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February 15, 2024

Jason Robinson, PE
State of North Carolina
Department of Environmental Quality
Division of Water Infrastructure
512 North Salisbury Street
Raleigh, NC 27604

NOTE: Information in this waiver may have been redacted or removed due to issues of proprietary business information or incompatibility with Federal accessibility requirements. To request the information redacted for purposes of accessibility

Ref: City of Graham Wastewater Treatment Plant Expansion Project
Project No. CS370563-04
Submit to cwsrtwaiver@epa.gov

Subject: Project Waiver of American Iron and Steel Requirements for small diameter 150# stainless steel pipe and fittings.

Mr. Robinson,

To meet the project's technical specifications for small diameter 150# stainless steel piping, fittings, and valves we must submit and obtain a project waiver to the American Iron and Steel Requirement. The waiver request is specific to all small diameter stainless steel piping, fittings, and valves.

The following supporting documentation is included for review and is presented in the order listed below.

General

1. Description of the foreign and domestic construction materials
2. Unit of measure
3. Quantity
4. Price
5. Time of delivery or availability
6. Location of the construction project
7. Name and address of the proposed supplier
8. A detailed justification for the use of foreign construction materials

Cost Waiver Request, we are not submitting for a waiver based on cost.

Availability Waiver Requests

1. Supplier information or pricing from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials.
2. Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers.
3. Project Schedule
4. Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials.

5. Waiver request includes a statement from the prime contractor and/or supplier confirming the nonavailability of the domestic construction materials for which the waiver is sought.
6. Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?

Sincerely,

[Redacted signature]

[Redacted name]

[Redacted title]

Project Manager

cc: [Redacted email]

[Redacted email]

Tonya Mann, City of Graham

General

1. Description of the foreign and domestic construction materials:

Foreign Materials: These materials shall include smaller than 2" stainless-steel pipe, fittings, and tubing with associated fittings, and ball valves.

Domestic Construction Materials: These materials are not available domestically for smaller than 2" stainless-steel pipe, fittings, and tubing with associated fittings, and ball valves to meet the American Iron & Steel requirements.

2. Unit of Measure:

The prices shown are for foreign material. Domestic materials Smaller than 2" stainless-steel pipe, fittings, and tubing with associated fittings, and ball valves are not available to meet the job requirements.

Item 2 Unit of Measure Estimated Cost

Location / Description		QTY	UNIT	Est. UC	Est. Total Cost
BNR 1-4 Air Flow Meter (Venturi Meters)					
1"x1/2"	Bushings	2	EA	\$	
1/2"	ball valves	50	EA	\$	
1/2"	Compression Tee's	50	EA	\$	
1/2"	Compression 90's	50	EA	\$	
1/2"	Compression male adapter	100	EA	\$	
1/2"	Tubing	400	LNFT	\$	
BNR 1-4 Blower Facility (Pressure indicators)					
1/2"	ball valves	6	EA	\$	
1"x1/2"	Bushings	6	EA	\$	
1/2"	90's	12	EA	\$	
Digester Blower Facility (Pressure indicators)					
1/2"	ball valves	5	EA	\$	
1"x1/2"	Bushings	5	EA	\$	
Digester Blower Facility (Venturi Meters)					
1/2"	ball valves	20	EA	\$	
1/2"	Compression Tee's	20	EA	\$	
1/2"	Compression 90's	20	EA	\$	
1/2"	Compression male adapter	40	EA	\$	
1/2"	Tubing	60	LNFT	\$	
RAS Pump Station #1					
1/2"	ball valves	4	EA	\$	
1"x1/2"	Bushings	2	EA	\$	
RAS Pump Station #2					
1/2"	ball valves	4	EA	\$	
1"x1/2"	Bushings	2	EA	\$	
Chemical facility Hose Bibb					
3/4"	Hose Bibb	1	EA	\$	
3/4"	Vacuum Breaker	1	EA	\$	
1"x3/4"	Bushings	1	EA	\$	
Sodium Hypo Hose Bibb					
3/4"	Hose Bibb	1	EA	\$	
3/4"	Vacuum Breaker	1	EA	\$	
1"x3/4"	Bushings	1	EA	\$	
Sodium Bisulfate Hose Bibb					
3/4"	Hose Bibb	1	EA	\$	
3/4"	Vacuum Breaker	1	EA	\$	
1"x3/4"	Bushings	1	EA	\$	
Digester 3 & 4 Hose Bibb					
3/4"	Hose Bibb	1	EA	\$	
3/4"	Vacuum Breaker	1	EA	\$	
1"x3/4"	Bushings	1	EA	\$	

Total: [REDACTED]

3. Time of delivery or availability:

Lead time for Foreign smaller than 2" stainless-steel pipe, fittings, and tubing with associated fittings, and ball valves is 1-2 weeks.

4. Location of the construction project:

Graham WWTP
1204 E Gilbreath St. Graham, NC 27253

5. Name and address of the proposed supplier:

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

6. A detailed justification for the use of foreign construction materials:

All smaller than 2" stainless-steel pipe, fittings, and tubing with associated fittings, and ball valves specified on the project must meet the engineering design requirements. The smaller than 2" stainless-steel pipe, fittings, and tubing with associated fittings, and ball valves that meet the project requirements are not manufactured domestically.

3. Project Schedule:

Type	Pipe Designation	Service	Material	Description	Class/Design	Restraining system/Design Pressure (PSI)	Test Pressure (PSI)	Start Date	Finish Date
Small diameter Stainless steel @ BNR 1 & 2	A	Process Air	304SS	Stainless steel tubing	CL150	10	15	3/11/2024	3/15/2024
	A	Process Air	304SS	Compression Fittings	CL150	10	15	3/11/2024	3/15/2024
	A	Process Air	304SS	Ball valves	CL150	10	15	3/11/2024	3/15/2024
Small diameter Stainless steel @ BNR 1 & 2	A	Process Air	304SS	Stainless steel tubing	CL150	10	15	3/1/2025	3/6/2025
	A	Process Air	304SS	Compression Fittings	CL150	10	15	3/1/2025	3/6/2025
	A	Process Air	304SS	Ball valves	CL150	10	15	3/1/2025	3/6/2025
Small diameter Stainless steel @ Digester 3 & 4	A	Process Air	304SS	Stainless steel tubing	CL150	10	15	4/15/2024	4/19/2024
	A	Process Air	304SS	Compression Fittings	CL150	10	15	4/15/2024	4/19/2024
	A	Process Air	304SS	Ball valves	CL150	10	15	4/15/2024	4/19/2024
Small diameter Stainless Steel @ RAS Pump Station #1	RAS	Return Activated Sludge	304SS	Ball valves	CL150	10	15	4/15/2024	4/19/2024
Small diameter Stainless Steel @ RAS Pump Station #2	RAS	Return Activated Sludge	304SS	Ball valves	CL150	10	15	4/15/2024	4/19/2024
Small diameter Stainless Steel @ Chemical Facility hose bibb	PW	Potable water	304SS	Hose bibb assembly	CL150	100	150	5/20/2024	5/25/2024
Small diameter Stainless Steel @ Sodium Hypo Facility hose bibb	PW	Potable water	304SS	stainless steel fittings	CL150	100	150	5/20/2024	5/25/2024
	PW	Potable water	304SS	Hose bibb assembly	CL150	100	150	9/23/2024	9/27/2024
Small diameter Stainless Steel @ Sodium Bisulfate Facility hose bibb	PW	Potable water	304SS	stainless steel fittings	CL150	100	150	9/23/2024	9/27/2024
	PW	Potable water	304SS	Hose bibb assembly	CL150	100	150	9/23/2024	9/27/2024
Small diameter Stainless Steel @ Digester 3&4 hose bibb	PW	Potable water	304SS	stainless steel fittings	CL150	100	150	5/20/2024	5/24/2024
	PW	Potable water	304SS	Hose bibb assembly	CL150	100	150	5/20/2024	5/24/2024

4. **Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials:**

SECTION 40 05 24.13
STEEL PIPE FOR LOW PRESSURE PROCESS AIR SERVICE

PART 1 – GENERAL

1.01 THE REQUIREMENT

- A. This specification shall apply to steel and stainless steel pipe for low pressure air service (less than 25 psig).
- B. The AWWA Specifications referenced in this Section are supplemented as follows:
 - 1. An affidavit of compliance is required from the pipe manufacturer.
 - 2. The steel manufacturer's certification that the material meets the ASTM Specification will be accepted in lieu of tests on specimens taken from the fabricated pipe.
 - 3. The fabricator may purchase steel plates on the chemical basis only and shall furnish to the Owner certified test reports.
- C. All parts of the materials furnished shall be amply designed, manufactured, and constructed for the maximum stresses occurring during fabrication, erection and operation. All materials shall be new and both workmanship and materials shall be of the very best quality, shall be entirely suitable for the service to which they will be subjected, and shall conform to all applicable Sections of these Specifications. Manufacturer's designs shall accommodate all of the requirements of these Specifications.
- D. The Contractor shall be responsible for the structural design of the steel and stainless steel pipe, fittings, and couplings. The Contractor shall submit certification that the steel and stainless-steel pipe, fittings, and couplings have been designed to resist all loads implied and reasonably anticipated.

1.02 RELATED SECTIONS

- A. Section 40 05 00 – Basic Mechanical Requirements
- B. Section 40 05 07 – Pipe Supports
- C. Section 40 05 41 – Piping Expansion Compensation

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- b. Areas of pipe to be welded shall receive 1 mil (dry) of weldable primer as manufactured by [REDACTED], or equal. After welding and pressure and leakage testing are completed, welded joints shall be thoroughly cleaned of all foreign matter and any scale or rust and primed as specified above.
 - c. Over the prime coat shall be a finish coat of 3 to 5 mils (dry) of a high heat polymer coating and shall be [REDACTED] as manufactured by [REDACTED] or equal.
5. Exterior Painting and Tape Wrap for Buried Steel Pipe
- a. Except for areas of pipe to be welded, the exterior of buried steel pipe shall receive a prime coat of 6 to 10 mils (dry) of an epoxy-phenolic or epoxy-amine primer service rated for -50°F to 300°F continuous service and shall be [REDACTED] as manufactured by [REDACTED], [REDACTED] as manufactured by [REDACTED], [REDACTED] as manufactured by [REDACTED], or equal. The primer product used shall be compatible with the exterior tape system manufacturer recommendations.
 - b. Areas of pipe to be welded shall receive 1 mil (dry) of weldable primer as manufactured by [REDACTED], or equal. After welding and pressure and leakage testing are completed, welded joints shall be thoroughly cleaned of all foreign matter and any scale or rust and primed as specified above.
 - c. The exterior of buried steel pipe shall receive, over the prime coat, a multi-layered, cold-applied tape wrap system which shall be shop applied with a minimum total coating thickness of 80 mils. The cold applied type wrap shall operate satisfactorily at a temperature of 300°F. The wrap shall be applied in accordance with manufacturer's recommendations and as specified herein. All fittings shall be wrapped in accordance with manufacturer's recommendations. Successive layers shall be applied such that windings are staggered and overlay the midpoints of previous tape widths. Prime coat and wrap shall be applied to each joint as specified for the pipe for continuous coating and wrapping of all buried steel piping. Polyethylene backed coatings shall be protected from sunlight at all times. The tape wrap system shall be the [REDACTED] as manufactured by [REDACTED], or equal.

2.02 STAINLESS STEEL PIPE AND FITTINGS

- A. Stainless steel pipe for process aeration and other low pressure air service for nominal pipe sizes ranging from three (3) inches to sixty (60) inches shall be manufactured from 304L stainless steel annealed and pickled sheets and plates per ASTM A240.
- B. Stainless steel pipe shall be fabricated in accordance with ASTM A778 and shall be rated for at least 25 psig and 300 degrees Fahrenheit (°F). Only seamless or one (1) longitudinal seam shall be permitted unless otherwise required for fabrication of large

diameter pipe in accordance with ASTM A774. Only stainless steel pipe shall be provided; tubing shall not be allowed. Stainless steel pipe shall be as manufactured by [REDACTED], or Engineer approved equal.

- C. Stainless steel pipe shall be manufactured to the nominal pipe sizes as listed in ANSI B36.19, Table 2, and shall have the following minimum wall thicknesses:

Nominal Pipe Size (inches)	Schedule/Gauge/Plate
4 and less	Schedule 5S (0.083-inch)
5 to 8	Schedule 5S (0.109-inch)
10 to 12	12 gauge (0.109-inch)
14 to 18	11 gauge (0.125-inch)
20	10 gauge (0.140-inch)
24 to 36	0.187-inch
42 to 48	0.250-inch
54 to 60	0.312-inch

- D. Fittings shall be fabricated from the pipe specified and shall conform to ASTM A774, unless otherwise shown on the Drawings or required for proper installation.
- E. Flanges where shown on the Drawings shall be a lap joint flange assembly consisting of a 304L stainless steel slip-on rolled angle ring with a 304L stainless steel drilled backup flange conforming to ASTM A240, and shall conform dimensionally to ANSI B16.1, Class 125. The leg of the angle ring shall not interfere with the flange bolt holes. Alternately, slip-on plate flanges conforming to ANSI B16.1, Class 125 are acceptable at specific locations as approved by the Engineer. The plate flange shall be continuously welded to the pipe. The backup flanges and plate flanges shall be supplied with the following nominal thicknesses:

Nominal Pipe Size (inches)	Flange Thickness (inches)
2-1/2 to 3	1/2
4	9/16
6 to 10	5/8
12 to 16	3/4
18 to 20	7/8
24 to 30	1

Nominal Pipe Size (inches)	Flange Thickness (inches)
36	1-1/8
42	1-1/4
48	1-3/8
54	1-3/8
60	1-1/2

- F. Bolts for flanged joints shall be of the size and length called for and in accordance with the "American Standard" and comply with the requirements of the ANSI/AWWA Standards. Bolts shall be per ANSI B18.2, stainless steel, type and grade to prevent galling. Bolts shall have hexagonal heads and nuts; no washers shall be used. Bolts used at all transitions to material other than stainless steel shall be furnished with dielectric insulation material service rated for 300 degrees Fahrenheit continuous service at 25 psig.
- G. Gaskets for flanged joints shall be ██████ or silicone material, "Ring-Gasket" type, 1/8-inch minimum thickness, and suitable for 300 degrees Fahrenheit continuous service at 25 psig. Dielectric gaskets shall be used at all transitions to material other than stainless steel. Segmented gaskets will not be acceptable.
- H. Joints in piping 3 inches in diameter or larger shall be butt welded or flanged, unless otherwise shown on the Drawings. Joints in piping less than 3 inches in diameter shall be threaded, unless otherwise shown on the Drawings.
- I. Welding practices for joints shall conform to those specified for the manufacture of the pipe and fittings in ASTM A774 and A778, and the specifications contained herein. All welds shall be free from burrs, snags, or rough projections.
- J. Welding shall be performed by AWS-certified welders in conformance with standard procedures. Piping with wall thickness up to 11 gauge (0.125-inch) shall be welded with the TIG (GTAW) process. Heavier walls shall be properly beveled and have a root pass with the TIG (GTAW) process followed by subsequent passes with the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process. Filler wire of ELC grades only shall be added to all welds to provide a cross section at the weld equal to or greater than the parent metal. Weld deposit shall be greater than the parent metal. Weld deposit shall be smooth and evenly distributed and have a crown of no more than 1/16 inch on the I.D. and 3/32 inch on the O.D. of the piping or fittings. Concavity, undercut, cracks, or crevices shall not be allowed. Butt-welds shall have full penetration to the interior surface, and inert gas shielding shall be provided to the interior and exterior of the joint. Excessive weld deposits, slag, spatter, and projections shall be removed by grinding. Angle face rings shall be continuously welded on both sides to the pipe or fitting. Welds on gasket surfaces shall be ground smooth.

- K. All fittings shall be welded with 304L filler metal. All elbows through 24-inch size shall be long radius, die-formed, and shall be automatically butt welded in accordance with ASTM A774 of the same material and thickness as the pipe using gas tungsten-arc procedures with inert gas backing. Tees, crosses, true wyes, and laterals shall be shop-fabricated. All short radius, special radius, and reducing elbows and long radius elbows greater than 24-inch shall be mitered construction with at least (5) miter sections for 90-degree bends, (3) mitered sections for 45-degree and 60-degree bends, and (2) mitered sections for 30-degree and smaller bends. All reducers shall be straight tapered, cone-type. Longitudinal welds on all fittings, except elbows, shall be accomplished by the same procedures as listed for pipe. Weld seams shall have full penetration and be free of oxidation, crevices, pits, cracks, and protrusions. Fitting dimensions shall be in accordance with ANSI B16.9 and shall be terminated and dimensioned as indicated on the Drawings.
- L. Pipe spools shall be manually welded with 304L filler metal using gas tungsten-arc procedures with internal gas purge where internal weld seams are not accessible. Where they are accessible, seams shall be welded both inside and outside using manual shielded metal-arc procedures. Weld seams shall have full penetration and shall be free of oxidation, crevices, pits, cracks, and protrusions.
- M. All pipe, fittings, and spools shall be completely pickled and passivated by immersion in a nitric-hydrofluoric bath at the proper temperature and length of time to insure removal of all free iron, weld scale, and other impurities and to ensure the establishment of a passive surface. A clean water rinse shall follow the acid pickle.
- N. The inspection of all welds shall be required. This shall be a visual inspection for crevices, pits, cracks, protrusions, and oxidation deposits. Presence of any of these items found in the weld seams shall be considered as grounds for rejection of the joint.
- O. All fabricated piping shall have openings plugged and flanges secured for storage and/or transport after fabrication. All fabricated piping shall be piece marked with identifying numbers or codes which correspond to the Contractor's layout and installation drawings. The marks shall be located on the spools at opposite ends and 180 degrees apart.
- P. The piping supplier during manufacturing, fabrication, and handling stages and the Contractor during handling and installation stages shall use extreme care to avoid the contact of any ferrous materials with the stainless steel piping. Only manufacturer recommended saws, drills, files, wire brushes, etc. shall be used for stainless steel piping. Pipe storage and fabrication racks shall be non-ferrous or stainless steel or rubber-lined. Nylon slings or straps shall be used for handling stainless steel piping. Contact with ferrous items may cause rusting of iron particles embedded in the piping walls. After installation, the Contractor shall wash and rinse all foreign matter from the piping surface. If rusting of embedded iron occurs, the Contractor shall pickle the affected surface with [REDACTED] or equal, scrub with stainless steel brushes, and rinse clean.

2.03 PROCESS AIR PIPE SUPPORT AND EXPANSION/CONTRACTION SYSTEM

- A. Process air pipe expansion/contraction system shall be coordinated with fixed and sliding supports per Section 40 05 07 – Pipe Supports and Section 40 05 41 – Piping Expansion Compensation.

PART 3 – EXECUTION

3.01 FIELD WELDING OF STEEL AND STAINLESS STEEL PIPING AND FITTINGS

- A. Contractor shall minimize the amount of field welding of steel and stainless steel piping required. Locations for pipe field welding will be evaluated and allowed on a case-by-case basis upon written approval of the Engineer. All field welding of steel and stainless steel pipe is subject to the following requirements:
 - 1. Welding shall be performed by AWS-certified welders in conformance with AWS 1.6. Submit welder's certification for approval prior to performing any field welding.
 - 2. Piping with wall thickness up to 11 gauge (0.125-inch) shall be welded with the TIG (GTAW) process. Heavier walls shall be properly beveled and have a root pass with the TIG (GTAW) process followed by subsequent passes with the TIG (GTAW) or MIG (GMAW) process. Filler wire of ELC grades only shall be added to all welds to provide a cross-section at the weld equal to or greater than the parent metal. Weld deposit shall be greater than the parent metal. Weld deposit shall be smooth and evenly distributed and have a crown of no more than 1/16 inch on the I.D. and 3/32 inch on the O.D. of the piping or fittings. Concavity, undercut, cracks, or crevices shall not be allowed. Butt-welds shall have full penetration to the interior surface. Excessive weld deposits, slag, spatter, and projections shall be removed by grinding.
 - 3. Jigs shall be utilized to align adjacent sections of piping.
- B. Post-Weld Treatment:
 - 1. All field welds shall be wire brushed utilizing steel or stainless steel wire brushes to remove slag and spatter. Stainless steel brushes shall be used on stainless steel pipe.
 - 2. The weld and the heat affected area shall be pickled with a brush-on pickling gel in accordance with ASTM A380 to remove all weld residue, oxide, and heat stain from the field weld and affected areas.
 - 3. Pickling of stainless steel pipe shall be done in accordance with pickling paste manufacturer's directions, and areas being pickled shall be protected from direct sunlight. After pickling period is complete, neutralize pickling gel in accordance with directions and rinse area clean.

- C. Where field welding of steel (carbon or stainless) piping is approved by the Engineer, all field welds shall be visually inspected and either ultrasonic or radiographically tested by an approved quality assurance testing firm in accordance with AWS D1.1, AISC Design Guide 21 Welded Connections, Section 9.0, and other applicable referenced sections of AWS and AISC. The Contractor is responsible for all costs associated with testing and shall be responsible for contracting with an approved testing firm. The Contractor shall submit a proposed testing firm and personnel for approval in addition to his proposed plan to visually inspect and test all field welds of steel pipe prior to field welding of steel pipe.

3.02 FLUSHING AND TESTING

- A. Flushing and testing of all installed low pressure air piping shall be performed as specified in Section 40 05 00 – Basic Mechanical Requirements. The field testing procedure for process air piping shall use air pressure only.

END OF SECTION

SECTION 40 05 63

BALL VALVES

PART 1 – GENERAL

1.01 THE REQUIREMENT

- A. Reference Section 40 05 00 – Basic Mechanical Requirements.
- B. Valves required for chemical service shall be constructed of materials suitable for the intended service.

PART 2 – PRODUCTS

2.01 BALL VALVES (WATER SERVICE)

- A. Ball valves (water service) shall be of the full port, single seated, metal to metal seated, tight-closing type conforming to the latest revision of AWWA C507 Specifications. The manufacturer shall have a minimum of 5 years of experience in manufacturing ball valves of the sizes required in accordance with AWWA C507 Specifications. All ball valves shall be the product of one manufacturer. Ball valves shall be as manufactured by [REDACTED], or equal.
- B. Each valve shall be performance and leak tested as specified in AWWA C507 revised as follows: In addition to the testing requirements of AWWA C507, each ball valve shall be thoroughly cleaned and opened and closed at least three (3) times prior to testing. Certified copies of the test results shall be submitted to the Engineer for approval prior to shipment of the valve.
- C. Ball valves shall be AWWA Class 150, unless otherwise indicated in the valve schedules, design with flanged ends, and installed as shown on the Drawings.
- D. The valve body shall be constructed of epoxy coated cast iron conforming to ASTM A 48, Class 35, with a full, unrestricted circular inlet and outlet, with nominal opening diameter equal to the rated size of the valve. Each valve body shall be provided with flanged ends conforming in diameter and drilling to ANSI B16.1, Class 125. All flanges shall be flat faced and finished to true plan surfaces within a tolerance limit of 0.005 inch. Each flange face shall be perpendicular to the longitudinal axis of the valve within a maximum angular variation tolerance of 0.002 inch per foot of flange diameter. Flange faces shall have concentric or spiral serrated finish. The body trunnions shall be fitted with ample sized bronze bearings of sufficient difference in hardness from the plug bearings to eliminate seizing and galling. Bearing pressure shall not exceed 1500 psi at full differential pressure of 150 psi. Valve designs employing [REDACTED] coated or other

non-metallic material will not be acceptable. Bearings shall be machined in accurate alignment for reception of the plug trunnions.

- E. The body shall provide rigid means for supporting the valve operating mechanism without the necessity of additional supports and shall be of such design that it shall be capable of receiving the complete plug sub assembly. The valve body shall have integral hubs for housing shaft bearings and seals.
- F. The body shall have a rigidly attached metal seat. The body seat shall be [REDACTED] and shall be machined, ground and polished for contact with the stainless steel seat mounted on the plug.
- G. There shall be two (2) pipe connections, one for an air vent and the other for drain.
- H. The plug shall be constructed of epoxy coated cast iron conforming to ASTM A48, Class 35, with a full unobstructed, circular waterway with a diameter equal to the rated size of the valve. It shall have trunnion supports cast integral on the axis of rotation. An extension of one trunnion, called the operating shaft, shall pass through a shaft seal chamber and connect to the valve operation mechanism.
- I. The plug shall have a stainless steel seat conforming to ASTM A276, Type 304, mounted thereon which shall properly align with the body seat when the valve is in the closed position. The surfaces of the seat ring shall be spherically generated and shall be machined, ground and polished for contact with the body seat.
- J. The plug trunnions shall be fitted with bronze bearings of sufficient difference in hardness from the body bushings to eliminate seizing and galling.
- K. Bearing pressure shall not exceed 1500 psi at full differential pressure of 150 psi. Valve designs employing [REDACTED] coated or other non-metallic bearing material will not be acceptable.
- L. Valve shafts shall be integral with the plug and shall connect the plug to the torque unit. The shaft shall be of chrome Molybdenum Steel (ASTM A 322 Grade 4140) with hard chrome plate through the seal chamber suitably sized to transmit the torques required to operate the valves under the conditions listed in the valve schedule with appropriate safety factor. Shafts shall be securely attached to valve plug by means of conservatively sized corrosion-resistant taper pins, threaded at one end and secured with lockwashers and nuts (i.e.: mechanically attached). Provide O-ring seal on taper pin if required to prevent leakage. Shaft key shall be constructed of corrosion-resistant material.
- M. Shaft bearings shall be contained in the integral hubs of the valve body and shall be the permanently self-lubricated, corrosion resistant, sleeve type of heavy-duty bronze. The valve assembly shall be furnished with a factory set thrust bearing designed to center the valve plug in the valve seat at all times. End cover bolts shall be of stainless steel construction.

- N. A shaft seal shall be provided of the type utilizing a plug shaft stuffing box, four (4) "O" ring seals, a bronze retainer and a corrosion resistant steel lock ring. The "O" ring material shall be [REDACTED] rubber, as intended for use with potable water or wastewater.
- O. Manual operators for ball valves 18-inches in diameter or larger shall be the worm gear or travelling nut type conforming to AWWA C507. Manual operators for ball valves mounted above 6 feet from the operating floor shall be equipped with worm gear chainwheel actuators. Operators shall be equipped with adjustable AWWA limit stops and shall require a minimum of 15 turns for 90 degrees or full stem valve travel. The capacity of the manual operator shall be adequate to drive the valve under the differential pressure of 150 psi and maximum anticipated flow, unless otherwise indicated in the appropriate valve schedule. Electric motor operators shall be as specified elsewhere in this Section.
- P. The torque unit (valve operating mechanism) shall be of the traveling-nut type and shall be the product of the valve manufacturer. The assembly shall be mounted and attached to the valve body. The torque unit shall be designed to accept a manual, cylinder or electric motor actuator. The torque unit housing shall employ the following:
1. A traveling crosshead to impart positive rotary movement to the plug which will move transversely to the valve shaft.
 2. A cylinder piston rod or stainless steel Type 416 threaded leadscrew (reach rod or stem) with the crosshead directly attached thereto.
 3. A rotator lever (of cast steel construction).
 4. A matched set of interconnecting links (of cast steel construction) connecting the traveling crosshead to the rotator lever.
- Q. The traveling crosshead shall be confined to permit linear motion only and to prevent it from any tendency to rotate due to linkage reaction. A plug shaft support bearing shall be supplied on the cover.
- R. The torque unit shall be so designed that during the first 50 percent of stroke in closing the flow area is reduced by approximately 81 percent. The remaining 19 percent of flow area shall be gradually reduced to a complete shutoff throughout the last 50 percent of the closing stroke.
- S. The torque unit shall be totally enclosed in a suitable housing with a removable cover and shall be capable of being inspected, lubricated, adjusted and repaired without interfering with or removing the valve from the line and shall be permanently lubricated. All parts shall be of first class workmanship, easily replaceable and manufactured of the best materials suited for the purpose. All parts subject to rubbing shall be of significantly different hardness to prevent galling and shall be sized to result in a maximum bearing stress at full load of 2,000 psi. The main shaft shall be replaceable without removing the torque unit housing and while the valve is in the line under pressure.

- T. The manufacturer shall certify that the ball valves are capable of operating in continuous duty service under these pressures and flow conditions.
- U. Each valve shall be hydrostatically tested and tested for bubble tightness after the operator has been mounted and adjusted. Copies of the hydrostatic and leakage test certification and certification of conformance shall be submitted to the Engineer prior to shipment.
- V. All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.
- W. Where valves are installed in piping to be insulated and jacketed, proper length stem extensions shall be furnished and installed such that the valve operator easily functions without interference with the insulation and jacket.

2.02 BALL VALVES (SERVICE AIR)

- A. Ball valves (service air) shall be manufactured by [REDACTED], or equal. The body materials shall be cast bronze rated at 600 psi WOG, 150 psi saturated steam. Valves shall be tested by the manufacturer to MSS SP-72, 100 psi air under water, in the opened and closed position. The valve shall provide a port diameter equal to or exceeding the mating pipe size. Valves 2-1/2 inches in diameter and smaller shall have lever operators, unless otherwise specified herein or noted on the Drawings. Levers shall be cadmium plated steel covered with a vinyl grip and attached with a nut and have a hole for tagging purposes. The stem gland shall be adjustable and independent of the lever to compensate for wear. Bottom loaded stems shall be designed to be blow-out proof. The stuffing box seals and ball seats shall be composed of glass-reinforced TFE. The ball and stem shall be 316 stainless. Ball valves shall have NPT ends.

2.03 BALL VALVES (BALL CHECK FOR CAUSTIC SERVICE)

- A. Ball check valves installed in carbon steel caustic solution piping shall be constructed of Type 304 or 316 stainless steel. Valves shall have a 200 psi minimum pressure rating and a maximum temperature rating not less than 300°F. Valves shall be flanged and equipped with unions as necessary to expedite removal and servicing.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 40 79 00
MISCELLANEOUS INSTRUMENTS, VALVES, AND FITTINGS

PART 1 – GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish, test, install and place in satisfactory operation, the instrumentation and control system accessories with all spare parts, and appurtenances as herein specified and as shown on the Drawings.
- B. Accessories include various items of equipment that may be required in the system but are not scheduled. Accessories are shown on details, flow sheets or plans. Accessories are also called out in specifications for scheduled instruments and in the installation specifications. It is not intended, however, that each piece of hardware required will be specifically described herein. This Specification shall be used as a guide to qualify requirements for miscellaneous hardware whether the specific item is described or not.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 40 61 13 – Process Control System General Provisions
- B. Section 40 70 00 – Instrumentation for Process Systems

1.03 SUBMITTALS

- A. Per Section 40 61 15 – Process Control System Submittals
- B. Impulse piping layout and routing drawings
- C. Complete instrument assembly drawings showing orientation to installed process piping.

PART 2 – PRODUCTS

2.01 PROCESS TUBING

- A. Process, impulse, or capillary tubing shall be 1/2 x 0.065-inch seamless, annealed, ASTM A-269 Type 316L stainless steel with 37 degrees Type 316 stainless steel flared fittings or [REDACTED] or [REDACTED] flareless fittings.
- B. Piping for closely coupling instruments to process seals shall be standard stainless steel NPT threaded piping or NPT tapped mounting blocks.
- C. A nickel-based lubricant shall be used on threaded stainless steel piping connections to prevent galling.

2.02 POWER, CONTROL, AND SIGNAL CABLES

- A. Power, control, and signal wiring shall be provided under Division 26 of the Specifications, unless otherwise indicated.

2.03 CHEMICAL DIAPHRAGM SEALS

- A. Diaphragm seals shall be provided for isolation of pressure gauges, switches and transmitters attached to systems containing chemical solutions or corrosive fluids. As a minimum, seals shall be of all 316 stainless steel construction. In general, diaphragms shall be 316L stainless steel for operating pressures at or above 15 psi and elastomers for operating pressures below 15 psi. However, all components shall be non-reactive with the process fluid in all cases. Refer to the Process Control System Instrument Lists for specific materials requirements.
- B. Seal shall have fill connection, 1/4-inch NPT valved flush port and capable of disassembly without loss of filler fluid. Where specified, diaphragm seals shall comply with the above requirements and shall be provided with 316 SS factory filled capillaries.
- C. Seals shall be [REDACTED], [REDACTED], [REDACTED], or equal.

2.04 ISOLATING RING SEALS

- A. For solids bearing fluids, line pressure shall be sensed by a flexible cylinder lining and transmitted via a captive sensing liquid to the associated pressure sensing instrument(s).
 - 1. Full Line Size Isolating Ring Seals
 - a. Where indicated, the sensor body shall be full line size wafer design.
 - b. Full line size isolating ring seals shall have 316 stainless steel housing and assembly flanges and [REDACTED] flexible cylinder lining for in line mounting. The wafer shall have through bolt holes or centerline gauge for positive alignment with the associated flanged piping. Gauge or readout shall be oriented for viewing.
 - c. The captive liquid chamber and associated instrument(s) shall be furnished with threaded drain tap and plug. Manufacturer shall furnish seals with a quick-disconnect-type fitting for field disassembly and reassembly, however, seal and instruments shall be factory assembled prior to arriving at the job site
 - d. Isolating ring seals shall be [REDACTED], [REDACTED], [REDACTED], or equal.
 - 2. Tapped Isolating Ring Seals

- a. Where indicated, pressure shall be sensed via a minimum 1-1/2" diameter spool type isolating ring seal mounted on a 1-1/2" pipe nipple at 90 degrees from the process piping.
- b. An isolation ball valve shall be provided between the process piping and the ring seal, and a cleanout ball valve shall be provided between the ring seal and the atmosphere. The factory assembled and filled pressure instrument shall be back or side mounted to the ring seal such that the gauge or readout may be viewed normally.
- c. Tapped isolating ring seals for solids service shall be [REDACTED], [REDACTED], [REDACTED], or equal.

2.05 FILLING MEDIUM:

- A. The filling medium between instruments, isolating ring seals and diaphragm seals shall be a liquid suitable for operation in an ambient temperature ranging from -10 degrees F to +150 degrees F.
- B. Filling medium shall be silicone unless oxidizing agents, such as sodium hypochlorite, are present, then halocarbon shall be used.

2.06 TAMPER EVIDENT PAINT

- A. Piping and screwed/bolted connections of instrumentation containing the filling medium shall be marked with a small continuous tick mark of tamper evident paint over each piping/instrument joint. Tamper evident paint shall be applied prior to instrument assemblies arriving on the job site. Disturbance of the joint shall break the paint.
- B. Instrument assemblies with broken paint or missing paint shall not be accepted and shall be repaired or replaced at no additional cost to Owner. Paint shall be [REDACTED] or equal.

2.07 ISOLATION VALVES

- A. Isolation valves shall be 1/2 inch diameter ball valves, unless otherwise indicated, with a Type 316 stainless steel body, Type 316 stainless steel ball. Where 316 stainless steel is not compatible with the process fluid, materials of construction shall be suitable for the associated process fluid (e.g., PVC for chemical service).

2.08 ALARM ANNUNCIATION DEVICE

- A. Sirens:
 - 1. For Class I, Division 2 areas and non-hazardous areas: