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RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

SPECIFICATION

FOR

Centrifugal Canned Motor Pumps to be Located In-Bulge

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Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

**TECHNICAL SPECIFICATION
FOR
CENTRIFUGAL CANNED MOTOR PUMPS
LOCATED IN-BULGE**

1 Scope

1.1 Project Description and Location

The River Protection Project –Waste Treatment and Immobilization Plant (RPP-WTP) is a complex of waste treatment facilities where the U.S. Department of Energy (DOE) Hanford Site tank waste will be put into stable glass form. The WTP Contractor will design, build and startup the RPP-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 RPP-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

Design, furnish materials, fabricate, assemble, test and deliver the centrifugal canned motor pumps and accessories in accordance with this specification, including:

1.2.1 Centrifugal canned motor pumps, each complete with electric motor and accessories specified on individual Pump Data Sheets and in this Specification.

1.2.2 Services of an installation supervisor when required.

1.2.3 One lot of any special tools required for installation and maintenance.

1.2.4 One lot of startup and commissioning spare parts, and list of recommended spare parts.

1.2.5 Installation, Operation and Maintenance Manuals.

1.2.6 Each pump and motor assembly shall include all components and accessories fully assembled, aligned, piped and wired, requiring only connecting to Buyer's pipe, electrical and control systems.

1.3 Work by Others

1.3.1 Material unloading and storage at jobsite

1.3.2 Installation labor

1.3.3 Interconnecting pipework external to the equipment

1.3.4 Electric power supply

1.3.5 Wiring external to the pump and driver

1.3.6 Motor starters.

1.4 Definitions and Abbreviations

1.4.1 Definitions – See API-610 and:

Bulge A fabricated steel, floor mounted enclosure to house items, such as pumps and valves, which is located adjacent to a room that contains radioactive material. Top covers will be removable to permit access to equipment.

Important to Safety (ITS) Project classification of Structures, Systems and Components (SSCs) based on their importance to safety controlling normal radiographic/chemical releases, accident prevention and mitigation. ITS safety classifications are 1) Safety Design Class (SDC), 2) Safety Design Significant (SDS), 3) Other SSCs and 4) Commercial Grade SSCs.

SDC Safety Design Class SSCs includes those that, by performing their specified safety function, prevent workers or the maximally exposed member of the public from receiving a radiological exposure that exceeds the accident exposure standards defined in the Safety Requirements Document. SDC also applies to those features that, by functioning, prevent the worker or maximally exposed member of the public from receiving a chemical exposure that exceeds the Emergency Response Planning Guidelines (ERPG)-2 (AIHA 1988) chemical release standard. Those features credited for the prevention of a criticality event are also designated as SDC.

SDS Safety classification for Important to Safety SSCs needed to achieve compliance with the radiological or chemical exposure standards for the public and workers during normal operation; and SSCs that can, if they fail or malfunction, place frequent demands on or adversely affect the function of SDC SSCs.

Other SSCs Those SSCs that are neither SDC nor SDS.

QL-1 SDC items. This level is based on the safety classification identified in the Standard Identification Process Database (SIPD).

QL-2 SDS items. This level is based on the safety classification identified in the SIPD. QL-2 shall also be used to identify other items and activities for which Nuclear Quality Assurance (NQA)-1 (1989) compliance is required.

QL-3 Quality Level 3 based on Immobilized High Level Waste (IHLW) Acceptance Items and Activity List for IHLW product quality-affecting items and associated services that affect the functionality of an SSC item that is not designated as SDC or SDS.

Non-Quality Related Remaining SSC items and associated services (those that are not designated as SDC or SDS) that are manufactured using standard commercial practices. For designed items, quality requirements will be defined in applicable design documents.

Seismic Category RPP-WTP Project's seismic classifications of SSCs based on their safety function. Seismic Categories are I (SC-I), II (SC-II), III (SC-III), IV (SC-IV) and V (SC-V).

SC-I SSC important to safety and which has a seismic safety function.

SC-II SSC important to safety, whose failure during a seismic event could prevent a Seismic Category I SSC from performing its seismic safety function.

SC-III (a) SSC important to safety, but without seismic safety function.
(b) SSC not important to safety, but has an inventory of radioactive or hazardous material in an amount less than an important-to-safety significant quantity.

SC-IV SSC not important to safety and without an inventory of radioactive or hazardous material, but requiring seismic protection.

SC-V SSC not important to safety and does not require seismic design.

1.4.2 Abbreviations of Organizations

ABMA	American Bearing Manufacturers Association
AGMA	American Gear Manufacturers Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society of Nondestructive Testing
ASTM	American Society for Testing and Materials
HI	Hydraulics Institute
ISO	International Organization for Standardization
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association

1.5 Safety/Quality Classifications

Safety Classification, Quality Level and Seismic Category, if any, of each pump described in this specification will be on the individual Pump Data Sheets, included in Section 2 of the Material Requisition.

2 Applicable Documents

2.1 Codes and Industry Standards

2.1.1 API-610, Eighth Edition — Centrifugal Pumps for Petroleum, Heavy Duty Chemical and Gas Industry Service. (See its Appendix A for additional Referenced Publications and International Standards)

2.1.2 ASNT SNT-TC-1A, August 1984 — Recommended Practice (including Non-Destructive Examination [NDE] personnel certification)

2.1.3 NEMA MG 1-98 — Motors and Generators

2.2 Engineering Standards

2.2.1 24590-WTP-3PS-G000-T0001, General Specification for Supplier Quality Assurance Program Requirements

2.2.2 24590-WTP-3PS-G000-T0002, Specification for Positive Material Identification (PMI)

2.2.3 24590-WTP-3PS-G000-T0003, RPP-WTP General Specification for Packaging, Shipping, Handling and Storage Requirements

2.3 Reference Documents/Drawings

2.3.1 24590-LAW-MX-RLD-00001001, General Arrangement LAW-RLD C3/C5 Pump Bulge RLD-BULGE-00001

2.3.2 24590-LAW-MX-RLD-00001002, Piping Assembly LAW-RLD C3/C5 Pump Bulge RLD-BULGE-00001

3 Design Requirements

3.1 Basic Function

3.1.1 These centrifugal canned motor pumps will be located in a bulge in the Low Activity Waste Facility. They will transfer liquid to meet conditions as shown on the Pump Data Sheets.

3.1.2 The pumps shall have design refinements to extend the normal time between maintenance, and to allow removal of the canned motor/pump rotating element assemblies using semi-remote handling devices. Bidders shall include descriptions and sketches, as appropriate, of these design refinements in the proposal.

3.2 Performance

See the individual Pump Data Sheets.

3.3 Design Conditions

3.3.1 See the individual Pump Data Sheets.

3.3.2 These pumps will be designed to be mounted in a vertical position with the suction and discharge connections butt-welded to the piping. The bolts connecting the back cover to the pump casing shall be designed to permit removal from some distance above with a specially designed tool(s) to be furnished by the Supplier.

3.3.3 The equipment and appurtenances will be used in a plant that has a design life of 40 years. The design objective for these canned motor pumps shall also be based on a 40 year life. If the design life can not be met, the maintenance items shall be easily accessible once the motor and rotating element have been removed from the case.

3.3.4 All components of the pump and motor shall be self-draining. Pockets or voids that could entrain process fluid are not allowed.

3.3.5 The canned motor pumps shall be manufactured so that oil is not used for lubricant or cooling purposes. The motor windings shall be potted to reduce size as much as possible.

3.3.6 The Supplier shall include recommendations for safety monitoring devices, such as bearing wear detection and motor winding thermostats, to help avoid unexpected outages.

3.3.7 The pumps shall meet API Standard 610 as much as possible. **Paragraphs which do not match the type of pump and/or required modifications, will not apply.** The following Purchaser modifications to API 610, using the paragraph numbers found in API-610, apply:

API 610 Paragraph No.

1.1.1 This specification covers the minimum requirements for centrifugal pumps designed in accordance with API 610, Eighth Edition, "Centrifugal Pumps for Petroleum, Heavy Duty Chemical, and Gas Industry Services" as modified by this section. The paragraph numbers in this section correspond to those in API 610 and each of the paragraphs denotes an "Addition", "Decision" or "Modification" to the API requirements. Bulleted items not addressed in this specification shall have the decisions noted on the individual pump data sheets.

1.2.2 (Decision) Dimensions shall be U.S. Standard.

1.3 Conflicting Requirements (Modification)

In case of conflict between this specification and other referenced documents, the following order of precedence shall govern:

- Purchase Order
- Data Sheets
- This Specification
- API 610
- Other referenced specifications and standards

2.1.9 (Decision) Pump Suction Specific Speed (S) shall not exceed 12,000 (calculated using rotative speed in rev/min, BEP flow at the maximum diameter impeller in GPM and NPSH in feet). Pumps offered with suction specific speeds > 12,000 may be accepted subject to purchaser's written approval.

2.1.11 (Addition) Pumps for parallel operation shall have equal head rise (within ±1% as measured on the performance test) to shutoff.

2.1.14 (Addition) Noise level shall not exceed 85 dBA measured 3 ft from the edge of the baseplate.

2.1.29 (Decision) Pumps and auxiliaries shall be suitable for outdoor installation in the climatic zone specified on the data sheets.

2.2.4 (Modification) The maximum allowable working pressure shall apply to all parts referred to in the definition of "pressure casing" (See API paragraph 1.4.40), except for double-casing pumps. Components and sections of double-casing pumps which are normally subjected to suction pressure shall be designed to permit, as a minimum, a hydrostatic test pressure equal to the casing maximum allowable working pressure.

2.3.2.1 (Modification) ~~All pumps, except double-casing designs, shall have suction and discharge flanges of equal rating.~~ The pumps shall have weld ends at suction and discharge suitable to be butt welded to Purchaser's suction and discharge piping.

2.3.3.3 (Decision) Cylindrical threads shall not be used.

2.3.3.10 (Addition) Casings shall be provided with flanged vents and drains. Flanges shall be the same rating as the pump discharge nozzle capability.

2.3.3.11 (Decision) Pressure gauge connections shall not be provided.

2.6.4.1 (Addition) The wear ring running clearance (adjusted for temperature) and diameter, shall be provided for each service. Pump efficiencies shall be based on the corrected clearances.

3.2.12 (Addition) Coupling guards are not used due to canned motor, close-coupled design.

3.3.3 (Addition) Centers of the mounting pads shall be at the correct relative elevation with 0.002 inch per foot of separation between the pads. Each pad shall be machined flat to within 0.002 inch total variation across the surfaces. NOT APPLICABLE

3.3.4 (Modification) Pump pads are not to be machined to allow for the installation of shims. Pump feet will not be shimmed. NOT APPLICABLE

3.3.14 (Addition) Transverse alignment positioning jackscrews shall be provided for all components, except the pump. NOT APPLICABLE

3.3.21 (New) To insure that final alignment can be achieved in the field, the equipment manufacturer shall align the pump and driver to within 0.010 inch parallel offset and 0.002 inch/inch angular in the shop. The bolts shall be centered in their holes after the preliminary alignment. Undercutting of hold-down bolts is not acceptable. NOT APPLICABLE

Note : Hold down bolts shall not be bolt bound after final alignment in the field. The hold-down bolt shall be reasonably centered, based on visual inspection after the final field alignment.

4.2.3.3 (New) The following in process items shall be verified by the Supplier Quality Representative: NOT APPLICABLE

a. Flatness of the mounting feet at the machining process
b. Initial alignment of the drive train
c. Vertical NEMA frame motors with thrust bearings comply with paragraph 3.1.8 of API-610
d. Shaft runout of horizontal motors

4.3.2.1a (Modification) Double-casing pumps and other special-design pumps, as approved by the purchaser, may be segmentally tested at the appropriate section pressure. Segmental hydro testing of horizontal multistage pumps is not acceptable. Hydrostatic testing, whether on a component basis or assembled pump, shall be done after all machining and welding (such as piping connections, drain, vents, seal welding) has been completed. NOT APPLICABLE

4.3.4.1.1 (Addition) NPSHR test shall be performed if the NPSH required by the pump differs from the specified available NPSH by 3 feet or less. The NPSH test will be a vacuum tank suppression test unless a suction valve throttling test has been approved by the purchaser.

SECTION 6 – SUPPLIER'S DATA The requirements of Section 3 of the Material Requisition shall be applicable in addition to the API-610 requirements.

END OF COMMENTS TO API-610.

3.4 Environmental Conditions

3.4.1 See individual Pump Data Sheets.

3.4.2 When noted on the Data Sheets, motors will require radiation shielding. It is preferred that this be designed and furnished by the motor Supplier so they consider motor cooling air flow.

3.4.3 When noted on the Data Sheets, all bearings may require special radiation resistant lubricants.

3.4.4 When noted on the Data Sheets, the seal elastomer components shall use high radiation-tolerance materials.

3.5 Mechanical Requirements

3.5.1 See individual Pump Data Sheets.

3.5.2 If an external clean water supply is required to avoid problems due to the pumped liquid, ie. slurry content, or cooling, the Supplier shall advise the expected minimum flow and pressure required.

3.6 Loading

3.6.1 Suction and Discharge pipe ends, which will be butt welded to Project piping, shall meet the API 610 load capability requirements.

3.6.2 After initial installation, the motor and the pump rotating element will be removed through an opening in the bulge. Any maintenance tools, or devices shall be provided by the Supplier, and must be designed to allow for removal of the motor and rotating element from above.

3.6.3 See the individual Pump Data Sheets for Seismic Classification, if any.

3.7 Electrical Requirements

3.7.1 See individual Motor Data Sheets.

3.7.2 Electric motors shall meet the requirements of NEMA MG 1-98, Motors and Generators.

3.7.3 Motors shall be furnished with 30 foot long power cable to facilitate power hookup. The power cable shall be three (3) wire, No. 12 size plus ground wire, with standard insulation. The motor power leads shall be tagged with line phase designations to permit for proper motor and pump rotation.

3.8 Instrumentation and Control Requirements

See individual Pump Data Sheets.

3.9 Accessibility and Maintenance

3.9.1 These pumps will require semi-remote removal capability, and the following modifications must be furnished with clear information on how to perform maintenance:

3.9.1.1 Bolts holding the back cover to the pump casing shall be removable with a tool(s) used through a removable cover plate on top of the bulge.

3.9.1.2 Any other electrical / cooling liquid connections shall be removable from outside the bulge with manually handled tools.

3.9.1.3 Lifting eye(s) / lugs to be used by the maintenance crane to lift the canned motor and pump rotating element must be easily accessible and take into account balance points to prevent swinging of the unit.

3.9.2 As the pumps may not operate for some period of time after installation, the Supplier shall provide clear pre-operation maintenance and preservation instructions to keep the equipment like-new.

4 Materials

4.1 Construction

See individual Pump Data Sheets for materials of construction.

4.2 Prohibited Materials

Bronze, copper, lead, zinc, tin, antimony, cadmium, or other low melting point metals, their alloys, or materials containing such metals as their basic constituents, or molybdenum and halogens, shall not be used in direct contact with stainless steel, with the exception of oil impregnated bronze bearings. This prohibition applies to the use of tools, fixtures, paints, coatings and sealing compounds , and any other equipment or materials used by the Supplier in handling, assembly and storage of stainless steel parts or components.

4.3 Special Requirements

See individual Pump Data Sheets. Note the requirement in Specification for Positive Material Identification of casings of 316 SS and better.

4.4 Storage of Special Materials (e.g., stainless steel) prior to work

The Supplier shall advise any special storage and preservation requirements.

5 Fabrication

5.1 Welding

5.1.1 Welding and weld repairs shall follow requirements of API-610.

5.1.2 Weld repair records shall be available for shop inspection and be submitted with documentation package.

5.1.3 Weld procedures and procedure qualification records shall be submitted to Buyer for review and acceptance prior to start of fabrication.

5.2 Assembly

No special comments.

5.2 Heat Treatment

Heat treatment shall be conducted as required by Supplier and/or welding procedures.

5.4 Other Processes (as required)

No special comments.

6 Tests and Inspections

6.1 Personnel Qualifications

Qualification of Supplier's inspection and test personnel shall be verified.

6.2 Non-Destructive Examinations

Personnel performing non-destructive examinations or reviewing such test results shall be certified to ASNT Standard SNT-TC-1A.

6.3 Shop Tests

6.3.1 Supplier shall conduct and be responsible for all shop tests listed in the individual Pump Data Sheets, API-610 and other applicable standards and reference documents.

6.3.2 Supplier shall furnish all facilities necessary for the performance of such tests. In the event Supplier's own facilities are not suitable for such tests, Supplier shall advise Buyer and obtain permission for using alternative facilities.

6.4 Site Tests

Buyer's startup personnel will run field performance tests after installation. Buyer may request Supplier's assistance during startup. Supplier shall be responsible for after-installation performance of the pumps.

7 Preparation for Shipment

See instructions in the Material Requisition, Section 7 and General Specification for Packaging, Shipping, Handling and Storage.

7.1 Cleanliness

Remove all dirt, oil, grease, loose mill scale, weld spatter and other foreign matter from all surfaces, with special attention to surfaces to be painted in accordance with Buyer's cleaning and coating procedures.

7.2 Painting

After visual examination, all exposed surfaces, except if stainless steel, shall be primed and coated in accordance with Buyer's cleaning and coating procedures. Supplier shall submit their conforming procedures as part of the documentation package. Color shall be advised later.

7.3 Tagging

See Paragraph 2.12 of API-610.

7.4 Packaging

See Material Requisition, Section 7, and General Specification for Packaging, Shipping, Handling and Storage.

7.5 Documentation

See API 610 and Material Requisition, Section 3.

7.6 Shipping Instructions

See Material Requisition, Section 7.

8 Quality Assurance

See Material Requisition, Section 9.

8.1 QA requirements specific to item(s) or service

8.1.1 The Supplier Quality Assurance Program (QAP) Requirements are included in Reference Document 2.2.1.

8.1.2 Supplier's QAP Manual shall be submitted to Buyer for review in accordance with Reference 2.2.1.

8.2 Program QA elements

Supplier's Quality Assurance Program, as a minimum, shall contain the requirements detailed in the Material Requisition.

9 Configuration Management

Equipment and/or components covered by this specification are identified with Plant Item (equipment tag) Numbers as given on the individual Data Sheets. Each item to be tagged per Section 7.3.

10 Documentation and Submittals

See Section 3 of the Material Requisition, which includes Forms G-321-E and G-321-V with their associated instructions, for the required documents and submittals.