



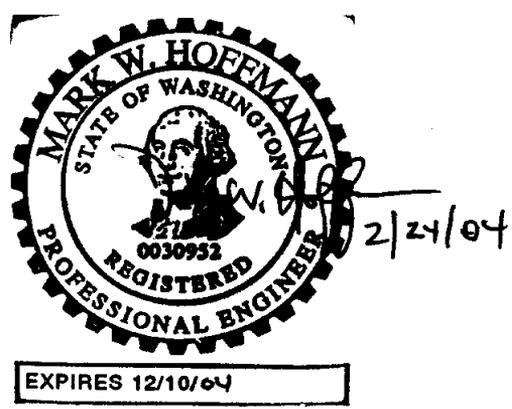
**RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT**

**ENGINEERING SPECIFICATION**

FOR

**Submersible Centrifugal Sump Pumps**

ISSUED BY  
 RPP-WTP-PDC  
 INT DATE



Content applicable to ALARA?  Yes  No  
 ADR No. Rev

Quality Designator
QL
DOE Contract No. DE-AC27-01RV14136

NOTE: Contents of this document are Dangerous Waste Permit affecting.

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SPECIFICATION No. 24590-WTP-3PS-MPVS-TP001 Rev 1

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# 1 Scope

## 1.1 Project Description and Location

The River Protection Project-Waste Treatment Plant (WTP) is a complex of waste treatment facilities where the US Department of Energy (DOE) Hanford Site tank waste will be put into stable glass form. The WTP Contractor will design, build and start-up the WTP pretreatment and vitrification facilities for the DOE Office of River Protection (ORP). The waste treatment facilities will pretreat and immobilize the low-activity waste (LAW) and high-level waste (HLW) currently stored in underground storage tanks at the Hanford Site.

The Hanford Site occupies an area of about 560 square miles and is located along the Columbia River, north of the city of Richland, Washington. The WTP Facility will be constructed at the east end of the 200 East Area of the Hanford Site. The counties of Benton, Franklin, and Grant surround the Hanford Site.

## 1.2 Equipment, Material, and Services Required

The Seller shall design, furnish materials, fabricate, shop test, and deliver submersible centrifugal pumps in accordance with this specification and its appendices and the requirements contained in the Material Requisition. The Seller shall provide the following as a minimum:

- 1.2.1 Vertical close-coupled submersible centrifugal pumps complete with electric motor drivers and the accessories specified on the individual Pump Data Sheets.
- 1.2.2 If specified on individual Pump Data Sheets, pumps shall be provided with a guide rail system.
- 1.2.3 One set of any special tools required for repair and maintenance.
- 1.2.4 One lot of consumable spare parts per item for start-up and one year operation.
- 1.2.5 Documentation and Submittals as listed in Section 10.

## 1.3 Work by Others

- 1.3.1 Material unloading and storage at jobsite
- 1.3.2 Installation labor
- 1.3.3 Foundation and anchor bolts
- 1.3.4 Connection of pipework external to unit
- 1.3.5 Electric power supply and connection
- 1.3.6 Wiring external to pump and driver
- 1.3.7 Motor starters and control systems

## 1.4 Definitions and Acronyms

### 1.4.1 Definitions:

Quality Level	WTP Project's quality classifications of structures, systems, and components based on their importance to safety. See Supplier Quality Assurance Program Requirements Datasheet and individual Pump Data Sheets for quality requirements.
Non-Quality Related	Structures, systems, components and associated services that are manufactured using standard commercial practices.
Seismic Category	WTP Project's seismic classifications of structures, systems, and components based on their safety function. See Engineering Specification 24590-WTP-3PS-FB01-T0001 and individual Pump Data Sheets for seismic requirements.

### 1.4.2 Acronyms of Organizations and Terms

ASME	American Society of Mechanical Engineers
HI	Hydraulic Institute
NPSH	Net Positive Suction Head
OSHA	Occupational Safety and Health Administration

## 1.5 Safety/Quality Classifications

Quality Level and Seismic Category of each pump described in this specification will be indicated on the individual Pump Data Sheets.

# 2 Applicable Documents

## 2.1 General

- 2.1.1 Work shall be done in accordance with the referenced codes, standards, and documents listed below, which are an integral part of this specification.
- 2.1.2 When specific chapters, sections, parts, or paragraphs are listed following a code, industry standard, or reference document, only those chapters, sections, parts, or paragraphs of the document are applicable and shall be applied. If a date or revision is not listed, the latest issue, including addenda, at the time of Request for Quote (RFQ) shall apply. When more than one code, standard, or referenced document covers the same topic, the requirements for all must be met with the most stringent governing.

## 2.2 Codes and Industry Standards

<u>Sponsor</u>	<u>Number</u>	<u>Subject</u>
ASME	B16.5	Pipe Flanges and Flanged Fittings

<u>Sponsor</u>	<u>Number</u>	<u>Subject</u>
ASME	B1.20.1	Pipe Threads, General Purpose (Inch)
HI	1.1-1.6, 9.1-9.8	Centrifugal Pump Standards
OSHA	1910.95	Occupation Noise Exposure

**2.3 WTP Specifications**

- 2.3.1 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*
- 2.3.2 24590-WTP-3PS-G000-TP002, *Specification for Positive Material Identification (PMI)*
- 2.3.3 24590-WTP-3PS-G000-T0003, *General Specification for Packaging, Shipping, Handling and Storage Requirements*
- 2.3.4 24590-WTP-3PS-MUMI-T0002, *Engineering Specification for Low Voltage Induction Motors*
- 2.3.5 24590-WTP-3PS-FB01-T0001, *Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks*
- 2.3.6 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture* (Note: Only the sections, paragraphs, and appendices referenced below are applicable and form an integral part of this specification)

Section 3.4 (all paragraphs)	Paragraph 5.5.1.1.1
Section 3.5.2 (paragraphs: 4,5,7,8,12)	Appendix C
Paragraphs 3.5.5.1 & 3.5.5.2	

### 3 Design Requirements

**3.1 Basic Function**

These submersible centrifugal pumps shall provide the motive force required to remove liquids from sumps.

**3.2 Performance**

- 3.2.1 Pumps shall have head-capacity curves that rise continuously from maximum flow to shutoff.
- 3.2.2 Pumps shall be capable of operating continuously at any flowrate between minimum and maximum flow without cavitation, vibration in excess of the HI Standards latest Vibration Acceptance Criteria, or overloading motor.
- 3.2.3 Pump/motor unit shall have a combined noise level less than 85 dBA when measured 3 feet in any direction from pump/motor unit. (OSHA 1910.95) Seller shall furnish expected noise data.

3.2.4 Pumps shall have a rotational speed no greater than that recommended by the Hydraulic Institute, which is based on the NPSH available at rated capacity and a suction specific speed value of 11,000.

### **3.3 Design Conditions**

3.3.1 Equipment and accessories are to be used in a plant with a design life of 40 years. The design objective for pumps purchased to this Specification shall be 40 years of useful life with periodic maintenance as recommended by the Seller. Maintainable and replaceable items will be specified for cost-effective design lives taking into account current technology and standards.

3.3.2 Furnished pumps shall be submersible, closed-coupled centrifugal pumps with accessories, conforming to design requirements stated in individual Pump Data Sheets.

3.3.3 Pumps shall have dual mechanical seals, with an oil reservoir for lubrication.

3.3.4 Pump casings shall be designed to withstand the suction pressure plus shutoff head.

3.3.5 Impellers shall be statically and dynamically balanced before assembly on pumps shafts. Dynamic balance to manufacturer's standard.

3.3.6 Impeller and casing wear rings (when furnished) shall be of compatible materials with nongalling characteristics. Wear rings shall be positioned and rigidly attached to prevent loosening.

3.3.7 Pumps shall have alignment or centering fits on all assembly joints or junctions as required for reassembly or alignment of parts.

3.3.8 Pumps and guide rails shall be designed for ease of decontamination. See 24590-WTP-3PS-M000-T0002 paragraphs 3.1.1, 3.5.2.4, 3.5.2.5, 3.5.2.7, 3.5.2.8, and 3.5.2.12.

3.3.9 Dimensions shall be US Standard.

### **3.4 Environmental Conditions**

3.4.1 Sump conditions will be specified on individual Pump Data Sheets.

3.4.2 Pumps and auxiliaries shall be suitable for outdoor installation in the environmental conditions specified on the individual Pump Data Sheets, but will be normally located indoors.

3.4.3 Some pumps will be in the LAW R5 areas. See 24590-WTP-3PS-M000-T0002 section 3.4 for details.

### **3.5 Mechanical Requirements**

3.5.1 See the individual Pump Data Sheets.

3.5.2 Furnished pumps shall have integral support feet and intake strainers.

- 3.5.3 Through bolted flanges are preferred to threaded connections for the discharge nozzle. If alternative methods of flange connection are required, the Seller shall supply flange details in the proposal.
- 3.5.4 Pumps shall have attached lifting eyes. Guide rail systems shall have a quick disconnect connection between pump and discharge pipe and be designed for ease of pump removal from the guide rail mounting.
- 3.5.5 Seller shall advise Buyer if sump pumps that are not furnished with a guide rail system need to be anchored in place to keep them from moving while pumping. If anchors are required, Seller shall provide anchor design.
- 3.5.6 Assuming normal maintenance practices are accomplished by Buyer as recommended by Seller and based on information provided in individual Pump and Motor Data Sheets, Seller shall provide data similar to the following for the pump and motor:
- estimated service life
  - common modes of failure (i.e. bearings seized, motor burned out, etc.) and the estimated hours until such an event occurs
  - maintenance time for replacement of major maintenance items (such as bearings), assuming normal work environments

### **3.6 Loadings**

- 3.6.1 Equipment shall, as a minimum, be designed for the loading specified in Engineering Specification 24590-WTP-3PS-FB01-T0001, as applicable.

### **3.7 Electrical Requirements**

- 3.7.1 See the individual Pump Data Sheets.
- 3.7.2 Provide each pump with an electric motor in accordance with Engineering Specification 24590-WTP-3PS-MUMI-T0002.
- 3.7.3 Pumps shall have 100 feet of electrical cord unless otherwise specified on the individual Pump Data Sheet.

## **4 Materials**

### **4.1 Construction**

- 4.1.1 All surfaces contacting sump fluid, including bolts and nuts, shall be made of 316L stainless steel unless otherwise noted in the individual Pump Datasheets. Stainless steel pumps shall have no aluminum components that are exposed to sumps fluids.
- 4.1.2 Materials used in constructing the equipment shall be suitable for the specified service and subject to review and acceptance by Buyer. Where specific materials are identified in this

specification or the individual Pump Data Sheets, the bid shall be based on their use. However, the Seller may additionally offer the option of utilizing alternative materials of equal or superior properties for Buyer's consideration.

- 4.1.3 Some pumps will be used in LAW R5 areas, see 24590-WTP-3PS-M000-T0002 paragraphs 3.5.5.1 and 3.5.5.2, and Appendix C for recommendations on material selection for radioactive environments.

## 4.2 Prohibited Materials

- 4.2.1 Mercury and other low melting point metals, their alloys, or materials containing such metals as their basic constituents shall not be used in the construction of pumps.
- 4.2.2 The use of asbestos is prohibited.

# 5 Fabrication

## 5.1 General

- 5.1.1 Use Seller's standard procedures and those of sub-suppliers for fabrication and manufacture of items covered by this specification provided they do not render these items unsuitable for service and conditions specified herein. Where Seller's (or sub-suppliers) standard procedures conflict with applicable specifications, codes or other standards, apply the most stringent requirements to fabricate and manufacture equipment specified.
- 5.1.2 All equipment shall be furnished neatly finished and free of burrs and fins.
- 5.1.3 Surface finish shall be in accordance with 24590-WTP-3PS-M000-T0002 paragraph 5.5.1.1.1.

## 5.2 Welding

Fabricated sections and repairs shall be welded using welding methods, procedure qualifications, electrodes, preheat, postweld treatment, and welder performance tests in accordance with the Seller's standard Quality Assurance procedures.

## 5.3 Assembly

All components furnished under this specification shall be preassembled in Seller's shops to maximum extent consistent with shipping, handling and erection constraints.

# 6 Tests and Inspections

Specified tests shall be conducted in accordance with applicable HI Standards, except as noted in this section. The chloride content of liquids used to test austenitic stainless steel materials shall not exceed 50 parts per million. To prevent deposition of chlorides as a result of evaporative drying, all residual liquid shall be removed from tested parts at the conclusion of the test.

## 6.1 General

- 6.1.1 Seller shall conduct and be responsible for all shop tests listed in the individual Pump Data Sheets and other applicable standards and reference documents. Tests may be witnessed by the Buyer's Supplier Quality Representative.
- 6.1.2 As a minimum, every pump shall have a hydrostatic and a performance test. Seller shall submit testing procedures for Buyer review and approval.
- 6.1.3 Seller shall furnish all facilities necessary for the performance of such tests. In the event Seller's own facilities are not suitable for such tests, Seller shall advise Buyer and obtain advanced written permission for using alternative facilities.
- 6.1.4 The Seller shall supply Buyer with all certified test data whether witnessed or not.

## 6.2 Positive Material Identification

If specified on individual Pump Data Sheets, pressure retaining casings of 316 or higher grade alloy shall be tested for Positive Material Identification. Positive Material Identification tests shall be performed in accordance with Specification 24590-WTP-3PS-G000-TP002.

# 7 Preparation for Shipment

## 7.1 Cleanliness

All dirt, oil, grease, mill scale, cuttings, weld spatter, and other foreign matter shall be removed from all interior and exterior surfaces per General Specification 24590-WTP-3PS-G000-T0003.

## 7.2 Painting

- 7.2.1 Nonferrous parts, nameplates, instruction plates, machined faces and fittings, preparations for field welding, and parts to be embedded in concrete shall not be painted.
- 7.2.2 If the individual Pump Data Sheet specifies ferrous materials, exposed surfaces shall be painted in accordance with Seller's standard procedures. Rust preventative means in accordance with General Specification 24590-WTP-3PS-G000-T0003 shall be employed to provide protection of ferrous surfaces during shipment and storage.

## 7.3 Tagging

- 7.3.1 Each pump shall be provided with a permanent corrosion-resistant nameplate(s) securely attached at a readily visible location on the equipment and on any other major piece of auxiliary equipment.
  - 7.3.1.1 The nameplate(s) shall be stamped with the following information in units consistent with the datasheet:
    - 7.3.1.1.1 Plant item (equipment) number.

- 7.3.1.1.2 Purchase order number.
- 7.3.1.1.3 Seller's size and model number.
- 7.3.1.1.4 Pump serial number.
- 7.3.1.1.5 Capacity.
- 7.3.1.1.6 Pumping head.
- 7.3.1.1.7 Casing hydrostatic test pressure.
- 7.3.1.1.8 Speed, RPM.
- 7.3.1.1.9 Maximum allowable working pressure (MAWP).
- 7.3.1.1.10 Temperature, basis for MAWP.
- 7.3.1.1.11 Bearing manufacturer's identification numbers.
- 7.3.1.2 In addition to being stamped on the nameplate, the pump serial number shall be plainly and permanently marked on the pump casing.
- 7.3.1.3 Rotational arrows shall be cast in or attached to each major item of rotating equipment at a readily visible location.
- 7.3.1.4 Nameplate(s) and rotation arrows (if attached) shall be of austenitic stainless steel or of nickel-copper alloy (Monel or its equivalent). Attachment pins shall be of the same material. Welding is not permitted.

#### **7.4 Packaging and Shipping Instructions**

- 7.4.1 All equipment shall be packed, securely anchored and protected for shipment in accordance with General Specification 24590-WTP-3PS-G000-T0003.
- 7.4.2 All lifting points shall be clearly marked. Lifting lugs shall be provided for motor-pump assemblies and for guide rail assemblies.
- 7.4.3 All openings shall be covered to protect against moisture and dust.
- 7.4.4 Packaging shall provide protection for equipment during transit and storage. Equipment may be stored outdoors at jobsite for as long as one year before it is installed.

## 8 Quality Assurance

### 8.1 General Requirements

- 8.1.1 The Seller's Quality Assurance Program (QAP) Requirements are included in 24590-WTP-3PS-G000-T0001, Supplier Quality Assurance Program.
- 8.1.2 Seller's QAP Manual shall be submitted to buyer for review in accordance with 24590-WTP-3PS-G000-T0001, Supplier Quality Assurance Program.
- 8.1.3 Seller's QAP, as a minimum, shall contain the requirements detailed in the Supplier Quality Assurance Program Requirements Data Sheet(s) listed in Section 2 of the MR.

## 9 Configuration Management

Equipment and/or components covered by this specification are identified with Plant Item (equipment) numbers as given in the individual Data Sheets. Each item shall be tagged per paragraph 7.3.

## 10 Submittals

### 10.1 General

Submittals and document quantities, including Drawings, Installation Procedures, Inspection and Test Reports, Calculations, Manuals, Certificates of Conformance, Schedules, Material Certificates, and others appropriate to the purchased equipment, are detailed in Section 3 of the Material Requisition, including Forms G-321-E and G-321-V.

### 10.2 Drawings

Drawings shall be inclusive, as a minimum, of all the following requirements:

- 10.2.1 Outline drawings of pump-motor assembly and guide rails, including outline and detail drawings for each component, and weights of components and assemblies.
- 10.2.2 Mounting dimensions and information required for the design of supports and/or foundations. (See 3.5.4 and 3.5.5.)
- 10.2.3 Flange locations, dimensions and details per paragraph 3.5.3.
- 10.2.4 Locations and identification of parts included in the parts list.
- 10.2.5 Wiring schematic diagrams and data. Diagrams shall include wire gauges and show wires and equipment applicable to the supplied units only. External connections for power shall be shown on these diagrams. Submittals shall meet requirements specified in 24590-WTP-3PS-MUMI-T0002 (paragraph 10.1) as applicable.
- 10.2.6 See G-321-E Form of the Material Requisition for drawing submittal requirements.

10.2.7 Mechanical seal drawings.

### **10.3 Parts List**

10.3.1 Priced lists of recommended spare parts for start-up and one (1) year's operation.

10.3.2 Complete lists of equipment parts, with drawings showing sectional views of identified parts and assembly locations shall be provided.

10.3.3 Seller shall identify limits to shelf-life and storage requirements of parts anticipated to have functional life spans shorter than the equipment design life.

### **10.4 Inspection and Test Reports**

10.4.1 Inspection and Test Reports shall be provided. See Section 3 and Section 5 of the Material Requisition.

10.4.2 Completed data sheets, as applicable, incorporating required information.

10.4.3 Performance curves (Quadrant) showing NPSH Required, Horsepower, Efficiency, flow vs. head at applicable speeds.

10.4.4 Hydrostatic test results.

10.4.5 Certified Performance test report.

10.4.6 Certificates of material conformance per the requirements referenced in 6.2.

10.4.7 All other certified test data per paragraph 6.1.4.

### **10.5 Manuals**

10.5.1 Manuals shall be furnished to provide information on the correct storage, installation, operation and maintenance of the equipment assembly.

10.5.2 Rigging, storage, installation and maintenance instructions/manuals shall be provided 30 days prior to shipment.

### **10.6 Schedules**

Manufacturing schedules and progress reports shall be furnished and sent directly to the Project Expeditor as shown in Section 3 of the Material Requisition.

### **10.7 Other**

10.7.1 Noise data per paragraph 3.2.3.

10.7.2 Estimated service life and failure data per paragraph 3.5.6.

10.7.3 Alternative materials per paragraph 4.1 (optional).

10.7.4 Documentation required by attached specifications.

## **10.8 Records**

The following Documents shall be submitted for review and maintained on file at Seller's shop and be accessible for Buyer's review:

- 10.8.1 Dynamic balancing procedures
- 10.8.2 Hydrostatic test procedures
- 10.8.3 Performance test procedures
- 10.8.4 Cleaning and painting procedures
- 10.8.5 Shipping preparation procedures