PDHonline Course G467 (2 PDH)

Preparing the Written Equipment Specification

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ATTACHMENT A

Specification Name: STAINLESS VESSELS

Specification Number: _____later_____

Owner: XYZ CORPORATION

Location: Winston, NC

Project Name: “C”

Equipment Name:
“A” REACTOR

0	9/11/09	Issue for bid	CW	AW	SS		
A	8/29/09	Issue for COMMENT	CW	AW	SS		
REV.	DATE	REASON FOR REVISION	BY	CHECK	APP		

1.0 SCOPE

1.1 This specification, together with attachments, and applicable referenced National Codes, shall establish the minimum requirements for the design, fabrication, cleaning, testing, and delivery of the equipment listed in Section 2.0. In the event of a conflict between documents, the Vendor shall submit, in writing, the type and source of the conflict.

1.2 Vendor shall be responsible for design, fabrication, cleaning, testing, and delivery of the listed equipment to the XYZ Corp plant in Winston, NC.

1.3 In addition to the equipment, the Vendor shall provide:

1.3.1 Documentation as required in attached Vendor Data Requirement Form.

1.3.2 A spare set of gaskets for the Manway.

1.4 Information in this specification is considered CONFIDENTIAL and should not be disclosed without permission from XYZ Corp, Winston, NC.

2.0 EQUIPMENT

2.1 Vendor shall be responsible for design, fabrication, cleaning, testing, and delivery of the following equipment:

Qty	Equipment No.	Equipment Name (Description)
1	R142	Acrylic Acid Reactor 7,000 liter (to top seam) 316 ss reactor vessel 60 inches ID with 145 inches Tangent Line to Tangent line side wall. Ratings to be: Shell 100 PSIG/FV @ 450 F; Jacket 100 PSIG @ 450 F. See attachment sketch.

3.0 CODES AND STANDARDS

3.1 Each equipment item shall be designed, fabricated, and tested in accordance with the latest editions of the following industry, association, and government codes and standards. It is the vendor's responsibility to determine applicable portion of codes for design and fabrication of the equipment detailed in this specification. Applicable codes and standards are as follows:

ANSI American National Standards Institute

API	American Petroleum Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers, Inc.
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSPC	Steel Structures Painting Council
UL	Underwriters' Laboratory

XYZ Corporation plant standards as follows are applicable to the design and fabrication of the requested equipment except where any applicable national standard applies as law and is more restrictive than the plant standard.

1PC	Process Pipe Codes
2PC	Utility Pipe Codes
3PC	Fluid Power Pipe Codes
4PC	Underground Pipe Codes
IMS	Instrument Mounting Standards
PROC	Plant Painting Standards
PSS	Pipe Support Standards
CSS	Conduit Support Standards

Other standards as listed on drawings.

4.0 DESIGN AND FABRICATION

4.1 Substitution of material shall have the written approval of XYZ Corporation, or their representative before being used in construction. A request by Supplier for substitution of materials must be accompanied with the ASTM/ASME designation or complete chemical and mechanical properties including proposed thickness.

4.2 In the vendor's fabrication facility stainless steel materials shall be segregated from carbon steel materials at all times.

4.3 Grinding discs used on stainless steel materials shall be clean, iron free and not previously used on carbon steel materials.

4.4 Metal removal and abrasive tools used on galvanized material shall be segregated from all other materials.

4.5 Brushes, grinding wheels, or other abrasives previously used on steel or iron shall not be used on stainless steel.

4.6 Clamps and fixtures used during fabrication that come in contact with stainless steel shall be made of stainless steel or have a stainless steel or other suitable material as an isolation pad attached to them.

4.7 To prevent chloride induced stress corrosion cracking, only low chloride water certified to contain <25 ppm chloride, markers, adhesive, etc. shall be used on stainless steel material.

4.8 All stainless steel vessels shall be rinsed with a boiler condensate, de-mineralized water, or other approved chloride-free water to prevent chloride stress corrosion after testing.

4.9 The vessels shall be designed, fabricated and tested in accordance with the latest edition of ASME Section VIII, Division 1. ASME Code Stamp and National Board Number are required. Pressure vessels designed for installation in North Carolina shall receive a state pressure vessel nameplate. It is the vendor's responsibility to provide data sheets and nameplates in compliance with such state or local requirements as determined from the "ship to" address noted at the end of this specification.

4.10 Nameplate bracket shall be installed on each vessel in accordance with ASME Standards. Nameplate shall include, but is not limited to, the following:

P. O. Number
"XYZ Corp."
"Winston, NC"
"Project C"
Equipment Number
Equipment Name
Supplier Name
Model Number, if applicable
Serial Number
Date of Manufacture
Empty Weight

4.11 Removable and non-removable internal piping shall be 3mm (1/8-inch) minimum thickness, plus 2 times the corrosion allowance.

4.12 Bolt sizes (including studs and nuts), threads, and marking shall conform to ANSI B1.1 with threads Class 2A External and 2B Internal. All bolts shall be coarse thread series (UNC).

4.13 External bolting for covers, blind flanges, and flanges shall be stud bolts, with 2 heavy hex nuts each. However, in cases of pad type openings, stud bolts with 1 hex nut each are acceptable.

4.14 Hardened washers shall be used on soft materials where nuts are likely to damage surfaces.

4.15 Reinforcing and attachment pads shall be fabricated from material of the same specification as the shell or head part to which it is attached. Dissimilar metals shall not be welded to the pressure envelope of the unit. The support or other appurtenance should be welded to a pad, and the pad welded to the vessel, in that order.

4.16 All reinforcing pads for nozzles or over a pressure envelope weld shall have at least one hole drilled and tapped to ¼" NPT for leak testing. For segmented pads, each segment shall have a test hole.

4.17 Vessels shall be provided with two (2) grounding lugs spaced 180° apart, located on the vessel supports, oriented so as not to present a hazard. Lugs shall be 2-1/2" x 2"x 3/8", with a 9/16" diameter drilled hole located on the clip's horizontal centerline and approximately one inch (1") from the free end. Material of construction shall be stainless steel, or higher base metal to match part to which attached. A positive path to ground across all gasketed surfaces shall be provided.

4.18 Vessels shall be provided with a minimum of two (2) lifting lugs. Tailing lugs shall be provided where required for erecting vessel or components. Design of the lugs shall include the weight of the vessel and all internals. Impact factor for design shall be 2.0.

4.19 Insulation, when required, will be provided by others. Insulation support rings and brackets shall be provided in accordance with the insulation specification.
Insulation supports shall be self-draining, having semicircular holes of at least ½" radius on 12 inch centers, maximum.

4.20 Nozzle flanges shall be in accordance with ANSI B16.5. Flanges larger than the scope of ANSI B16.5 shall be in accordance with ANSI B16.47, Series B. All flange face surface finishes shall be 125 to 250 Ra serrated.

4.21 Nozzle necks shall be schedule 80 for carbon steel and schedule 40 for stainless steel for nozzles 2" NPS or less. Nozzle Necks larger than 2" shall be minimum Schedule 40 for carbon steel and Schedule 20S for stainless steel.

4.22 Nozzles less than 1" shall have provision for vertical support.

4.23 Minimum nozzle projections shall be 6 inches, unless noted otherwise on the data sheets. Insulated vessels shall have nozzle projections extending a minimum of 4 inches beyond the finished insulation.

4.24 All nozzles and couplings shall be trimmed flush and ground smooth with the inside surface of the vessel. Inside edges of all manways and hand holes shall be rounded to a radius of 1/8" or more, unless other wise specified.

4.25 All nozzle flanges shall have two holes straddling the vessel vertical center line or if on the top or bottom then the two holes shall straddle a vessel diameter.

5.0 TESTING AND INSPECTION

5.1 Dye penetrating testing shall be performed on all internal welds of all alloy equipment. Carbon steel is exempt from this requirement. Defects shall be corrected and area retested prior to hydrotesting.

5.2 The test procedure for vessels shall be in accordance with the ASME Code.

5.3 The hydrostatic test procedure for all vessels shall be conducted by filling with water pressured to 1.5 x design and held per ASME code. Pressure shall be reduced to maximum allowable working pressure and held for a minimum of one (1) hour, during which the weld seams shall be frequently inspected for leakage. Gaskets used for hydrostatic test are to be identical to the service gaskets unless approved by Buyer. Test gaskets are not to be shipped with the equipment, all new and if practical still in the original packaging gaskets shall be provided for shipment with the vessel.

5.4 Test water having no more than 25 ppm chlorides shall be used on stainless and alloy vessels.

5.5 Hydrotesting must be repeated after any leak repairs are made. A written report of testing shall be submitted with other pressure vessel and material data sheets.

5.6 Immediately after hydrostatic testing, vessels shall be drained thoroughly. Standing water shall be removed by blowing with oil free air or bottled nitrogen. Hot air drying is not permitted. Stainless steel vessels shall be dried with towels.

5.7 Purchaser and/or owner shall have the option of performing shop inspection of the equipment before shipment. Purchaser or his designee may elect to observe the hydrostatic tests. Vendor shall notify owner two weeks in advance of hydrostatic testing.

6.0 CLEANING AND PAINTING

6.1 Each vessel shall be thoroughly cleaned inside and outside and shall be free from grease, weld spatter, scale, slag, rust and any other foreign matter, both internally and externally.

6.2 All process surfaces shall be cleaned and free of marking ink and paint. The removal of interior and exterior markings made during the course of fabrication shall be accomplished with a cleaner compatible with stainless steel, and likewise, not containing sulfur or chlorides.

6.3 Only stainless steel brushes, or clean iron-free sand, ceramic, or stainless steel grit shall be used for cleaning stainless steel or alloy surfaces. Sanding disks, flapper wheels, or other tools previously used on carbon steel shall not be used on stainless or alloy.

6.4 Alloys may require passivation as specified on the equipment data sheet. Interior surface blasting is not permitted without prior approval of Owner.

6.5 Ferrous equipment that requires oxidation treatment prior to use are not to be treated or cleaned with chlorinated or chlorine bearing compounds. Citric or nitric acid solutions are acceptable.

6.6 Weld discoloration may be removed by wire brushing. No interior surface blasting of stainless steel or alloy surfaces is permitted without written approval from Owner or their representative.

6.7 Weld discoloration shall be removed from <u>exterior</u> surfaces, and may be brush blasted (outside only).

6.8 Stainless steel vessels shall not be painted.

7.0 SHIPPING AND TAGGING REQUIREMENTS

7.1 Supplier shall be solely responsible for the adequacy of cleaning and preparation for shipment.

7.2 Parts are to be packaged to prevent damage from corrosion, contaminants, and handling during transit and for a minimum period of two weeks of outside storage at the job-site before installation.

7.3 Vendor shall attach an embossed or engraved stainless steel nametag to each unit described in Section 2.0. The nametag - or the exterior of all loose packages - shall show the following information:

P. O. Number
"XYZ Corp."
"Winston, NC"
""C" Project"
Equipment Number
Equipment Name

7.4 The center of gravity shall be marked on all horizontal vessels and vertical vessels shipped horizontally. The Letters "C-G" and shipping weight in tons shall be painted at 2 locations diametrically opposite to each other. The location of the center of gravity shall be calculated by the supplier and specified on the vessel drawings. Supplier shall make a suitable adjustment for shipping supports if they cause the center of gravity position to move more than 6 inches.

7.5 Lifting lugs on subassemblies, such as manways, removable covers, etc., shall be labeled "For lifting component only, not for lifting shell."

7.6 Nameplates should be placed such that they are above the manway. Otherwise they shall be placed so that they are readily visible from an adjacent walkway or access platform.

7.7 Preparation for shipment and internals will be subject to inspection and rejection by Buyer's inspectors. All costs occasioned by such rejection shall be to the account of the supplier.

7.8 Exposed finished and machined carbon steel surfaces, including bolting, shall be coated with heavy rust-preventive grease or other approved corrosion preventative.

7.9 Flange faces other than those furnished with permanent blinds shall be covered with 1/2 inch exterior grade plywood and neoprene type gasket, no smaller than the flange OD, and secured with a minimum of half the flange compliment of bolts.

7.10 Internal and external parts and piping assembled with the vessel shall be suitably supported and braced to prevent damage during handling and transporting.

7.11 Separate, loose, and spare parts shall be completely boxed.

7.15 One (1) set of spare gaskets shall be shipped. The second unused set shall be packaged to prevent damage in transit and be shipped with the vessel.

7.15 Supplier shall attach a waterproof envelope labeled "Rigging and Handling Instructions" to the unit. Rigging instructions shall include drawings, and written specifications and instructions for lifting the unit, and specify which lugs are for

lifting entire unit, including tailing lugs for righting the assembly. Storage instructions shall also be included.

8.0 INFORMATION REQUIRED FROM VENDOR

8.1 The Vendor shall submit documentation as required in attached Vendor Data Requirement Form.

8.2 One electronic file of approval drawings shall be provided. These drawings must be submitted and approved before release for fabrication is issued. One print of each drawing will be returned stamped as (a) "RELEASE FOR FABRICATION", (b) "RELEASE FOR FABRICATION, RETURN CERTIFIED", (c) "RELEASE FOR FABRICATION, REVISE & RETURN CERTIFIED", or (d) "REVISE & RESUBMIT, NOT FOR FABRICATION". Fabrication will be released according to a note on the transmittal letter covering the return of the prints. Upon receipt of returned approval drawings, Vendor shall revise to include all changes and return for use as noted above.

8.3 Certified drawings are required for design and construction purposes. If "as-built" conditions differ from certified drawings, the Vendor shall modify the drawings to reflect the "as-built" condition and re-issue as certified to the Purchaser.

8.4 Engineer's and/or owner's review/approval of design documents shall not be construed as acceptance of any defects or errors contained therein nor shall it in any way lessen Supplier's responsibility to provide a complete and functional component.

8.5 Documents shall be submitted in electronic form. The quality of documents shall be suitable for scanning without loss of clarity. The following electronic formats will be accepted and are in order of preference for drawings:

AutoCAD - *.DWG or *.DXF
Adobe Acrobat - *.PDF

8.6 All correspondence and documentation shall show the following information:

P. O. Number (if applicable)
"XYZ Corp."
Winston, NC"
""C" Project"
Equipment Number
Equipment Name

8.7 Drawings shall, as a minimum, show the following information:

- Overall dimensions and differential elevations, as required.
- External design pressure and temperature.
- Internal design pressure and temperature.
- Minimum design metal temperature.
- MAWP (maximum allowable working pressure) based on the nominal thickness, in corroded condition at design temperature and limiting part (internal and external, if applicable).

- Materials of Construction.
- Thickness of all components. An as-built drawing shall be supplied with location and thickness values from the material thickness readings taken in the shop.
- Weld joint efficiencies.
- Tests performed including hydrotest, waterfill, and NDT.
- Gasket dimension drawings or manufacturer's model number for each standard gasket and with complete specifications, for each non-standard gasket.
- Nozzle or inlet sizes, rating, attachment details including welding/locations.
- Support mounting dimensions and locations of anchor bolt holes.
- Torque values and procedures for all bolts – minimum and maximum recommended, re-torque, and hot re-torque procedures.
- Weld details and identification by use of the standard welding symbols of AWS A2.4.
- NDT (nondestructive examination) symbols per AWS A3.0.
- Total assembled weight, operating weight as if filled with water and test weight
- Location of lifting lugs and rigging points.
- Size (space envelope) required for disassembly and maintenance.
- Wind load and seismic design factors.

8.8 Calculations:

Supplier shall submit checked and PE (Professional Engineer) sealed design calculations for review for all vessels/jackets designed per ASME. These include calculations for internal and external pressures, wind and seismic calculations, and structural calculations for supports, lifting lugs, and tailing lug.

Calculations developed by computer software shall be printed and submitted in full and show the name and version number of the software and signature and seal of the inputting engineer.

9.0 ATTACHMENTS

The following items are attached and become part of this specification.

Data Sheet:
Vendor Data Requirement Form, 2/2/2006.
Required delivery schedule as noted on purchase order
Purchase order

10.0 LEGAL

Contents of this document are considered Confidential and shall not be distributed in hard copy or any electronic format without written approval of XYZ Corporation

END OF SPECIFICATION