LOS ANGELES COUNTY SANITATION DISTRICTS
Converting Waste Into Resources

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Delivered Via Electronic Mail
Leslie Corcelli
U.S. EPA
Office of Wastewater Management

Via email: Corcelli.Leslie@epa.gov

NOTE: The referenced attachments with project diagrams, schedules, and supplier correspondence are in formats that do not meet the Federal accessibility requirements for publication on the Agency's website. Hence, these exhibits have been omitted from this waiver publication. They are available upon request by emailing CWSRFWaiver@epa.gov.

Dear Ms. Corcelli:

Request for Waiver of AIS Provisions for Small Diameter Piping for the Valencia Water Reclamation Plant Advanced Water Treatment Facility Project, Clean Water State Revolving Fund (CWSRF) Project No. C-06-8156-110

The Sanitation Districts of Los Angeles County (Districts) are requesting a product-specific project waiver of AIS provisions be issued for ½-inch to 2-inch diameter steel pipe for the construction of the Valencia Water Reclamation Plant Advanced Water Treatment Facility (VWRP AWTF) Project. 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.

Project Background

The VWRP AWTF project involves the construction of an advanced water treatment facility to comply with the requirements established by the Regional Water Quality Control Board – Los Angeles associated with the Santa Clara River Total Maximum Daily Load (TMDL) for chloride. The project will remove chloride from a portion of the plant's effluent and this low chloride flow will be blended back with the remaining flow prior to disinfection and discharge. The permitted discharge capacity of the VWRP is 21.6 million gallons per day (mgd) and currently, the VWRP produces approximately 15 mgd of tertiary-treated recycled water that is mainly discharged to the Santa Clara River.

The AWTF will consist of microfiltration (MF) for particulate removal, nanofiltration (NF) for water softening, an enhanced membrane system (EMS) using high recovery reverse osmosis (RO) for chloride removal, and a truck loading station for brine disposal. Approximately 8.3 mgd of VWRP tertiary-treated water will be diverted to the AWTF, which will produce approximately 7.7 mgd of low chloride product water that will be blended with the remaining VWRP tertiary-treated water to meet a 100-mg/L chloride TMDL.

The VWRP AWTF project is funded by a loan through the Clean Water State Revolving Loan Fund (CWSRF). The Consolidated Appropriations Act of 2014 includes an "American Iron and Steel" (AIS) provision that requires recipients of CWSRF assistance to use iron and steel products produced in the United States.

The VWRP AWTF project includes the installation of ½-inch to 2-inch diameter steel pipe, which is subject to AIS provisions. The steel grade for the ½-inch to 2-inch diameter steel piping is specified based on the service of the line. Type 316L stainless steel is specified for compressed air distribution. Alloy 20 is specified for sulfuric acid piping, which is industry standard for 93% or greater sulfuric acid. Depending on the chloride concentration, either Alloy 2205 or Zeron 100 is specified for RO feed and concentrate. Alloy 2205 will be installed for concentrate with a chloride concentration of 9,500 ppm, and Zeron 100 will be installed for the concentrate with a chloride concentration of 18,000 ppm.

Discussions with possible manufacturers and suppliers for the ½-inch to 2-inch diameter steel pipe have indicated that none are able to meet both the project specifications and the AIS provisions. It is believed that these products are not produced in the U.S. in sufficient and reasonably available quantities and of satisfactory quality to meet the needs of the project.

General

Description of the foreign and domestic construction materials

The ½-inch to 2-inch diameter steel pipe from Ta Chen are made of schedule 40 316 Stainless Steel, schedule 40 Alloy 20, Alloy 2205, and Zeron 100.

Unit of measure

The unit of measurement for the steel piping is linear feet.

Quantity

There is approximately 3,120 feet of 316 Stainless Steel pipe, 560 feet of Allow 20 pipe, 500 feet of Alloy 2205 Pipe, and 60 feet of Zeron 100 pipe. Refer to [redacted], Ta Chen.

Price

The total price for 316 Stainless Steel pipe is approximately $[redacted]. The total price for Alloy 20 pipe is approximately $[redacted]. The total price for Alloy 2205 pipe is approximately $[redacted]. The total price for Zeron 100 pipe is approximately $[redacted]. Refer to [redacted] the list of materials and [redacted] from the manufacturer, Ta Chen.

Time of delivery or availability

The estimated delivery time is approximately three(3) to four(4) weeks after an approved submittal.

Location of the construction project

The Valencia WRP is located at:
28185 The Old Road
Valencia, CA 91355

Name and address of the proposed supplier

Santa Fe Winwater Company
10244 Freeman Avenue
Santa Fe Springs, CA 90607

Detailed justification for the use of foreign construction materials

316L stainless steel is specified for compressed air distribution piping with a diameter of less than 2-inches. 316L stainless steel was chosen for this application due to its corrosion resistance when buried, strength, and longevity.

Alloy 20 piping is specified for the sulfuric acid piping in double containment areas and at the injection locations into the process piping. Metal piping is specified to be used in these locations because it is unlikely to break and cause a spill. Alloy 20 is specified because it is the industry standard metal material to be used with 93% or greater sulfuric acid.

Alloy 2205 and Zeron 100 are specified for the RO feed and concentrate piping. The use of Alloy 2205 and Zeron 100 stainless steel is dictated by chloride concentration in the water. Steel pipe will corrode rapidly in the presence of chlorides, including 316 stainless steel, when the chloride concentration is above 1,000 ppm. The Chloride concentration in the secondary RO concentrate will be around 9,500 ppm, and therefore Alloy 2205 is specified. The Concentrate of the Recovery will have a higher chloride concentration of 18,000 ppm, and therefore Zeron 100 is specified.

Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with prime contractor.

Refer to Attachment B, the AIS provision contract language in Section 1D, Part 4 of the Special Provisions, which communicates the AIS requirements to potential bidders.

Availability Waiver Request

Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials

Santa Fe WinWater contacted the following manufacturers about the availability of the specified pipe. None of the manufacturers contacted could domestically source the pipe in accordance with the Special Provisions. Refer to Attachment C, the letter from Santa Fe WinWater, which contains the list of manufacturers contacted and their responses.

- Ta Chen
- Multalloy
- Felker Bros
- Merit Brass
- Alaskan Copper
- Core
- Texas Flange
- Stainless & Alloy
- Smith Cooper
- PAC Stainless

Documentation of the assistance recipient's efforts to find available domestic sources, such as description of the process for identifying suppliers and a list of contacted suppliers

In addition to the manufacturers contacted by Santa Fe WinWater as listed above, District engineers have contacted the following manufacturers and suppliers and asked about the availability of the specified pipe. The manufacturers and suppliers who responded indicated that they are unable to provide AIS compliant pipe that meet the specifications.

- Alaskan Copper
- Core Manufacturing
- Felker Brothers
- MultAlloy
- RathGibson/PCC
- Stainless & Alloy
- Swagelok
- Taylor Forge Stainless, Inc.
- Wilson Metals

Project schedule

The anticipated schedule for the VWRP AWTF project as it relates to the stainless steel pipe is summarized as follows:

- Stainless Steel Pipe Submittal Review and Approval: As soon as AIS waiver is granted
- Procurement and Delivery: 3-4 weeks after approved submittal
- Project Completion: February 2022

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

The technical specification for the stainless steel pipe (Section 40_05_23.01, Stainless Steel Pipe and Tubing) is included in Attachment D. Select plans and sections of the VWRP AWTF project detailing the stainless steel pipe is presented in Attachment E. The Pipe Material Schedule is included on Sheet No. M-2 in Attachment E.

Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of domestic construction materials for which the waiver is sought.

Refer to Attachment C for a statement from Santa Fe WinWater describing their communication with manufacturers who cannot meet the AIS provisions for the specified pipe.

If you have any questions, please contact Paul Mikulas, Supervising Engineer, at (562) 908-4288, extension 2175.

Very truly yours,

Paul Mikulas
Supervising Engineer
Wastewater and Solid Waste Design Section

PM:SH:bp

Attachments:

[redacted]
Attachment B - Section 1D of the Special Provisions
Attachment C - Letter from Santa Fe WinWater, dated December 26, 2019
Attachment D - Section 40_05_23.01 of the Special Provisions
Attachment E - Sheet Nos. M-2, 4M5-2, 4M5-3, 4M5-4, 4M5-5, 4M5-6, and 9M7-1 of the Contract Drawings

cc: D. Zondervan
M. Hinostroza
S. Hunkler
M. Copeland
D. Drorbaugh
I. Chang

SECTION 40_05_23.01

STAINLESS STEEL PIPE AND TUBING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Stainless steel piping and tubing.

B. Related sections:
   1. Section 01_33_00.02 - Submittal Procedures.
   2. Section 01_75_17 - Commissioning and Process Start-Up.
   3. Section 40_05_00.01 - Common Work Results for General Piping.

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 Welding Society (AWS):
   1. D1.6 - Structural Welding Code - Stainless Steel.

C. 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.

D. 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_00.02.

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_75_17.

D. Provide Manufacturer's Certificate of Installation and Functionality Compliance as specified in Section 01_75_17.

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 pressures exceeding 250 pounds per square inch gauge, minimum wall thickness corresponding to Schedule 40S or 80S (depending on test pressure requirement as stated in the Drawings).
   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:
      a. For general service applications with pressures less than 250 pounds per square inch gauge, minimum wall thickness corresponding to Schedule 40S.
      b. For pressures exceeding 250 pounds per square inch gauge, minimum wall thickness corresponding to Schedule 80S.

C. Piping material and manufacturing:
1. Comply with the requirements outlined in the following table:

Service	Stainless Steel Grade	Pipe Manufacturing Process
Membrane and Reverse Osmosis/Nanofiltration Systems 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
Brackish water Membrane and Reverse Osmosis/Nanofiltration Membrane Filtration Systems with chloride concentrations between 1,000 and 10,000 parts per million.		
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
Brackish and Seawater Membrane and Reverse Osmosis/Nanofiltration Membrane Filtration Systems with chloride concentrations between 10,000 to 20,000 parts per million		
All piping diameters	Austenitic and duplex grades of material with PREN greater than 40	In accordance with ASTM A 312, ASTM A 790 or ASTM A 928
Brackish and Seawater Reverse Osmosis Concentrate (i.e., Brine) with chloride concentrations greater than 20,000 parts per million		
All piping diameters	Austenitic and duplex grades of material with PREN greater than 45	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
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

2. Location of material fabrication and Chemical analysis certificates.

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.
   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, Class 150.

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 valves and flanged pipe appurtenances in stainless steel piping systems with flanged ends.
      2) 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:
      1) Aboveground piping: Welded, flanged, or grooved.
      2) Underwater piping: Welded or flanged.
      3) Buried piping: Welded or mechanically restrained.
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 B16.5, 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 approved 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 or ASME B16.5, Class 150, 300 or 600, as scheduled.
      1) Manufacturers: The following or approved equal:
         a) Alaskan Copper Works, Figure SK-39 (tube) or SK-39P (pipe).
   c. 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 approved 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 approved equal:
(1) Piedmont Pacific Corporation.
(2) Victaulic Style 489 Rigid Coupling.

G. Gaskets:
1. All service applications: EPDM, nitrile, or other materials 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 exterior: All piping except concrete encased piping.
2. For piping greater than 2-inches in diameter:
   a. Electropolish stainless steel pipe 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. Seamless tubing made of Type 316L stainless steel and in accordance with ASTM A 269, wall thickness not less than 0.035 inch.
2. For EMS:
   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.

B. Fittings: Swage ferrule design:
   1. Components made of:
      a. Type 316 stainless steel.
      b. For EMS:
         1) Austenitic or duplex stainless steel of type matching the tubing system.
   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 approved equal:
      a. Crawford Fitting Company, Swagelok.
      b. Hoke, Gyrolok.
      c. Parker, CPI.

C. Valves for use with stainless steel tubing:
   1. Ball type valves with swage ends to match tubing diameter.
   2. Constructed from:
      a. Type 316 stainless steel with TFE seats.
      b. For EMS:
         1) Austenitic or duplex stainless steel of type matching the tubing system, with TFE seats.
   3. Manufacturers: The following or approved equal:
      a. Crawford Fitting Company, Swagelok.

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:
   1. Supplementary testing is not required.

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

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

F. 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_00.01:
   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_75_17 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					
	Training Requirements		Installation		Functional Testing		Process Operational Period	
Source Testing (Witnessed or Non-witnessed)	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