

DOCUMENT RELEASE AND CHANGE FORM			Release Stamp
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1. <b>Doc No:</b> RPP-SPEC-62915 <b>Rev.</b> 00			
2. <b>Title:</b> Procurement Specification for Peroxide Decomposer Vessels			
3. <b>Project Number:</b> T1P201	<input type="checkbox"/> N/A	4. <b>Design Verification Required:</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
5. <b>USQ Number:</b> RPP-27195	<input checked="" type="checkbox"/> N/A	6. <b>PrHA Number</b> <b>Rev.</b> <input checked="" type="checkbox"/> N/A	
<b>7. Approvals</b>			
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<b>8. Description of Change and Justification</b>			
The Peroxide Destruction Modules (PDM) at the Effluent Treatment Facility (ETF) need to be replaced. This procurement specification identifies the physical and operational requirements to procure two vessels. The two new vessels will match the existing vessels, size, and nozzle locations to install in-place of the existing vessels and existing piping.			
<b>9. TBDs or Holds</b>			<input checked="" type="checkbox"/> N/A
<b>10. Related Structures, Systems, and Components</b>			
a. <b>Related Building/Facilities</b> <input type="checkbox"/> N/A	b. <b>Related Systems</b> <input type="checkbox"/> N/A	c. <b>Related Equipment ID Nos. (EIN)</b> <input type="checkbox"/> N/A	
2025E	ETF-60B ETF-60C ETF-60D	60D-CO-1A 60D-CO-1B	
<b>11. Impacted Documents – Engineering</b>			<input checked="" type="checkbox"/> N/A
<b>Document Number</b>	<b>Rev.</b>	<b>Title</b>	
<b>12. Impacted Documents (Outside SPF):</b>			
N/A			
<b>13. Related Documents</b>			<input type="checkbox"/> N/A
<b>Document Number</b>	<b>Rev.</b>	<b>Title</b>	
EDT-851985	00	ETF PEROXIDE DESTRUCT VESSEL REPLACEMENT DRAWING	
MT-50440	00	ETF PDV Replacement	
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**RPP-SPEC-62915**  
**Revision 0**

# Procurement Specification for Peroxide Decomposer Vessels

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Date Published  
January 2019



Prepared for the U.S. Department of Energy  
Office of River Protection

Contract No. DE-AC27-08RV14800

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**1.0 SCOPE**

This purchase specification is for two hydrogen peroxide decomposer vessels to replace the two existing vessels, equipment identification numbers 60D-CO-1A and 60D-CO-1B. The decomposers are part of the main treatment train at the Effluent Treatment Facility (ETF). They contain a catalyst that accelerates the destruction of residual hydrogen peroxide from the wastewater. The wastewater flows up through the catalyst bed so that oxygen bubbles generated by the peroxide destruction can be vented out of the system. The two vessels procured under this specification will be direct replacements for the existing vessels. The **SELLER** shall provide the vessels in accordance to the requirements of this specification.

**NOTE:** “Internal Pressure” refers to a uniformly distributed internal pressure in the vessel, and is in addition to the normal varying pressure head due to depth of contained fluid.

The following is a summary of the **SELLER**'s responsibilities described in this specification:

Design and fabricate vessels in accordance with—

- a. this specification,
- b. the **SELLER'S BUYER**-approved drawings, and
- c. other referenced documents.

Design and fabricate two pressure vessels in accordance with this specification, American Society of Mechanical Engineers (ASME®) BPVC.VIII.1, *ASME Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels*, the **BUYER**'s drawings, and other referenced documents. Design and fabricate distribution headers in accordance with this specification, ASME B31.3, *Process Piping*, Normal Fluid Service, the **BUYER**'s drawings, and other referenced documents.

Furnish design data required by this specification to document design of the pressure vessel.

Procure equipment, materials, or supplies to complete the work, unless otherwise stated.

Test and inspect as required by this specification and ASME BPVC.VIII.1 and ASME B31.3.

Furnish the data required by this specification to document that required tests and inspections have been performed.

Pressure vessel is to be stamped in accordance with ASME BPVC.VIII.1, and National Board registered in accordance with NBBI NBIC NB 23 to show compliance with code requirements.

Package, ship, and deliver vessels.

Provide the **BUYER** full access to the facility for performing random or scheduled inspections and/or surveillance of work performed.

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**2.0 APPLICABLE DOCUMENTS**

The following documents, of the exact issue shown, form a part of the basis of design to the extent specified in the applicable sections of this document and establish the Code of Record. In the event of a conflict between documents referenced herein and the requirements of this specification, the requirements of this specification shall take precedence over requirements in documents listed in Table 2-1 and Table 2-2 only when the specification requirements are more stringent or conservative.

**2.1 GOVERNMENT DOCUMENTS**

Documents listed in Table 2-1 constitute a part of this specification to the extent specified herein and establishes the Code of Record. The most current version of the documents shall be used, unless otherwise specified. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

**Table 2-1. Government Documents.**

<b>Document Number</b>	<b>Title</b>
<b>(DOE) U.S. Department of Energy</b>	
DOE/RL-92-36, Rev. 1, Release 84	<i>Hanford Site Hoisting and Rigging Manual</i>
<b>(WAC) Washington State Administrative Code</b>	
WAC 173-303-640	<i>Dangerous Waste Tank Systems</i>

**2.2 NON-GOVERNMENT DOCUMENTS**

The following documents of the exact issue shown in Table 2-2 form a part of this specification to the extent specified herein and establishes the Code of Record. In the event of conflict between the documents referenced herein and contents of this specification, the contents of this specification shall be considered a superseding requirement.

**Table 2-2. Non-Government Documents. (2 sheets)**

<b>Document Number</b>	<b>Title</b>
<b>(ASME) American Society of Mechanical Engineers</b>	
ASME BPVC.II.A-2017	<i>ASME Boiler and Pressure Vessel Code, Section II: Materials, Part A, Ferrous Material Specifications</i>
ASME BPVC.II.C-2017	<i>ASME Boiler and Pressure Vessel Code, Section II: Materials, Part C, Specifications for Welding Rods, Electrodes, and Filler Metals</i>
ASME BPVC.II.D-2017	<i>ASME Boiler and Pressure Vessel Code, Section II: Materials, Part D, Properties (Customary)</i>
ASME BPVC.VIII.1-2017	<i>ASME Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels</i>
ASME BPVC.IX-2017	<i>ASME Boiler and Pressure Vessel Code, Section IX: Welding, Brazing, and Fusing Qualifications</i>

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**Table 2-2. Non-Government Documents. (2 sheets)**

<b>Document Number</b>	<b>Title</b>
ASME B16.5-2017	<i>Pipe Flanges and Flanged Fittings</i>
ASME B16.9-2018	<i>Factory-Made Wrought Buttwelding Fittings</i>
ASME B16.20-2017	<i>Metallic Gaskets for Pipe Flanges</i>
ASME B31.3-2016	<i>Process Piping</i>
ASME SA182/SA182M-2017	<i>Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service</i>
ASME SA193/SA193M-2017	<i>Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications</i>
ASME SA194/SA194M-2017	<i>Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both</i>
ASME SA240/SA240M-2017	<i>Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General applications.</i>
ASME SA276-2017	<i>Specification for Stainless Steel Bars and Shapes</i>
ASME SA312/SA312M-2017	<i>Specification for Seamless, Welded, and Heavily Cold worked Austenitic Stainless Steel Pipes</i>
ASME SA403/SA403M-2017	<i>Specification for Wrought Austenitic Stainless Steel Piping Fittings</i>
ASME SA479/SA479M-2017	<i>Specification for Stainless Steel Bars and Shapes for Use in Boilers and other Pressure Vessels</i>
<b>(ASNT) American Society Nondestructive Testing</b>	
ASNT CP-189-2016	<i>ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel</i>
ASNT SNT-TC-1A-2016	<i>Standard Topical Outlines for Qualification of Nondestructive Testing Personnel</i>
<b>(AWS®) American Welding Society</b>	
AWS B2.1/B2.1M-BMG:2014	<i>Base Metal Grouping for Welding Procedure and Performance Qualification</i>
AWS D1.3/D1.3M:2018	<i>Structural Welding Code — Sheet Steel</i>
AWS D1.6/D1.6M:2017	<i>Structural Welding Code — Stainless Steel</i>
AWS D9.1M/D9.1:2018	<i>Sheet Metal Welding Code</i>
AWS QC1:2016	<i>Specification for AWS Certification of Welding Inspectors</i>
<b>(NBBI) National Board of Boiler and Pressure Vessel Inspectors</b>	
NBIC-2017	<i>National Board Inspection Code</i>
<b>(WRC) Welding Research Council</b>	
WRC-297, 1984	<i>Local Stresses in Cylindrical Shells Due to External Loadings on Nozzles-Supplement to WRC Bulletin 107</i>
WRC-537, 2010	<i>Precision Equations and Enhanced Diagrams for Local Stresses in Spherical &amp; Cylindrical Shells due to External Loadings for Implementation of WRC Bulletin 107</i>



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**2.3 NON-CODE OF RECORD DOCUMENTS**

The **SELLER** shall draft a Request for Information (RFI) to inquire about specific Tank Operations Contractor (TOC) standards, procedures, and documents. The following documents (Table 2-3) are used in or referenced by this specification, but are not considered Code of Record. Unless otherwise shown or noted, the latest edition and addenda are applicable.

**Table 2-3. Non-Code of Record Documents. (1 sheet)**

<b>Document Number</b>	<b>Title</b>
QA-AVS B04	“Supplier Quality Program Evaluation”
QA-AVS B13	“Fabrication/Inspection/Test Plan”
QA-AVS B22	“Nonconformance Documentation and Reporting”
QA-AVS B25	“Certified Welding Inspector (CWI)”
QA-AVS B28	“Welding Procedures and Qualifications”
QA-AVS B31	“Nondestructive Examination Process”
QA-AVS B46	“Liquid Penetrant Material Certification”
QA-AVS B49	“Certified Material Test Report”
QA-AVS B52	“Inspection and Test Report”
QA-AVS B61	“Certification of Calibration Services”
QA-AVS B76	“Procurement of Potentially Suspect or Counterfeit Items”
QA-AVS B79	“Certificate of Conformance”
QA-AVS B85	“Packaging/Shipping Procedures”
RPP-8360, Rev. 6	<i>Lifting Attachment and Lifted Item Evaluation</i>
TFC-BSM-IRM_DC-C-02, Rev F-17	“Records Management”
TFC-BSM-IRM_DC-C-07, Rev A-11	“Vendor Processes”
TFC-ENG-STD-02, Rev. A-12	“Environmental/Seasonal Requirements for TOC Systems, Structures, and Components”
TFC-ENG-STD-06, Rev. D-1	“Design Loads for Tank Farm Facilities”
TFC-ENG-STD-12, Rev. E-3	“TOC Equipment Identification Numbering and Labeling Standard”
H-9-6116 Sheet 1 Rev 0	“Piping ETF Peroxide Destruct Vessel Assembly”
H-9-6116 Sheet 2, Rev 0	“Piping ETF Peroxide Destruct Vessel Assembly”
Vendor Information V-135A-002-340 Rev 5	“2 Train x 1 Stage Upflow Peroxide Destruct Module General Arrangement Drawing” (For Information Only Appendix B)

**2.4 HIERARCHY OF CODE**

Except in those instances where Washington State has been granted regulatory authority by the Federal Government, the hierarchical relationship among requirements specified in Section 3.0 is as follows:

1. Federal requirements (e.g., *Code of Federal Regulations*);
2. Washington State requirements (e.g., *Washington Administrative Code*);
3. Local ordinances;

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4. DOE orders and standards;
5. National consensus codes and standards; and
6. Hanford Site-specific codes and standards.

This hierarchy establishes the order of precedence of requirements levied in this specification. In the event of a conflict between two requirements, the **SELLER** shall submit a RFI for clarifications prior to use.

### **3.0 SYSTEM, STRUCTURE, AND COMPONENT CHARACTERISTICS AND REQUIREMENTS**

#### **3.1 SYSTEM, STRUCTURE, AND COMPONENT FUNCTIONS AND FUNCTIONAL PERFORMANCE REQUIREMENTS**

##### **3.1.1 General Design Requirements**

**NOTE:** Vessels will be installed indoors.

1. For the vessel operating conditions, design data, and vessel configuration refer to the Data Sheets in Appendix A.
2. Additional information regarding the interface of the vessels to the interfacing piping systems with supplementary measurement data is provided in Appendix B. These vessels are to be a physical direct replacement for the existing system vessels, except the support legs will be longer.
3. Design, fabricate, test, and label metallic vessels in accordance with:
  - a. this specification,
  - b. the **SELLER's BUYER**-approved drawings, and
  - c. applicable regulations.
4. If there is a conflict among the above listed requirements, applicable regulations will take precedence. Bring any conflicts to the **BUYER's** attention for resolution.
5. The **BUYER** will review and comment on design calculations and drawings. The **BUYER** review does not release the **SELLER** from responsibility to design and fabricate the vessels in accordance with applicable regulations, and this specification.

#### **3.2 SYSTEM, STRUCTURE, AND COMPONENT INTERFACES**

1. On the top of each of the vessels shall be three flanges, two 3-in. Class 150 raised-face flanges and one 2-in. Class 150 raised-face flange. Orientation and projection shall be as shown in Appendix B.
2. Two 3-in. Class 150 raised-face flanges shall be on the side of each of the vessels. Orientation and projection shall be as shown in Appendix B.
3. On the bottom of the vessels shall be two flanges, one 2-in. Class 150 raised-face flange and one 1-1/2-in. Class 150 raised-face flange. Orientation and projection shall be as shown in Appendix B.

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### 3.3 SYSTEM, STRUCTURE, AND COMPONENT CHARACTERISTICS

#### 3.3.1 Functional Characteristics

Additional information regarding the interface of the vessels to the interfacing piping systems with supplementary measurement data is provided in Appendix B. Vendor Information Drawing V-135A-002-340, Rev 5, has been included in Appendix B to provide the final field configuration of the existing PDMs for the **SELLER's** information. The new vessels are to be a physical direct replacement with the existing system vessels, with extended support legs and with the exceptions noted.

**3.3.1.1 System Design Life.** The vessels and accessories shall have a design life of 30 years.

**3.3.1.2 Design and Operating Conditions.** The vessels shall include internal lateral flow distribution assemblies. The assemblies shall be connected to the inlet and outlet nozzles specified in Appendix B. The vessels shall be in an up-flow operating configuration. The distributors shall be designed to provide a uniform flow regime preventing dead zones or channel flow through the catalyst bed. The design should include multiple well screen laterals. The well screens shall retain the 1.6 mm extrusion catalyst, while minimizing head loss at an operating flow of 90 gpm. Johnson Screens Inc. is a recommended flow distribution assembly vendor.

**3.3.1.3** Maximum superficial velocity 12.7 gpm/ft<sup>2</sup>.

**3.3.1.4** See Section 3.1.1 for additional conditions.

**3.3.1.5 Vessel Internals.** Vessel internals shall be designed to allow the use of a variety of media types. At a minimum, the following items shall be considered in the design of the internals:

1. Weight of the media,
2. Flow induced loading,
3. Chemical reactivity between the vessel internal materials of construction and the media, and
4. Distribution screen sizes shall be selected to allow a variety of different media types.

**3.3.1.6** Media bed shall be sufficiently sized to reduce H<sub>2</sub>O<sub>2</sub> concentration from greater than 100 mg/L to 0.5 mg/L. Media type selection and bed depth will be determined by the **BUYER**, and is not the responsibility of the **SELLER**. The proposed media is a Manganese Dioxide based catalyst.

**3.3.1.7 Performance Requirements.** For pressure vessel operating conditions, design data, and vessel configuration refer to the Data Sheets in Appendix A and Drawings in Appendix B.

#### 3.3.2 Physical Characteristics

This section provides the physical characteristics for the vessels and accessories.

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**3.3.2.1 Environmental Conditions.** Design the vessels and accessories to operate indoors and empty storage outdoors in the environmental conditions specified in TFC-ENG-STD-02 (see Appendix A and Section 3.1.1 of this specification).

**3.3.2.2 Design Loads.** Design loads shall comply with TFC-ENG-STD-06, Natural Phenomena Hazard Design Category (NDC)-2, Limit State D.

**3.3.2.3 Packaging, Storing, Shipping, and Load Handling.** When the **SELLER** has requirements for packaging, storage, shipping, and handling (PSSH), the **SELLER's** PSSH requirements must be approved by the **BUYER**. Otherwise, the **SELLER** shall use the requirements in Section 6.0.

### **3.4 DESIGN AND CONSTRUCTION REQUIREMENTS**

#### **3.4.1 Safety**

1. The vessels and accessories shall be designed for safe installation, operation, and maintenance.

#### **3.4.2 Major Components**

1. Fabricate, test, inspect, and ship completed vessels.

##### **3.4.2.1 Containment Boundary Design Requirements.**

1. Proposed weld joint configurations are to be approved by the **BUYER** prior to fabrication, unless the **BUYER** chooses to waive this requirement.

##### **3.4.2.2 Nozzle Requirements.**

1. Provide sufficient projection of flanged nozzles to allow removal of flange bolts from either side.
2. Make nozzles that are used as drains flush with vessel interior surface.
3. Unless specified otherwise, external nozzle flanges are to conform to ASME B16.5.
4. Refer to Section 4.1.4 for nondestructive examination (NDE) requirements.
5. **SELLER** shall design nozzles in accordance with the methods of WRC-297 and WRC-537, or **BUYER** approved analysis.

##### **3.4.2.3 Nozzle Loads**

1. Nozzles shall be designed to resist the following loads:
  - a. 3" Flanges (side of tank, inlets and outlets)
    - i. Axial force: Load = 286 lbf.
    - ii. Lateral force in any direction: Load = 882 lbf.
    - iii. Bending or torsional moment: Load = 60 ft-lbf.
  - b. 3" Flanges

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- i. Axial force: Load = 286 lbf.
  - ii. Lateral force in any direction: Load = 172 lbf.
  - iii. Bending or torsional moment: Load = 60 ft-lbf.
- c. Flanges smaller than 3”
- i. Axial force: Load = 90 lbf.
  - ii. Lateral force in any direction: Load = 319 lbf.
  - iii. Bending or torsional moment: Load = 113 ft-lbf.

**3.4.2.4 Cyclic loads.**

1. Vessels will be cycled between 0 psig to 130 psig back to 0 psig and 60 deg F to 160 deg F back to 60 deg F, 52 times per year.

**3.4.2.5 Corrosion of Parts.**

1. Design of tanks shall include a corrosion allowance of 0.002 in/yr over the design life of the vessels.

**3.4.2.6 Supports.**

1. Unless otherwise specified by the **BUYER**, design all vessels as self-supporting units, including legs, etc., as necessary to provide the required vessel elevation. Consider seismic loadings in support design, depending on installation method and location. Vessels will be located indoors, wind, snow, and volcanic loadings are not applicable.
2. Allow for thermal expansion and thermal expansion loads during support design.
3. Assume that a field hydrostatic test will occur where the vessels will be filled completely full of water, and account for this weight in the support design. Also allow for temporary erection loads on vessel structure.
4. Design and fabricate vessel supports and attachments in accordance with good structural design and practice, and ASME BPVC.VIII.1, Appendix G, “Suggested Good Practice Regarding Piping Reactions and Design of Supports and Attachments.”
5. Design vessel supports to meet NDC-2, Limit State D.
6. Vessels will be anchored to reinforced concrete floors on a maximum of 1-1/2 in.-thick leveling grout with Hilti® Kwik Bolt® TZ expansion anchors (by others). Provide reaction forces at the anchorage locations.
7. Incorporate lifting features into the vessel design. Design and position lifting features to prevent any strain or distortion of the vessel. Design lifting features to accept lifting by forklift, crane, or other appropriate device, and label these features appropriately as lifting points. Lifting lugs/features shall be designed in accordance with RPP-8360.
8. The vessels shall be supported by legs anchored to the existing concrete housekeeping pad. Provide additional structural support as necessary to support the vessel, external piping, and contents, including 700 lbs of weight of catalyst in addition to the vessel full of water. The catalyst will be filled to a maximum level of 7’-0” above the inlet nozzle of the tank.

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9. The pipe support plates and angle extensions shown on the Appendix B drawings shall be installed by the **SELLER**. The plate size may be increased over the existing plate size shown, as necessary. The piping will be field installed by the **BUYER** to the angle extensions and is not in the scope of this specification.

### 3.4.3 Materials

Certified Material Test Reports (CMTR) shall be submitted to the **BUYER** for all pressure boundary and structural materials. All other materials used in construction shall be provided with a Certificate of Conformance, in accordance with QA-AVS B49. Certificates of Conformance shall be traceable to the material used in the fabrication and conform to the requirements in Section 6.3.5. Material CMTRs are also acceptable, and if supplied, shall contain the test results from all testing specified by the referenced material code or standard, and be traceable to the material used in the fabrication.

Provide materials complying with ASME BPVC.II for ASME BPVC.VIII.1 tanks.

#### 3.4.3.1 Plate, Sheet, or Strip.

1. ASME SA240/SA240M, Type 316/316L stainless steel, for vessel shell and appurtenances.

#### 3.4.3.2 Heads.

1. ASME SA240/SA240M, Type 316/316L stainless steel, 2:1 ellipsoidal shape.

#### 3.4.3.3 Structural Shapes.

1. ASME SA276 or ASME SA479/SA479M Type 316/316L structural shapes, angles and plate.

#### 3.4.3.4 Pipe.

1. ASME SA312/SA312M, Grade TP, Type 316/316L, seamless, Schedule 40S.

#### 3.4.3.5 Fittings.

1. ASME SA403/SA403M, Class WP, Type 316/316L, seamless, butt welding in accordance with ASME B16.9, wall thickness to match pipe.

#### 3.4.3.6 Flanges.

1. Weldneck or slip-on Class 150, forged stainless steel, ASME SA182/SA182M, Grade F316. Bore weldneck flanges to match pipe internal diameter.

#### 3.4.3.7 Threaded Couplings.

1. Class 3000, threaded, forged stainless steel, ASME SA182/SA182M, Grade F316/316L.

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**3.4.3.8 Fasteners.**

1. Flanges: Stud bolts with two nuts, continuously threaded alloy steel studs, ASME SA193/SA193M, Grade B8M, Class 2, and heavy hex nuts, ASME SA194/SA194M, Grade 8F.
2. Bolts: Threaded alloy steel bolts, ASME SA193/SA193M, Grade B8M, Class 2.
3. Nuts: Heavy hex nuts ASME SA194/SA194M, Grade 8F.

**3.4.3.9 Gaskets.**

1. Flange Gaskets: Flexitallic<sup>®</sup>-style "LS" spiral wound gasket, Class 150, Flexicarb<sup>®</sup> flexible graphite, Type 316 stainless-steel outer ring manufactured to ASME B16.20.

**3.4.3.10 Backing Rings.**

1. Backing rings or consumable inserts are not to be used.

**3.4.3.11 Manway.**

1. Each vessel shall include a manway assembly access as positioned on the Appendix B drawings. The manway shall provide a minimum 16-in. (major dimension) access. The assembly shall include a gasket suitable for water service
2. 12" x 16" elliptical manway, constructed of Type 316 stainless steel, in accordance with ASME BPVC.II for ASME BPVC.VIII.1, rated for 300 psig, select gasket for maximum temperature of 180 deg. F and the conditions stated in the Data Sheets in Appendix A. Manway may be Res-Kem General Water Elliptical Yoke and Bolt Manway, or equal.

**3.4.3.12 U-Bolts.**

1. U-Bolts: Anvil Fig 137SS, Type 316/316L stainless steel standard U-bolt with double hex nuts.

**3.4.4 Lifting**

DOE/RL-92-36, RPP-8360, and TFC-ENG-STD-06 shall be used where applicable to the design of any equipment or items requiring load handling requirements.

**3.4.5 Nameplates and Product Marking**

Attach an identification nameplate to each vessel in accordance with the requirements stated in ASME BPVC.VIII.1. Also attach a nameplate containing the **BUYER** identification information to each vessel. Nameplates shall not be removable without destruction of the nameplate.

Vessels will require an Equipment Identification Number (EIN) label and bar code in accordance with TFC-ENG-STD-12, label design ID NK, and be labelled to meet the dangerous waste labelling requirements in accordance with WAC 173-303-640.

The EIN label and bar code shall be installed adjacent to each of the ASME BPVC nameplates.

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1. The EIN label shall be constructed of 6 to 16 gauge 300 series stainless steel. The label shall use either stainless steel (plain/natural) text on a black background or black text on a stainless steel (plain/natural) background. Label size, format and content shall be as described below:
  - a. LINE 1 = EIN; (60D-CO-1A or 60D-CO-1B)
  - b. LINES 2 & 3 = Equipment Description; (Peroxide Decomposer Vessel)
  - c. LINE 5 = Barcode Number; and
  - d. LINE 6 = Barcode Pattern. (LINES 4 & 7 are not used)
2. Font – USE ALL CAPITAL SIMPLE BLOCK TYPE FONT. Spacing between words shall be at least one full character width.
3. The EIN label shall be installed by welding or other means so that the label cannot be removed without destruction of the label.
4. The EIN and Equipment Description, are specified on the Vessel Data Sheets in Appendix A and the Drawings in Appendix B.
5. The Barcode number will be provided by the **BUYER**, prepare and send the **BUYER** an RFI to request the Barcode number.

**NK Label Coding**

DESIGN ID: NK		LABEL SIZE CODE: E4		WIDTH: 13.75"		BORDER: 0.438"		HEIGHT: 4.00"	
LINE	BARCODE REF DEN	MAX CHAR	ROW HGT	JUST C/L/R	START SIDE	TOP	FONT		
1		23	0.70	C	6.75	0.20	R-HEL-BOLD		
2		32	0.45	C	6.75	0.85	R-HEL-BOLD		
3		32	0.45	C	6.75	1.38	R-HEL-BOLD		
4		18	0.25	R	-0.10	2.40	R-HEL-BOLD		
5		09	0.20	C	6.75	2.44	R-HEL-BOLD		
6	5 4.0	09	0.45	C	6.93	2.25	R-HEL-BOLD		
7		29	0.23	L	0.60	2.40	R-HEL-BOLD		

**NOTE:** All equipment that is designed to be mechanically lifted shall have lifting points, the center of gravity, and the lifting weight marked. All specialized lifting devices shall be marked in accordance with DOE/RL-92-36.

**3.5 SYSTEM MAINTAINABILITY AND SPARE PARTS****3.5.1 Maintainability****3.5.1.1 Maintenance and Repair Cycles.**

1. **SELLER** shall recommend frequency requirements for maintenance of the components.

**3.5.1.2 Spare Parts.**

1. **SELLER** shall specify recommended spares and spare parts.



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### 3.6 PREPARATION FOR DELIVERY

#### 3.6.1 Shipping Preparation

Mode and method of transporting, and the extent of storage of the vessel assemblies are to be mutually agreed on by the **SELLER** and **BUYER** prior to fabrication and delivery of the vessels. The packaging procedure submitted for prior approval by the **BUYER** shall be used. For safety considerations, a means of pressure relief is to be provided on the vessels during shipping to prevent pressure buildup and/or to equalize pressure due to elevation and/or temperature changes.

#### 3.6.2 Package Marking

Packages shall be suitably marked on the outside to facilitate identification of the purchase order, the procurement specification, the package contents, weight, and any special handling instructions.

#### 3.6.3 Shipping and Receiving

Provide the **BUYER** with a copy of the bill of lading concurrent with the shipment. Properly and clearly describe the shipment on the bill of lading. At final destination, the **BUYER** will inspect the shipment, as necessary, to ensure that received items have not been damaged during shipment and that required items and supporting documentation have been received. The receipt inspection constitutes final acceptance.

## 4.0 FABRICATIONS REQUIREMENTS

### 4.1 WELDING

Welding qualifications shall be in accordance with applicable fabrication standards or as specified by the **BUYER**. ASME BPVC.IX, may be used in lieu of these requirements.

Weld size and type shall be selected by the manufacturer based on applicable loads and system pressure requirements established within this specification and must meet all applicable codes.

Special care shall be taken to limit contamination of stainless-steel components with halides, which are common to adhesive products. If necessary, stainless-steel components shall be cleaned with neutral detergent and water.

All weld joints and seams along the pressure boundaries shall be 100 percent continuously welded. Weld joints and seams shall be wire brushed or buffed after final NDE and inspections as required to remove heat discoloration, oxidation, all burrs, and sharp edges. For stainless-steel material, the wire brush shall not be made of carbon-steel elements or a stainless-steel brush previously used on carbon steel.

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**4.1.1 Structural Welding**

All structural welding shall meet the requirements of the following codes, as applicable, and all welds shall be visually inspected per statically loaded AWS criteria as follows:

1. AWS D1.3/D1.3M, Structural Welding Code – Sheet Steel, for sheet steel.
2. AWS D1.6/D1.6M, *Structural Welding Code – Stainless Steel*, for structural stainless steel and stainless steel to carbon steel.

**4.1.2 Weld Materials**

All welding filler materials and fluxes used in the fabrication and repair of components shall be in accordance with the requirements of ASME BPVC.II.C or AWS B2.1/B2.1M-BMG. Legible CMTRs for all weld materials shall be submitted to the **BUYER**.

**4.1.3 Welding Procedure Specifications and Qualifications**

All welding procedure specifications shall meet the requirements set forth in the applicable fabrication code as follows:

1. The **SELLER** shall prepare written Welding Procedures. Welding procedures and performance qualifications shall be in accordance with ASME BPVC.IX for all pressure boundary welds. Welding procedures and performance qualifications for structural steel welds shall be qualified in accordance with AWS D1.3 or D1.6 as applicable.
2. The **SELLER** shall submit copies of all Welding Procedures, Procedure Qualification Records, and Welder Performance Qualification Records to be employed in the performance of this specification. The **SELLER** shall provide records to indicate that the Welder and/or Operator are qualified.
3. The **SELLER's** Quality Control Procedures shall include the requirement that Welders shall have in their possession no more than one type of filler metal at any one time, an exception is that Welders may have both bare wire and covered electrodes that deposit weld metal of the same A-number class. The **SELLER's** filler metal control procedure shall be submitted and approved.
4. Welder Performance Qualification Records shall be submitted for all personnel performing welding, including tacking. Welders shall be qualified in accordance with ASME BPVC.IX.

**4.1.4 Weld Inspection Requirements**

1. Personnel performing visual weld inspections shall be a Certified-Welding Inspector (Minimum Level II) in accordance with the requirements specified in AWS QC1. Documentation shall be submitted prior to the start of fabrication inspection per QA-AVS B25.
2. All areas from which temporary attachments have been removed shall be examined by the liquid penetrant or magnetic particle method, as applicable, after the surface has been restored.

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3. NDE processes required within this purchase order shall meet the requirements in Section 5.2.2
4. Data packages and changes, thereto, shall be submitted to the **BUYER** as identified in the purchase order.
5. The **SELLER** will maintain and submit weld history data for each weld.

**4.1.5 Additional Welding Requirements**

1. All tools used for stainless steel shall be kept separate from any tools previously used or currently being used for cleaning carbon-steel components. Tools for stainless steel shall be used only on stainless-steel surfaces. Similarly, appropriate controls shall be put into place to ensure ferrous and non-ferrous material is properly segregated and that tools specifically used on non-ferrous material be designated.
2. Preparation for welds shall be accomplished by non-thermal methods, where practical.
3. Thermally cut surfaces shall be ground to provide slag-free metal and fit-up equivalent to machining.
4. Where welding destroys protective plating on hardware items, the weld and surrounding area shall be thoroughly cleaned, primed, and painted, as appropriate.
5. Where free-iron contamination (shows up as rust streaks on stainless steel) is observed, the surface area shall be cleaned prior to welding.

**4.1.6 Workmanship**

Acceptable workmanship shall be based on satisfactory completion of the inspections in Section 5.0 and those required by the drawings (Appendix B) and Quality Assurance (QA) Clauses.

**4.2 CLEANLINESS**

Protect stainless steel against carbon steel contamination from tooling and fixtures during fabrication. Exercise control during stages of fabrication to minimize exposure of stainless steel to contaminants, in particular to any chloride that might cause stress-corrosion cracking. Avoid chloride-bearing compounds; however, if used, completely remove by thorough cleaning. Do not use compounds, liquids, or markers on stainless-steel surfaces that contain more than 50 ppm of chloride content by weight.

**4.2.1 Material of Construction Compatibility**

Selection of fasteners and interfacing components (bolts, nuts, washers, unions, gaskets, etc.) shall be based on required performance (e.g., strength, fluid compatibility) and avoidance of potential for galvanic corrosion (e.g., connection/contact of dissimilar metals).

**4.2.2 Surface Finishes**

Exercise care to prevent scratching, abrading, nicking, and denting during receiving, storage, fabrication, and handling.

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**4.2.3 Cleaning**

1. After fabrication is completed, and before testing and inspection, clean, de-scale, and degrease the vessels and associated components. Clean exterior surfaces, but take particular care to clean the inside of the vessels thoroughly. Methods may include cleaning by hot water spray, etc. If a detergent is required, use a detergent that has less than 50-ppm chloride content for stainless-steel vessels.
2. Use fresh water with less than 50-ppm chloride content for wash and final rinse. After final rinse, dry inside surfaces using heat, lint-free cloth, or other means to ensure cleanliness. If de-ionized water is used for the final rinse, the vessels may be allowed to evaporate to dryness. If heat is used for drying stainless steel, do not allow the metal temperature to rise above 250 °F and use de-ionized water for the final rinse before drying.
3. Ensure that the cleanliness of the vessels meets the approval of the **BUYER** at the time of the final inspection.
4. After cleaning provide temporary plugs, covers, shields, or other devices required to close all external openings on the vessels.

**5.0 PRODUCT INSPECTION AND TESTING REQUIREMENTS  
(QUALITY ASSURANCE REQUIREMENTS)****5.1 QUALIFICATION TESTING REQUIREMENTS****5.1.1 General**

1. The **Seller** shall qualify Inspection Personnel performing acceptance inspections. In addition, the **Seller** shall document all qualifications.
2. The results of inspections shall be documented and submitted to the **BUYER** for review and approval before acceptance. The **BUYER's** approval indicates concurrence that results verify compliance with the associated design requirements.
3. NDE Personnel shall be qualified to ASNT CP-189 or ASNT SNT-TC-1A.

**5.1.2 Shop Acceptance Tests**

1. Perform inspection and testing of the completed vessels in accordance with the requirements of this specification and ASME BPVC.VIII.1.
2. The term "**BUYER's** Inspector" refers to the **BUYER's** Inspector. Provide the test location, equipment, instrumentation of certified accuracy, and any supplementary temporary connections and auxiliary parts necessary to fully execute the tests.
3. Provide the test location, equipment, instrumentation of certified accuracy, and any supplementary temporary connections and auxiliary parts necessary to fully execute the tests.
4. Provide test personnel qualified to conduct, record, and verify test results.
5. Provide the **BUYER** with a minimum ten (10) working day advance written notice of shop acceptance tests. (See Fabrication, Inspection, and Test Plan Section 5.2.1)
6. Submit the test results as part of the Quality Assurance Document Package.

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**5.1.3 Pressure Test**

1. Perform hydrostatic test in accordance with ASME BPVC.VIII.1. Ensure that weld surfaces are free of coating materials during test. Hold hydrostatic test pressure for 15 minutes, minimum.
2. Water for shop-testing austenitic stainless-steel vessels shall be potable quality with a chloride-ion content of less than 50 ppm. After testing, drain water and dry, standing water is not allowed to evaporate to dryness, unless de-ionized water is used as a final rinse.
3. Provide test reports in accordance with QA-AVS B52.

**5.1.4 Factory Acceptance Testing**

1. Before performing the Factory Acceptance Test (FAT), a FAT procedure shall be submitted to the **BUYER** for review.
2. The results of the FAT shall be documented and submitted to the **BUYER**.
3. The **Seller** shall provide qualified Inspectors per ASNT SNT-TC-1A for all NDE inspections and for functional tests in this section.

**5.2 PRODUCTION INSPECTION REQUIREMENTS****5.2.1 Fabrication, Inspection, and Test Plan**

The **SELLER** shall develop a Fabrication, Inspection, and Test (FIT) Plan that sequences the operations and denotes the **SELLER's** source inspection and witness notification points. The **SELLER** shall submit the FIT Plan for **BUYER** approval prior to the start of fabrication. The FIT shall be in accordance with QA-AVS B13.

The **BUYER** reserves the right to witness all tests and inspections listed below and shall be given a minimum of ten working days' written notice prior to each test date. It should be noted that third party Inspectors may be required to be present during testing as the representative for the **BUYER** or an independent representative for the **BUYER** and/or their representative for specific points in the fabrication/testing process:

1. Fabrication, Inspection, and Test Plan (Section 5.2.1)
2. Weld Inspection and Examination (Section 5.2.3 and 5.2.4)
3. Shop Acceptance Test (Section 5.1.2)
4. Pressure Test (Section 5.1.3)
5. Factory Acceptance Testing (Section 5.1.4)

**5.2.2 Inspection procedures and qualifications**

NDE processes required within this purchase order shall require review and approval of the **SELLER** as follows:

1. Personnel certification procedure;
2. NDE operational procedures; and

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3. Personnel certifications, including current and valid visual acuity examinations (less than 1 year old). **NOTE:** The examination must be performed annually.

Per QA-AVS B31, the personnel certification procedure and certification package for NDE personnel shall accurately reflect the requirements embodied in the applicable issue of ASNT SNT-TC-1A, plus any other requirements of the **SELLER**.

The NDE operational procedures shall contain all applicable requirements of the documentation referenced in the purchase order including:

1. Reference standard or image quality indicator information;
2. Chemical purity requirements per QA-AVS B46;
3. Calibration requirements per QA-AVS B61; and
4. Report forms, as a minimum per QA-AVS B52.

Data packages and changes, thereto, shall be submitted to the **BUYER** as identified in the purchase order.

Personnel performing NDE (RT, PT, UT, or MT) shall be qualified and certified to ASNT CP-189 or ASNT SNT-TC-1A (Level II or III), current edition unless otherwise specified. The recommended practices in ASNT SNT-TC-1A are mandatory requirements for this purchase order per QA-AVS B31.

The **SELLER** will maintain and submit weld history data for each weld per QA-AVS B13.

### 5.2.3 Visual Inspections

Unless specified otherwise, the minimum visual inspection required is 100% of all structural welds in accordance with AWS D1.3, or D1.6.

### 5.2.4 Radiography

All pressure containing welds shall have 100% radiography in accordance with ASME BPVC.VIII.1 (UW-51).

### 5.2.5 Hold Points

**SELLER** shall provide required notifications of verification points and shall not proceed past the required hold points without written authorization from the **BUYER**. The minimum hold/witness points are listed below and shall be incorporated into the Fabrication, Inspection, and Test Plan:

- |    |   |         |
|----|---|---------|
| 1. | Prior to first production weld for each weld procedure: | Hold    |
| 2. | Prior to NDE Inspection                                 | Witness |
| 3. | Prior to Hydrostatic/Leak test                          | Witness |
| 4. | Prior to Final Inspection                               | Hold    |
| 5. | Prior to Shipping                                       | Hold    |

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NOTE: **BUYER's** "hold/witness" points may be waived by correspondence (e.g. e:mail) from the **BUYER**, which will be included in the work control documents.

## 6.0 PROJECT MANAGEMENT

### 6.1 WORK PLAN

A work plan covering design, fabrication, testing, and submittal schedule dates shall be provided. Any changes to the work plan will require written concurrence of the **BUYER**.

### 6.2 SCHEDULE

To be provided by the **SELLER** upon award.

### 6.3 SUBMITTALS

The **SELLER's** submittals shall be per the following subsections. All electronic submittals shall be in a suitable format per TFC-BSM-IRM\_DC-C-02 and in compliance with TFC-BSM-IRM\_DC-C-07.

#### 6.3.1 Electronic Submittal Requirements

Required submittals are identified and listed on the procurement *TOC Master Submittal Register (MSR)* (Site Form A-6005-317), in addition to the submittals lists below. The MSR identifies the minimum submittals required by this specification and identifies when the submittals are required to be submitted in the procurement process. The MSR included with the purchase order will constitute the governing MSR.

Submittals shall be provided using the *Construction TOC Incoming Letter of Transmittal* (Site Form A-6005-315.1). All transmittal subject headings shall contain, at a minimum, the subcontract number, submittal number identified by the MSR, and submittal description.

All deliverable documentation shall be complete, accurate, legible, and reproducible. Before delivery, design media and documents shall be reviewed by qualified **SELLER's** personnel for technical adequacy and appropriate content in accordance with the **SELLER's** Quality Assurance procedures. The **SELLER** shall attest, in writing, to the accuracy and completeness of the information contained in the final deliverables.

The **SELLER** will not place any proprietary legend or stamp on any data produced as a result of this specification. All shop drawings or other data are the property of DOE. As-built drawings shall be required at the completion of construction.

Deliverables shall be subject to approval by the **BUYER**. Deliverables shall comply with this specification and technical basis documents and other requirements identified herein.

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**6.3.2 List of Submittals**

This list of submittals along with relevant dates shall be kept as part of the MSR.

**6.3.3 Submittals Required with Proposal**

Item	Title	Description
1	Preliminary Drawing and Documentation List	List of drawings and documentation that will be provided in completion of the contract.
2	Quality Assurance Program	Copy of the <b>SELLER's</b> Quality Assurance Program.
3	Identification of Subcontractors	List of all proposed subcontractors. The <b>SELLER</b> shall flow down all requirements to subcontractors, as applicable.
4	Preliminary Schedule	Summary of activities required to design, fabricate, test, and ship.
5	Data Sheets	The <b>SELLER</b> shall submit product data sheets for all components, equipment, and accessories.
6	American Society of Mechanical Engineers (ASME) Certificate of Authorization	<b>The SELLER</b> shall submit the current certificate in accordance with ASME BPVC.VIII.1.

**6.3.4 Submittals Required after Receipt of Order**

Item	Title	Description
7	Configuration Drawing	Detailed drawing detailing all major components and orientation.
8	Data Sheets	The <b>SELLER</b> shall submit product data sheets for all components, equipment, and accessories.
9	Work Plan	List of all proposed subcontractors. The <b>SELLER</b> shall flow down all requirements to subcontractors, as applicable.
10	Detailed Schedule	Summary of activities required to design, fabricate, test, and ship.

**6.3.5 Submittals Required Prior to Fabrication (Design Phase)**

The **SELLER** shall not begin fabrication until all submittals required prior to fabrication have been performed and the submittals are complete and approved by the **BUYER**.

Item	Title	Description
11	Fabrication Drawings	All fabrication and assembly drawings, including manufacturer standard details, associated with the fabrication, assembly drawings shall be submitted. Drawings shall include dimensions, required clearances, part number callouts, associated American Society for Testing and Materials (ASTM <sup>®</sup> ) standards, associated ASME standards, connection locations and sizes, welding, shipping weight, and operating weight.



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Item	Title	Description
12	Factory Test Procedures	Test procedures shall be submitted for review and approval per QA-AVS B52.
13	Preliminary Fabrication, Inspection and Test Plan	Preliminary Fabrication, Inspection, and Test plan shall be submitted for review and approval.
14	Welding and Welding Procedure Qualifications	All Welding and Welding Procedure Qualification Records, shall be submitted by the <b>SELLER</b> in accordance with Section 4.1 per QA-AVS B31.
15	Nondestructive examination (NDE) Procedures	All NDE Procedures shall be submitted by the <b>SELLER</b> in accordance with Section 4.1 per QA-AVS B31.
16	Authorization to Start Fabrication	The <b>SELLER</b> shall not start fabrication until written authorization has been received from the <b>BUYER</b> .
17	Packaging, Storage, Shipping, and Handling (PSSH) Plan	The <b>SELLER</b> shall submit a PSSH Plan for approval by the <b>BUYER</b> . The PSSH Plan shall be in accordance with QA-AVS B85 and include all plans, procedures, and drawings that address how items will be packaged, stored, shipped, and handled.
18	Lifting and Rigging Plan	The <b>SELLER</b> shall provide a Lift and Rigging Plan to cover the lifting and handling instructions for each lifted item. The plan shall describe the lift points, special lifting devices and/or hardware needs, and lift diagram.
19	Site Assembly Instruction	The <b>SELLER</b> shall provide site assembly instructions, including unpacking and installation drawings.
20	Calculations	Preliminary calculations shall be provided for review. Calculations may include, but are not limited to, structural and lifting calculations, vessel design calculations, and anchorage force calculations.
21	Preliminary Design Package	Preliminary design package includes Preliminary calculations for vessel, internals, external attachments, and supports including seismic calculations and fatigue analysis if required and anchorage loads. Preliminary Drawings for the vessels with dimensions and tolerances, weld callouts, and material callouts.

### 6.3.6 Submittals Required for Contract Completion

The **SELLER** shall not ship until all tests and inspections have been performed and the documentation data package is complete and approved by the **BUYER**. The **SELLER** shall notify the **BUYER** three weeks before the intended shipping date. The **SELLER** shall allow the **BUYER** one week after receiving the package and before shipment to review the data package.

Item	Title	Description
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Item	Title	Description
22	As-Built Drawings and Specifications	The <b>SELLER</b> shall deliver to the <b>BUYER</b> one (1) hard copy and one (1) electronic file in portable document format of the final fabrication level as-built drawings and specifications accurately depicting the product delivered. Drawings shall include dimensioned layouts, dimensioned subassemblies, dimensioned component details, material and fastener size, descriptions, weld symbols, and notes. The designer's name, responsible engineer's name, bills of lading, and drawing number shall appear on the index (cover sheet).
23	Final Calculations	Reviewed and approved calculations shall be legible and prepared on 8-1/2- by 11-in. sheets with all pages numbered and bound in a hard copy binder and individual electronic files in portable document format of the final calculations.
24	Inspection and Testing Reports	Inspections, examinations, testing, and NDE activities shall be documented and the documentation delivered before shipment of the product. Inspection reports shall provide actual inspection results, specifying what was inspected, who inspected it, the characteristics that were inspected, and the acceptance criteria. All test requirements called out in specification(s) and fabricator drawings shall be documented in the testing reports. Including American Society of Mechanical Engineers (ASME) Data Report per ASME BPVC.VIII.1.
25	Final Fabrication, Inspection, and Test Plan	Final Fabrication, Inspection, and Test Plan documentation.
26	Certified Material Test Reports (CMTRs)	CMTRs shall be provided for the production materials per QA-AVS B49.
27	Welding Inspections	Welding documentation shall meet QA-AVS B28 and be submitted in accordance with the requirements of Section 4.1, prior to shipping.
28	NDE Inspections	NDE documentation shall meet QA-AVS B28 and be submitted in accordance with the requirements of Section 5.2 prior to shipping.
29	Spare Parts List	The <b>SELLER</b> shall provide a list of all spare parts, identifying each specific subassembly to which it applies.
30	Certificate of Conformance	The Certificate of Conformance shall identify the contract requirements met per QA-AVS B79.
31	Warranty Information	The <b>SELLER</b> shall provide their warranty offer.
32	Maintenance Manuals	Manuals shall be provided including recommended lubrication details for bearings, etc. including grease type, volume, and lubrication frequency, as well as, bolt torque requirements, and hoisting and rigging sequences.

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Item	Title	Description
33	Operation Manuals	Manuals shall be provided including recommended commissioning, start-up, shut-down, and normal and off-normal operational procedures. Calibration and trouble-shooting sections should also be included.
34	ASME Certificate of Compliance	Provide ASME Certificate of Compliance in accordance with ASME BPVC.VIII.1.
35	Final Design Package	Final design package includes Final calculations for vessel, internals, external attachments, and supports, ASME BVPC.VIII code calculations, seismic calculations and fatigue analysis if required, Fluid induced loads, anchorage loads, nozzle loads, and design of attachments. Design details of each weld joint configuration, and weld maps. Final Drawings for the vessels with dimensions and tolerances, weld callouts, and material callouts.
36	Final QA data package	Final QA data package shall include the completed Fabrication, Inspection, and Test Plan, Inspection and test reports, weld inspections, material CMTRs, Weld filler material CMTRs, Certificates of Conformance, U-stamp code data reports, and NBIC forms.

### 6.3.7 Request for Information

Notify the BUYER, as soon as possible, in the event of conflicts among the specifications, drawings, and/or the manufacturer's recommended processes or instructions.

Requested changes shall be submitted per the RFI process described in TFC-BSM-IRM-DC-C-07.

### 6.3.8 Approval of Submittals

All Submittals transmitted shall include the designation in the Master Submittal Register (MSR) per TOC Vendor Processes stated in TFC-BSM-IRM\_DC-C-07. Submittals are divided into two types: (1) those requiring "approval" (e.g., approval data or pre-purchase evaluation data); and (2) those "not requiring approval" (e.g., vendor information data). Submittals "not requiring approval" will be reviewed to verify completeness and adequacy for their intended purposes. A submittal requiring approval that is not approved is identified as: (1) "Not Approved Revise and Resubmit" – the submittal is considered technically deficient, or incomplete, and therefore unacceptable (resubmittal is required, hence the fabrication, procurement, or performance of procedures shall not proceed); or (2) "Approved with Exception" – the fabrication, procurement, and performance may proceed (resubmittal is required to verify incorporation of the exception). Submittals "not requiring approval," that are determined to be incomplete or inadequate will be marked "Resubmit." An explanation of the deficiencies will be included for corrective action by the SELLER.

Approval by the BUYER does not relieve the SELLER of responsibility for accuracy or adequacy of design under this specification.

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If any revision has been made to previously submitted items, the **SELLER** shall resubmit updated versions of said items for approval, in addition to the items listed above.

Certified data shall be defined to mean that the design adequacy of a given item (document, drawing, calculation, etc.) be verified by persons other than those who prepared the item. Each deliverable (drawing, calculation, etc.) shall have at least an originator's/preparer's signature and a checked-by or approved-by signature.

### **6.3.9 Drawings, Calculations, and Supporting Data**

Submit design drawings, calculations, and supporting data prior to beginning vessel fabrication. Design drawings shall indicate the location of anchor points and reaction forces at the anchor points. The **BUYER** will review and comment on design calculations and drawings. The **BUYER** review does not release the **SELLER** from responsibility to design and fabricate the vessels in accordance with applicable regulations, and this specification. Include assumptions and input/output data with the calculations. If computer calculations are performed, include the name of the calculation program and the version number.

After completion of the vessel fabrication, inspection, and testing, submit as-built drawings, calculations, and supporting data.

### **6.3.10 Quality Assurance/Quality Control**

#### **6.3.10.1 Quality Assurance Manual.**

1. Submit an uncontrolled copy of the **SELLER's** QA manual for the **BUYER's** approval in accordance with QA-AVS B04. The **BUYER** may waive this requirement if the **SELLER's** QA Program has been previously reviewed and approved.

#### **6.3.10.2 Quality Assurance Clauses.**

1. The **SELLER** shall comply with the Procurement QA Clauses as stated in the procurement documents.

#### **6.3.10.3 Fabrication Procedures.**

If applicable, submit a copy of:

1. Welding Procedure Specifications (WPS),
2. Welding Procedure Qualification Record (WPQR),
3. Welding and NDE Personnel Listing, and
4. Radiographic Test Procedure.

#### **6.3.10.4 Certifications.**

Submit a copy of:

1. Welder Performance Qualification Records;
2. NDE Personnel Certifications; and

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3. Material certifications for steel, weld filler materials, and certify the chloride content of materials used in fabrication of stainless steel.

**6.3.10.5 Inspection Reports.**

Submit a copy of:

1. Weld Inspection Reports.

**6.3.10.6 Test Reports.**

Submit a copy of:

1. Leak Test Report.

**6.3.10.7 Shipping Submittals.**

Submit a copy of:

1. Bill of Lading with the vessel shipment.

**6.3.10.8 Substitutions.**

1. Ensure that any substitutions are in conformance with the **BUYER's** substitution procedures.

**6.3.11 Warranty**

The **SELLER** is to guarantee the vessel and associated equipment at design conditions and warrant that materials and workmanship, plus apparatus supplied (if any), are in accordance with Subcontract document requirements.

**6.3.12 Operation and Maintenance Manual**

Provide an Operations and Maintenance Manual, with detailed instructions for performance of any required maintenance activities, including as a minimum: lubrication, refurbishment/overhaul, calibration/testing, and spare parts list.

**6.4 QUALITY ASSURANCE PROGRAM**

The **SELLER** shall conduct work in accordance with a QA Program that meets the QA criteria specified by the **BUYER** using *Quality Assurance Requirements* (Site Form A-6006-661).

The **BUYER** reserves the right to verify the quality of work at the **SELLER's** facilities, including any sub-tier facilities. Access to sub-tier facilities shall be requested through the **SELLER** and verification may be performed jointly with the **SELLER**.

The **SELLER** shall have a documented and implemented QA Program. This work is designated as Quality Level 3. The **SELLER's** QA Program shall control a combination of design,

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materials, preparation, fabrication, inspection, testing, cleaning, packaging, and shipping that have to be done correctly to ensure the production of an acceptable finished product.

#### **6.4.1 Nonconformance Reports**

Non-Conformance Reports identified at the **SELLER's** or lower-tier subcontractor's facility, associated with this specification, with a proposed disposition of "Accept as is" or "Repair," shall be submitted to and approved by **BUYER's** Engineering and QA before the Subcontractor takes any corrective action on the nonconformance. Submittals must conform to QA-AVS B22.

#### **6.4.2 Inspection and Examination**

The **SELLER** shall include the qualifications of the Inspectors for all critical items or features identified from the design.

#### **6.4.3 Suspect/Counterfeit Items**

Procurement of genuine, new, and unused parts shall conform to QA-AVS B76.

#### **6.4.4 Certificate of Conformance**

Objective evidence in the form of a written document for all parts procured shall be provided by the **SELLER**. Documentation shall be in the form of a Certificate of Conformance. Certificates of Conformance shall be traceable to the material used in the fabrication. Documentation shall conform to QA-AVS B79.

## **7.0 NOTES**

### **7.1 DEFINITIONS**

#### **7.1.1 General Definitions**

The following definitions are to be used:

**May** – denotes a "permissive" for a stated action, or denotes a possible outcome, depending on the context of the verbiage.

**Must** – denotes a requirement.

**Shall** – denotes a requirement.

**Should** – denotes a recommendation. If a "should" recommendation cannot be satisfied, justification of an alternative design solution shall be submitted to Washington River Protection Solutions, LLC Engineering for approval.

**Will** – denotes a statement of fact.

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**7.1.2 Other Definitions**

**BUYER** – solicitors of purchasing proposal (i.e., Washington River Protection Solutions, LLC).

**Internal Pressure** – a uniformly distributed internal pressure in the vessel.

**SELLER** – supplying contractor(s).

**7.2 LIST OF TERMS**

ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
AWS	American Welding Society
BPVC	<i>Boiler and Pressure Vessel Code</i>
CMTR	Certified Material Test Reprt
CWI	Certified Weld Inspector
DOE	U.S. Department of Energy
EIN	Equipment Identification Number
ETF	Effluent Treatment Facility
FAT	Factory Acceptance Test
°F	Degrees Fahrenheit
FIT	Fabrication, Inspection and Test
ft	foot, feet
gpm	gallons per minute
in.	inch, inches
in/yr	inch, inches per year
lb	pound
lbf	pound force
mm	millimeter
MSR	Master Submittal Register
NBBI	National Board of Boiler and Pressure Vessel Inspectors
NBIC	National Board Inspection Code
NDE	nondestructive examination
NDC	Natural Phenomenon Hazard Design Category
QA	Quality Assurance
PDM	Peroxide Destruct Module
ppm	parts per million
PSSH	packaging, storage, shipping, and handling
RFI	Request for Information

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TOC	Tank Operations Contractor
WAC	Washington Administrative Code
WPS	Welding Procedure Specification
WPQR	Welding Procedure Qualification Record
WRC	Welding Research Council

**7.3 LIST OF TRADEMARKS**

ANSI	Registered trademark of the American National Standards Institute, Inc., New York, New York.
ASME	Registered trademark of the American Society of Mechanical Engineers, New York, New York.
ASTM	Registered trademark of ASTM International, West Conshohocken, Pennsylvania.
AWS	Registered trademark of the American Welding Society, Miami, Florida.
Flexicarb	Registered trademark of Flexitallic Investments, Inc., Houston, Texas.
Flexitallic	Registered trademark of Flexitallic Investments, Inc., Kingwood, Texas.
Hilti	Registered trademark of Hilti Aktiengesellschaft, Liechtenstein.
Kwik-Bolt	Registered trademark of Langford Tool & Drill Company, Minneapolis, Minnesota.
Microsoft and Windows	Registered trademarks of The Microsoft Corporation, Redmond, Washington




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**APPENDIX A**

**VESSEL DATA SHEETS**

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	<b>DS-001, Peroxide Decomposer Vessel</b>				<b>Specification No.</b> RPP-SPEC-62915	
	<b>Rev.</b>	<b>By</b>	<b>Date</b>	<b>Comment</b>	<b>Sheet</b>	<b>Date</b>
	0	JCMc	30-Jan	~~~	1 of 1	1/30/2019
					<b>Checked By</b>	<b>Approved By</b>
					JL	
<b>Project</b>	ETF PDV Replacement				<b>Purchase Order:</b>	
					<b>Requisition No.:</b>	
<b>Tag No.</b>	60D-CO-1A					
<b>PFD #</b>	H-2-89324	<b>Stream No.</b>	13 (inlet); 14 (outlet)			
<b>P&amp;ID #</b>	H-2-89332	<b>Quality Assurance Level</b>	General Service			
<b>Operating Data</b>		<b>Rev.</b>	<b>Material Specifications</b>			<b>Rev.</b>
Service	Process	~~~	Design	Design	Grade	Description
Fluid	Water	~~~	Design Code	ASME Section VIII, Div 1		
Fluid Spg.	1.00	~~~	Shell	SA240		316/316L SST
pH Range	4 - 8	~~~	Head/Top/Bot.	SA240		316/316L SST
Design Pressure (psig)	150.0	~~~	Internals	SA240/SA312	TP	316/316L SS I
Pressure Range (psig)	100-130	~~~	Bolts	SA193	B8M CI 2	316 SST
Normal Temperature (deg F)	160	~~~	Nuts	SA194	8F	303 SST
Design Temperature Range (deg F)	0-180	~~~	Reinf. Pads	SA240		316/316L SST
Ambient Temperature Range (deg F)	40-120	~~~	Supports	SA240/SA276/SA479		316/316L SST
<b>Design Data</b>			Cladding/Lining	*		
Type of Head (or Top)	Ellipsoidal	~~~	Wear Plates	SA240		316/316L SST
Type of Head (or Bottom)	Ellipsoidal	~~~	Clips	SA240		316/316L SST
Jacket? If so, state function (cooling or heating)	N/A	~~~	Jacketing	N/A		
Jacket Temperature Limit (if used)	N/A	~~~	<b>Finish (Applicable Stds./Specs.)</b>			
Physical Size - Fluid Volume (gal)*	(580)	~~~	Internal Finish	*		
- Diameter (in)	36	~~~	External Finish	*		
- Flat Side Height (in)	120	~~~	<b>Mixer</b>			
Design Pressure (Min/Max) (psig)	150	~~~	Vendor/Model		N/A	
Design Temperature (deg F)	0-180	~~~	Tank Turnover (per hr)		N/A	
Corrosion Allowance	0.002"/yr	~~~	Impeller Dia. (in)		N/A	
Other Loads	See Note 1	~~~	RPM (rpm)		N/A	
<b>Fabrication &amp; Inspection Data</b>			Drive Motor (hp/Vac/ph)		N/A	
Additional Radiography	Per Code	~~~	Shaft & Impeller Material		N/A	
Impact Values	N/A	~~~	<b>Manufacturers Data</b>			
Weld Hardness	N/A	~~~	Manufacturer	*		
Other N.D.T.	N/A	~~~	Model Number	*		
Stress Relief	N/A	~~~	Vendor - Name			
Weld Finish	N/A	~~~	- Address			
Code Certification Required	Yes	~~~	- Location			
<b>Weights</b>			- Phone			
Empty (lbs) *		~~~	- Fax			
Internals (lbs) *		~~~	Registration Number	*		
Insulation (lbs) *	N/A	~~~	Allowable Stress (psi) *			
Total Flooded Weight (lbs) *		~~~	Shell Thickness (in) *			
Shipping (lbs) *		~~~	Head Thickness (in) *			
During Hydrotest (lbs) *		~~~				
Fluid Contents (lbs) *		~~~				
Lining (lbs) *		~~~				
<b>Comments/Notes:</b>						
1. Cyclic Loads, 52 cycles per year, Refer to TFC-ENG-STD-06 for seismic requirements						
2. Vessel will contain catalyst up to 7'-0" above the inlet nozzle which will add an additional 700 lbs to the internal weight of the vessel including water.						
3. Vessel includes internal lateral distribution headers connected to the inlet and outlet.						
*Vendor to provide/verify this information						

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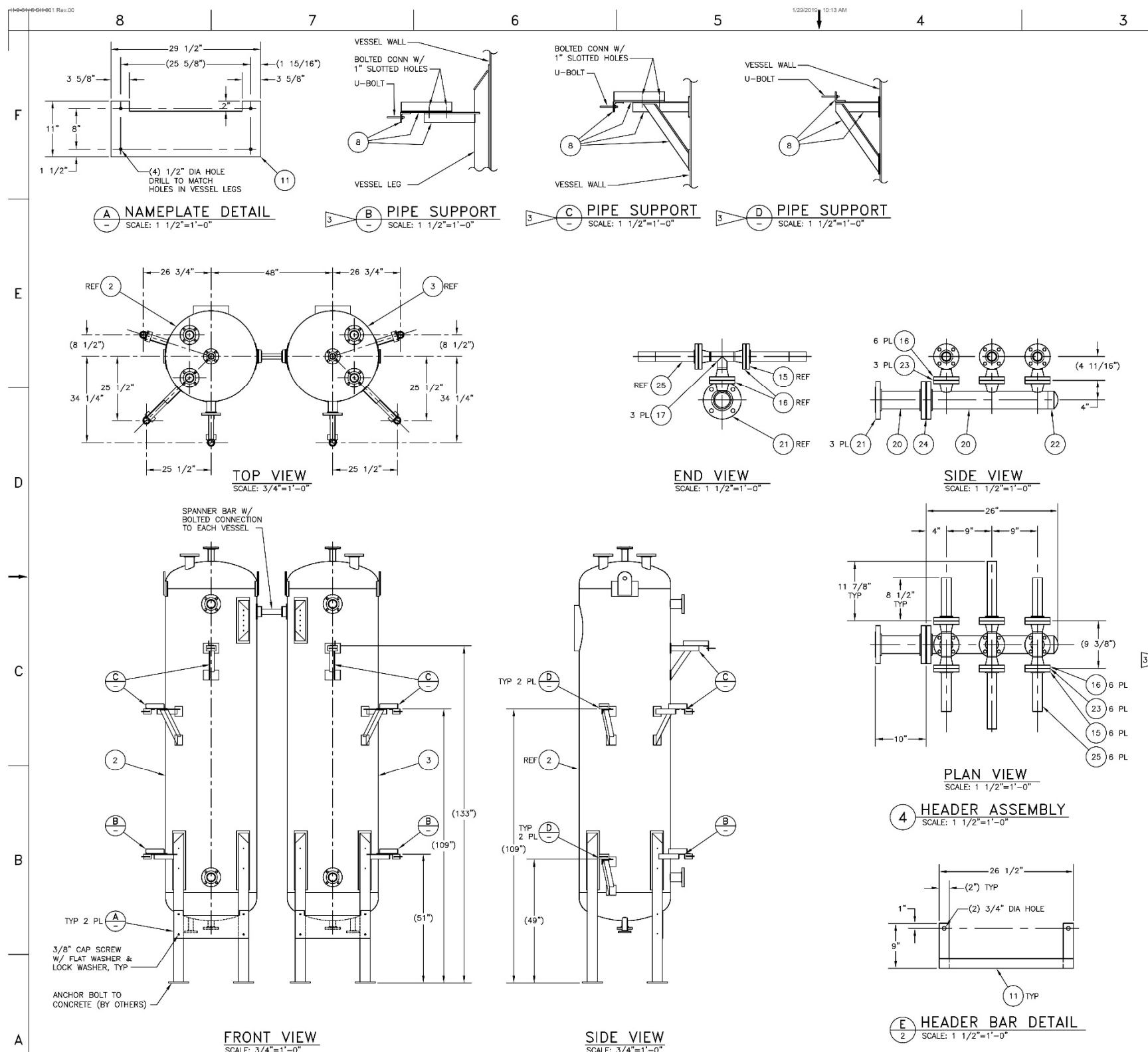
	<b>DS-002, Peroxide Decomposer Vessel</b>				<b>Specification No.</b> RPP-SPEC-62915	
	<b>Rev.</b>	<b>By</b>	<b>Date</b>	<b>Comment</b>	<b>Sheet</b>	<b>Date</b>
	0	JCMc	30-Jan	~~~	1 of 1	1/30/2019
					<b>Checked By</b> JL	<b>Approved By</b>
<b>Project</b> ETF PDV Replacement				<b>Purchase Order:</b>		
				<b>Requisition No.:</b>		
<b>Tag No.</b>	60D-CO-1B					
<b>PFD #</b>	H-2-89324		<b>Stream No.</b>	13 (Inlet), 14 (Outlet)		
<b>P&amp;ID #</b>	H-2-89332		<b>Quality Assurance Level</b>	General Service		
<b>Operating Data</b>			<b>Rev.</b>	<b>Material Specifications</b>		<b>Rev.</b>
Service	Process	Water	~~~	Design Code	ASME Section VIII, Div 1	~~~
Fluid			~~~	Design		~~~
Fluid Spg.		1.00	~~~	Grade		316/316L SST
pH Range		4 - 8	~~~	Description		316/316L SST
Design Pressure (psig)		150.0	~~~	Head/Top/Bot.	SA240	316/316L SST
Pressure Range (psig)		100-130	~~~	Internals	SA240/SA312	TP
Normal Temperature (deg F)		160	~~~	Bolts	SA193	B8M CI 2
Design Temperature Range (deg F)		0-180	~~~	Nuts	SA194	8F
Ambient Temperature Range (deg F)		40-120	~~~	Reinf. Pads	SA240	316/316L SST
			~~~	Supports	SA240/SA276/SA479	316/316L SST
<b>Design Data</b>				Cladding/Lining	*	*
Type of Head (or Top)	Ellipsoidal		~~~	Wear Plates	SA240	316/316L SST
Type of Head (or Bottom)	Ellipsoidal		~~~	Clips	SA240	316/316L SST
Jacket? If so, state function (cooling or heating)	N/A		~~~	Jacketing	N/A	~~~
Jacket Temperature Limit (if used)	N/A		~~~	<b>Finish (Applicable Stds./Specs.)</b>		
Physical Size - Fluid Volume (gal)*	(580)		~~~	Internal Finish	*	~~~
- Diameter (in)	36		~~~	External Finish	*	~~~
- Flat Side Height (in)	120		~~~	<b>Mixer</b>		
Design Pressure (Min/Max) (psig)	150		~~~	Vendor		N/A
Design Temperature (deg F)	0-180		~~~	Tank Turnover (per hr)		N/A
Corrosion Allowance	0.002"/yr		~~~	Impeller Dia. (in)		N/A
Other Loads	See Note 1		~~~	RPM (rpm)		N/A
<b>Fabrication &amp; Inspection Data</b>				Drive Motor (hp/Vac/ph)		N/A
Additional Radiography	Per Code		~~~	Shaft & Impeller Material		N/A
Impact Values	N/A		~~~	<b>Manufacturers Data</b>		
Weld Hardness	N/A		~~~	Manufacturer	*	~~~
Other N.D.T.	N/A		~~~	Model Number	*	~~~
Stress Relief	N/A		~~~	Vendor		- Name
Weld Finish	N/A		~~~			- Address
Code Certification Required	Yes		~~~			- Location
<b>Weights</b>						- Phone
Empty (lbs) *			~~~			- Fax
Internals (lbs) *			~~~	Registration Number	*	~~~
Insulation (lbs) *	N/A		~~~	Allowable Stress (psi) *		~~~
Total Flooded Weight (lbs) *			~~~	Shell Thickness (in) *		~~~
Shipping (lbs) *			~~~	Head Thickness (in) *		~~~
During Hydrotest (lbs) *			~~~			~~~
Fluid Contents (lbs) *			~~~			~~~
Lining (lbs) *			~~~			~~~
<b>Comments/Notes:</b>						
1. Cyclic Loads, 52 cycles per year, Refer to TFC-ENG-STD-06 for seismic requirements.						
2. Vessel will contain catalyst up to 7'-0" above the inlet nozzle which will add an additional 700 lbs to the internal weight of the vessel including water.						
3. Vessel includes internal lateral distribution headers connected to the inlet and outlet.						
*Vendor to provide/verify this information						

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**APPENDIX B**

**DRAWINGS**

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QTY	PARTS / DASH NUMBER	NOMENCLATURE/DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO.
1		PEROXIDE DESTRUCT VESSEL ARRANGEMENT		1	1
2		PEROXIDE DESTRUCT VESSEL 60D-CO-1A		2	2
2		PEROXIDE DESTRUCT VESSEL 60D-CO-1B		2	3
1		HEADER ASSEMBLY		1	4
1		ROLLED CYLINDER 36"OD X 120" LG	ASME SA240 TYPE 316L		5
2		ASME 2:1 ELLIPTICAL HEAD 36"OD	ASME SA240 TYPE 316L		6
AR	AR	ANGLE 4X4X1/4	ASME SA276 TYPE 316L		7
AR	AR	ANGLE	ASME SA276 TYPE 316L		8
AR	AR	PLATE, 1/4"	ASME SA240 TYPE 316L		9
AR	AR	PLATE, 1/2" X 10" X 10"	ASME SA240 TYPE 316L		10
AR	AR	PLATE	ASME SA240 TYPE 316L		11
AR	AR	ROUND, 2" DIA	ASME SA240 TYPE 316L		12
1		MANWAY 12" X 16" ELLIPTICAL	ASME SA240 TYPE 316L		13
AR	AR	PIPE, 1 1/2" SCH 40S	ASME SA312 TP316/316L		14
6	2	FLANGE, 1 1/2" RFSO 150#	ASME SA182 GR F316 SS		15
12		FLANGE, 1 1/2" RF WELD NECK 150#	ASME SA182 GR F316 SS		16
3		TEE, 1 1/2" SCH 40S	ASME SA403 WP316/316L		17
AR	AR	PIPE, 2" SCH 40S	ASME SA312 TP316/316LS		18
2	2	FLANGE, 2" RFSO 150#	ASME SA182 GR F316 SS		19
AR	AR	PIPE, 3" SCH 40S	ASME SA312 TP316/316L		20
3	2	FLANGE, 3" RFSO 150#	ASME SA182 GR F316 SS		21
1		PIPE CAP, 3" SCH 40S	ASME SA403 WP316/316L		22
9		GASKET, 1 1/2" 150# SPIRAL WOUND SS STYLE LS	FLEXITALLIC		23
1		GASKET, 3" 150# SPIRAL WOUND SS STYLE LS	FLEXITALLIC		24
AR		SCREEN	JOHNSON SCREENS		25

- GENERAL NOTES:**
- DESIGN, FABRICATE, TEST, INSPECT, AND SHIP VESSELS IN ACCORDANCE WITH RPP-SPEC-62915.
  - ALL EXTERNAL PIPING BY OTHERS.
  - FOR PIPE SUPPORTS B, C, AND D, EXTERNAL PIPE IS 2" SCH 40S TYPE 316L STAINLESS STEEL.
  - HEADER ASSEMBLY SHALL BE FABRICATED, TESTED, AND INSPECTED IN ACCORDANCE WITH ASME B31.3, NORMAL FLUID SERVICE.

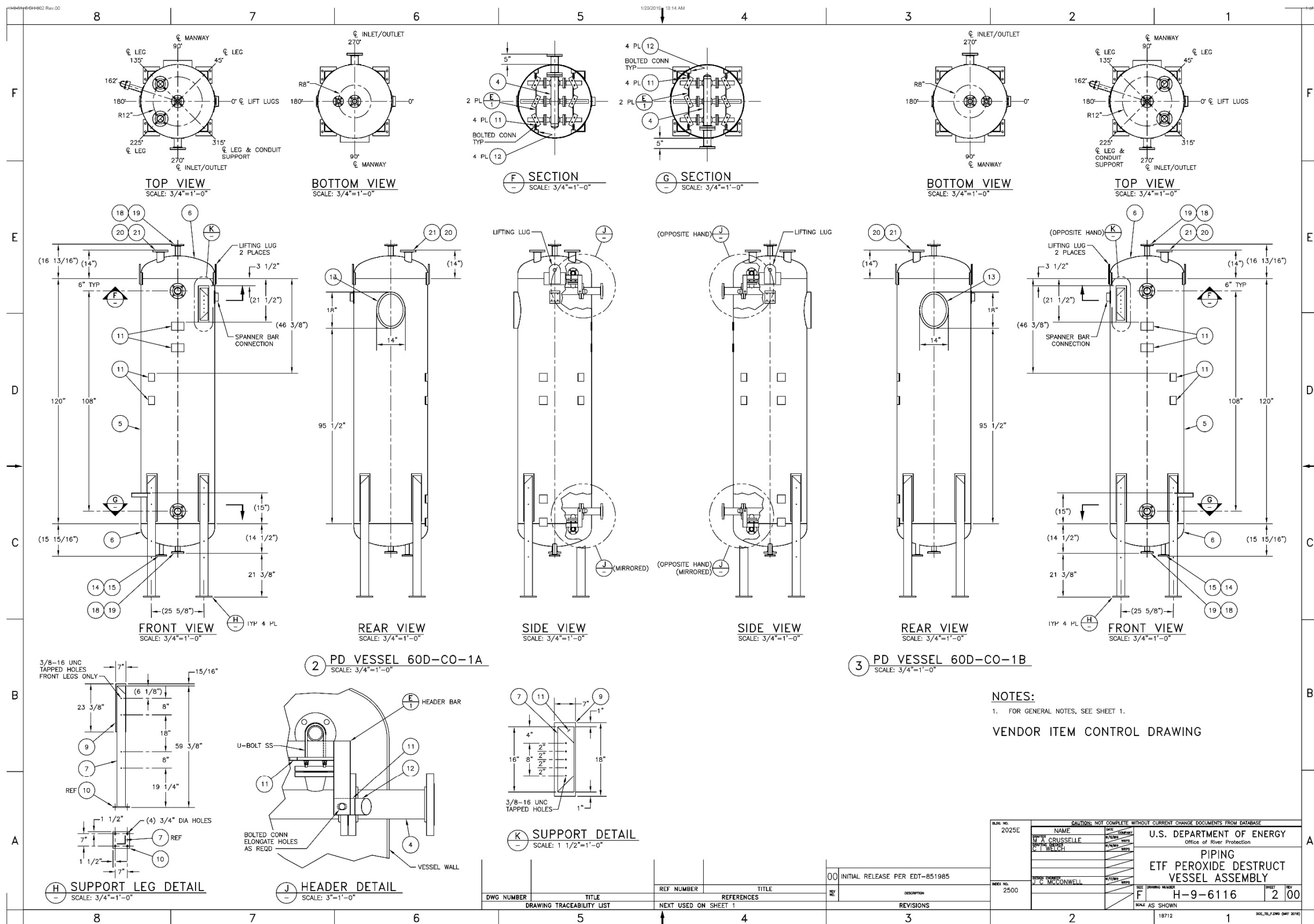
MACHINED		WELDMENT		CASTING	
DIMENSION	TOLERANCE	DIMENSION	TOLERANCE	DIMENSION	TOLERANCE
UNDER 6"	$\pm 0.015$	UNDER 24"	$\pm 1/16$	UNDER 2"	$+1/16$ / $-1/16$
6" TO 24"	$\pm 0.010$	24" & OVER	$\pm 1/8$	2" TO 5"	$+3/32$ / $-1/16$
24" & OVER	$\pm 0.031$	ANGULAR $\pm 0.30$ '00"		5" TO 8"	$+1/8$ / $-3/32$
	ANGULAR $\pm 0.30$ '00"			8" TO 12"	$+3/16$ / $-1/8$
				12" TO 15"	$+1/4$ / $-3/16$
				15" & OVER	$+1/4$ / $-1/4$

VENDOR ITEM CONTROL DRAWING

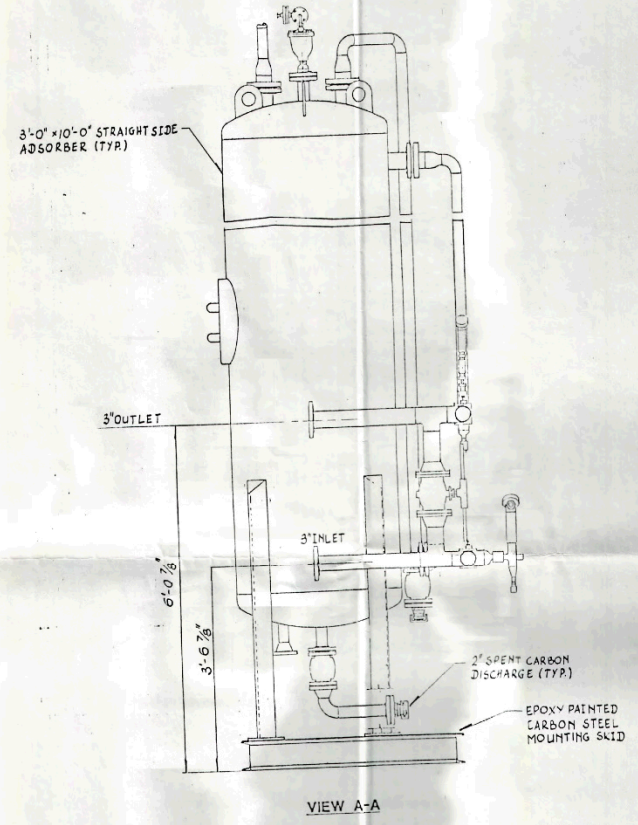
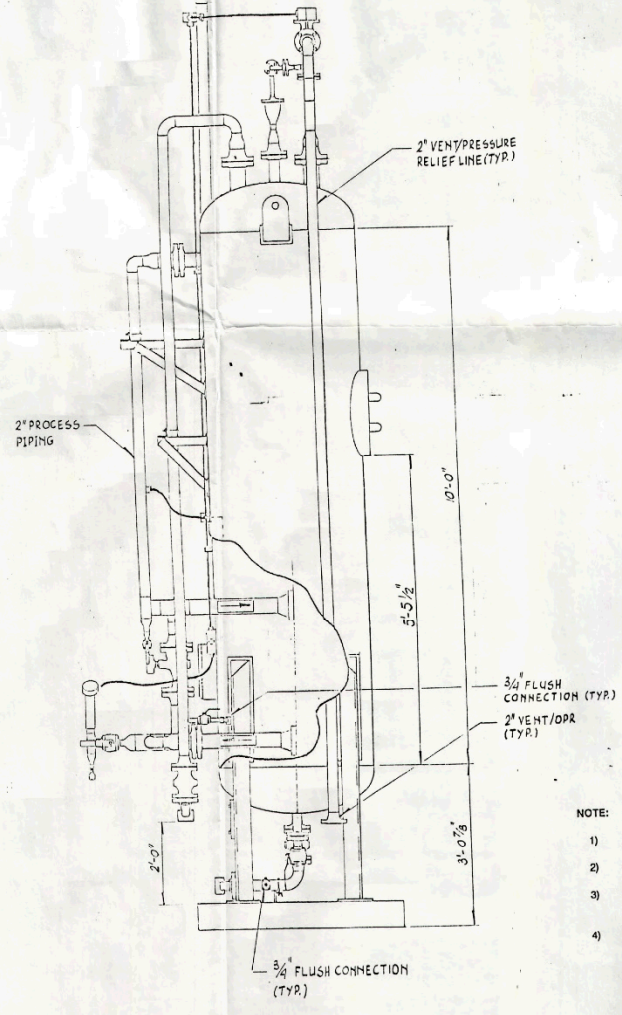
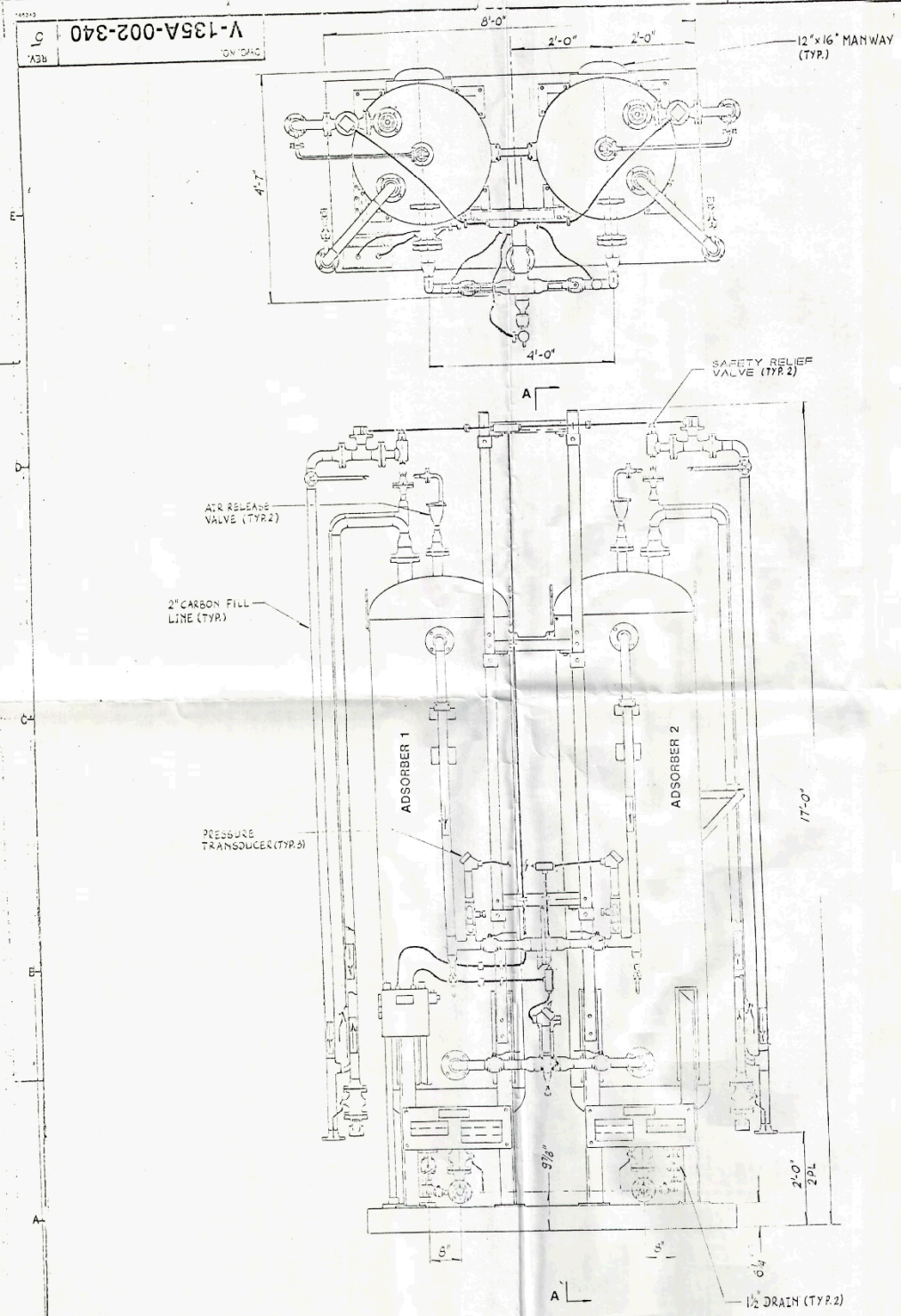
CAUTION: NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE			
NAME	DATE	U.S. DEPARTMENT OF ENERGY Office of River Protection	PIPING ETF PEROXIDE DESTRUCT VESSEL ASSEMBLY
A. CRUSSELLE	12/15/18		
DATE	SCALE		
12/15/18	AS SHOWN		
DESCRIPTION	SIZE		
00 INITIAL RELEASE PER EDT-851985	F		
REV. NO. 2500			
	H-9-6116		
	1		
	18711		

DWG NUMBER	TITLE	REF NUMBER	TITLE	DESCRIPTION
	DRAWING TRACEABILITY LIST			

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- NOTE:
- 1) SEE V-135-002-341 FOR ADDITIONAL DETAIL
  - 2) PIPING AND VESSEL SUPPORT SEISMIC DESIGN FOR ZONE 2B
  - 3) SEE OUTLINE SPECIFICATIONS V-135A-002-102 FOR ADDITIONAL DETAIL
  - 4) SEE V-135A-002-040 FOR VALVE TABULATION

DISTRIBUTION	
KEN	7
PM	
PJ	
CA	
EM	
PROCE	
MECHA	
PIPE	
ELC	
I/C	
HVAC	
CIVIL	
CM	
CONST	
CONST	
QA	
SAF	
PROCU	
PREOP	
SCH	
SCAD	
DCC (RWH)	
W.FILE	1
R.OFFI	
TYR	1
W. DESIG	APR

APPROVED  REVIEWED

WITH COMMENT  DISAPPROVED

RES. DEPT. (ENR) (1/29/19)

RELATED (246) (2/2/2019)

DEPT. (06) (1/29/19)

DATE (1-20-19)

JOB No. (0) (135A)

DOC No. (V) (135A-002) (340)

PEROXIDATION SYSTEMS INC. FORM 238-9

CONTROLLED DOCUMENT

ASBUILT

5	1/29/19	1	CHANGES PER SCR 390
4	1/29/19	1	RELOCATED MANWAY, REV'D DIMENSIONS, DRAIN MANWAY
3	1/29/19	1	DELETED ONE PRESSURE TRANSDUCER, REV'D PIPING
2	1/29/19	1	REVISED PIPING # DIMENSIONS, REV'D NOTES
1	1/29/19	1	

PEROXIDATION SYSTEMS INC.  
WATER TREATMENT THROUGH INNOVATIVE TECHNOLOGY

PROJECT: K-ETP

2 TRAIN X 1 STAGE UPFLOW PEROXIDE DESTRUCT MODULE GENERAL ARRANGEMENT

DRAWING NUMBER: V-135A-002-340

REV: 5