steam Specialty.
        2) APCO.
        3) Or equal.
20. Type V630 PVC Ball Check Valve 4 Inches and Smaller:
    a. ASTM D1784, Type I, Grade 1 polyvinyl chloride body, dual union socket weld ends, rated 150 pounds per square inch at 73 degrees Fahrenheit, and Viton seat and seal.
    b. Manufacturers and Products:
        1) Nibco; Chemtrol Tru Union.
        2) ASAHI/America.
        3) Spears; True Union.
        4) Or equal.
21. Type V631A CPVC Ball Check Valve 4 Inches and Smaller:
    a. ASTM D1784 Cell Class 23477B CPVC body, single or dual union socket weld ends, rated 150 pounds per square inch at 73 degrees Fahrenheit, 110 pounds per square inch at 140 degrees Fahrenheit, Viton seat and seal.

b. Manufacturers and Products:
1) Nibco; Chemtrol Tru Union.
2) ASAHI/America.
3) Spears; True Union.
4) Or equal.

22. Type V631B CPVC Ball Check Valve 4 Inches and Smaller:
a. ASTM D1784 Cell Class 23477B CPVC body, flanged end connections, rated 150 pounds per square inch at 73 degrees Fahrenheit, 110 pounds per square inch at 140 degrees Fahrenheit, Viton seat and seal.
b. Manufacturers and Products:
1) Nibco; Chemtrol Tru Union.
2) ASAHI/America.
3) Or equal.

23. Type V631C PVDF Ball Check Valve 4 Inches and Smaller:
a. Flanged end, PVDF body, ball, end connector, union nut, stop ring, PTFE seat and seals, rated 150 class.
b. Manufactueres and Products:
1) ASAHI/America.
2) Or equal.

24. Type V632 Ball Check Valve 3 Inches and Larger:
a. Flanged end, iron body valve with cleanout and floating type hollow steel ball, vulcanized nitrile rubber exterior, flanges ASME B16.1, Class 125, rated 150-pound working pressure, suitable for vertical up or horizontal flow.
b. Manufacturers and Products:
1) FLYGT Corp.
2) Flomatic Corp.
3) Golden Anderson.
4) Or equal.

25. Type V634 Rubber Flapper Check Valve 2 Inches to 24 Inches:
a. Iron body, ASME B16.1, Class 125 flanges, steel-reinforced Buna-N flapper raised seating ring, rated 150-pound CWP.
b. Manufacturers and Products:
1) APCO; Series 100.
2) Val-Matic; “Swingflex.”
3) Or equal.

26. Type V640 Double Check Valve Backflow Prevention Assembly 3/4 Inch to 10 Inches:
a. Two resilient seated check valves, two non-rising stem resilient-seated isolation valves, test cocks, in accordance with AWWA C510, rated 175 pounds per square inch maximum working pressure, meets requirements of USC Foundation For Cross-Connection Control and Hydraulic Research.
b. Manufacturers and Products:
1) FEBCO; Model 850.
2) Danfoss Flomatic; Model DCVE/DCV.
3) Watts; Series 007/709.

4) Or equal.

27. Type V642A Reduced-Pressure Principle Backflow Prevention Assembly 3/4 Inch to 10 Inches:
    a. Two stainless steel resilient seated check valves with an independent relief valve between the valves, two stainless steel outside screw and yoke resilient-seated isolation valves, test cocks, in accordance with AWWA C511, rated 175 pounds per square inch maximum working pressure, meets requirements of USC Foundation For Cross-Connection Control and Hydraulic Research.
    b. Manufacturers and Products:
        1) Ames 4000SS.
        2) Watts; Series 957OSY.
        3) Or equal.
28. Type V652 Check Valve 2 Inches and Smaller for Fuel Oil Service:
    a. Forged steel, lift-check type integral seat, stainless steel disc, screwed ends, rated 800 pounds per square inch at 850 degrees Fahrenheit.
    b. Manufacturers and Products:
        1) Smith; C80.
        2) R-P&C; F90.
        3) Or equal.
29. Type V654 Check Valve 2 Inches and Smaller for Process Air Service:
    a. All-bronze type lift-check valve type, screwed ends, rated 250-pound WOG.
    b. Manufacturers and Products:
        1) Metraflex, Model BSN.
        2) Lunkenheimner Co, 418.
        3) Or equal.
30. Type V690 Flap Gate 6 Inches to 96 Inches:
    a. Cast-iron body and cover, bronze-mounted, flanged frame type, dual pivot-point hinge arms, hinge arms bronze, hinge pins Type 304 stainless steel, seat bronze and impacted into grooves in body and cover flap, lubrication fittings for each pivot, upper and lower pivot adjustment.
    b. Manufacturers and Products:
        1) Rodney Hunt Co.; Series FV-AC or FV-AR.
        2) Hydro Gate; Model 50C or 50.
        3) Or equal.
31. Type V692 Flap Valve 4 Inches to 30 Inches:
    a. Flange style frame, cast-iron body, bronze seats on body and cover, bronze hinge pins.
    b. Manufacturers and Products:
        1) M&H Valve; Style 47-02.
        2) Clow Valve; No. F-3012.
        3) Or equal.
32. Type V694 Check Valve 1 Inch to 48 Inches:

a. Elastomer type flanged or slip-on as shown on Drawings, round entry area to match pipe, contoured duckbilled shaped exit, flat bottom and off-set bill design, curved bill for 18 inches and larger, valve open with approximately 2 inches of line pressure and return to CLOSED position under zero flow condition, rated for 50 pounds per square inch minimum operating pressure; flanges steel backing flange type, drilled to ASME B16.1, Class 125, plain-end valve attached with two Type 316 stainless steel adjustable bands, elastomer nylon-reinforced Buna-N.
b. Manufacturer and Product: Red Valve Co.; Tideflex Check Valve Series TF-1 or 35-1, or equal.

33. Type V695A Butterfly Check Valve 4 Inch to 24 Inch:
    a. Manufacturer: One of the following:
        1) Techno Check (Cameron), Model 5053-316.
        2) Crane Duo-Chek.
        3) Or equal.
    b. Valve Design:
        1) Spring-assisted dual valve plates with metal hinge. Springs designed to close valve plates upon flow reversal.
        2) Replaceable elastomeric seal secured to valve plates with clamp plates and fasteners.
        3) Valve seats integral with valve body. Eliminate leakage when valve plates are fully closed with elastomeric seal in full contact with valve seat.
        4) Wafer-style valve body.
        5) Stops on valve shaft which prevent valve plates from opening more than 90 degrees from closed position.
        6) Pressure Class: ASME Class 300, unless otherwise indicated in the valve schedule in the Drawings.
    c. Materials:
        1) Body valve plates, trim, and springs: 316 Stainless steel, ASME A351, Grade CF8M.
34. Type V695B Butterfly Check Valve 4 Inch to 24 Inch:
    a. Manufacturer: One of the following:
        1) Techno Check (Cameron), Model 5053-316.
        2) Crane Duo-Chek.
        3) Or equal.
    b. Valve Design:
        1) Spring-assisted dual valve plates with metal hinge. Springs designed to close valve plates upon flow reversal.
        2) Replaceable elastomeric seal secured to valve plates with clamp plates and fasteners.
        3) Valve seats integral with valve body. Eliminate leakage when valve plates are fully closed with elastomeric seal in full contact with valve seat.
        4) Wafer-style valve body.
        5) Stops on valve shaft which prevent valve plates from opening more than 90 degrees from closed position.

SST Flanges AIS Waiver Material List

To:

Attn:

Project Name: **North City Pure Water Facility**
Project City Location: **San Diego, CA**

SANTA FE Winwater COMPANY
10244 Freeman Ave., Santa Fe Springs, CA 90670
(562) 777-9724 Fax (562) 777-1084

QTY	SIZE	DESCRIPTION		UNIT	TOTAL
43	3"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
50	4"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
102	6"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
56	8"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
90	10"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
6	12"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
110	16"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
6	24"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
2	36"	Type-A Stub End A403WP-316L Sch10S	$	[redacted]	[redacted]
84	3"	Type-A Stub End A403WP-316L Sch40S	$	[redacted]	[redacted]
127	3"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
50	4"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
96	6"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
56	8"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
90	10"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
6	12"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
54	16"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
6	24"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
2	36"	Flange LJ 150# A182F-316L	$	[redacted]	[redacted]
6	6"	Flange LJ 300# A182F-316L	$	[redacted]	[redacted]
56	16"	Flange LJ 300# A182F-316L	$	[redacted]	[redacted]
203	2"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
12	2.5"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
121	3"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
169	4"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
55	6"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
95	8"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
117	10"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
68	12"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
101	16"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
24	18"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
12	20"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
35	24"	ANSI B16.5 A182F-316L 150# Raised Face Slip-on Flange	$	[redacted]	[redacted]
32	16"	ANSI B16.5 A182F-316L 300# Raised Face Slip-on Flange	$	[redacted]	[redacted]
1	2"	ANSI B16.5 A182F-316L 150# Raised Face Blind Flange	$	[redacted]	[redacted]
4	4"	ANSI B16.5 A182F-316L 150# Raised Face Blind Flange	$	[redacted]	[redacted]
9	6"	ANSI B16.5 A182F-316L 150# Raised Face Blind Flange	$	[redacted]	[redacted]
2	12"	ANSI B16.5 A182F-316L 150# Raised Face Blind Flange	$	[redacted]	[redacted]
4	16"	ANSI B16.5 A182F-316L 150# Raised Face Blind Flange	$	[redacted]	[redacted]
4	2"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
4	2.5"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
7	3"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
10	4"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
24	6"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
4	8"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
22	10"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
29	12"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
3	16"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
16	18"	ANSI B16.5 A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
3	30"	ANSI B16.47 Series "A" A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
2	36"	ANSI B16.47 Series "A" A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
40	42"	ANSI B16.47 Series "A" A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
15	48"	ANSI B16.47 Series "A" A182F-316L 150# Raised Weldneck Flange Sch10S	$	[redacted]	[redacted]
			Total		[redacted]

SST Fittings AIS Waiver Material List

To: **Shimmick Construction**

Attn: **Nick Eldert**

Project Name: **North City Pure Water Facility**
Project City Location: **San Diego, CA**

SANTA FE Winwater COMPANY
10244 Freeman Ave., Santa Fe Springs, CA 90670
(562) 777-9724 Fax (562) 777-1084

QTY	SIZE	DESCRIPTION	MATERIAL	UNIT	TOTAL
10	3"	EL90 SR A403WPW-316L Sch10S	T316SS	$	1
17	4"	EL90 SR A403WPW-316L Sch10S	T316SS	$	
23	6"	EL90 SR A403WPW-316L Sch10S	T316SS	$	
15	8"	EL90 SR A403WPW-316L Sch10S	T316SS	$	
59	10"	EL90 SR A403WPW-316L Sch10S	T316SS		
8	12"	EL90 SR A403WPW-316L Sch10S	T316SS		
45	16"	EL90 SR A403WPW-316L Sch10S	T316SS	$	
8	18"	EL90 SR A403WPW-316L Sch10S	T316SS	$	
10	3"	EL90 LR A403WPW-316L Sch10S	T316SS	$	
17	4"	EL90 LR A403WPW-316L Sch10S	T316SS	$	
23	6"	EL90 LR A403WPW-316L Sch10S	T316SS	$	
15	8"	EL90 LR A403WPW-316L Sch10S	T316SS	$	
59	10"	EL90 LR A403WPW-316L Sch10S	T316SS	$	
8	12"	EL90 LR A403WPW-316L Sch10S	T316SS	$	
45	16"	EL90 LR A403WPW-316L Sch10S	T316SS	$	
8	18"	EL90 LR A403WPW-316L Sch10S	T316SS	$	
				Total	