

WASTE TREATMENT PLANT PROJECT REQUEST FOR INTEREST

Requisition Number: 24590-QL-MRA-MACS-00009
Submit Interest By: 18 July 2022
Quality Level: QL
Award Type: Firm Fixed Price

ESTIMATED SCHEDULE

Issue Request for Proposal: 31 July 2022
Award and Notice to Proceed: 22 December 2022

PROJECT DESCRIPTION AND LOCATION

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is a complex of radioactive waste treatment processing facilities designed and constructed by Bechtel National, Inc. for the Department of Energy (DOE). The facility will process the Hanford Site tank waste and convert the waste into a stable glass form.

The Project site is located in the 200 East Area of the Hanford Reservation near Richland, Washington, along the Columbia River. The site elevation varies from 662 to 684 feet above mean sea level. Ambient temperature range is -23 degrees F minimum to 113 degrees F maximum, with relative humidity of 5% minimum to 100% maximum. The project design life is 40 years.

SCOPE OF WORK

Provide design, materials, fabrication, testing, inspection, preparation for shipment, submittals, and documentation of the fans and accessories in accordance with the Material Requisition and all codes, standards, and technical documents invoked by it.

Equipment and Materials Required

Four Single Stage Centrifugal Fans (hereinafter called fans) with associated components having tag numbers as identified on fan datasheet 24590-HLW-MAD-C5V-00027 and design features as described on the datasheet and equipment specification 24590-HLW-3PS-MACS-T0001.

QUALITY ASSURANCE (QA) REQUIREMENTS

Programmatic Quality Assurance (QA) requirements for subcontracts or purchase orders performed in the WTP Jobsite will be:

<input type="checkbox"/>	Non-Permanent or Temporary Work - Generally no QA program required
<input type="checkbox"/>	Commercial Quality - Based on DOE Order 414.1C
<input checked="" type="checkbox"/>	Nuclear Level Quality - Based on ASME NQA-1 2000

Bechtel may require, as an element of bidder pre-qualification, submission of a representative sample QA Program or Table of Contents copy. For Nuclear Level Quality subcontracts, the successful bidder's QA Program must be approved prior to award of the subcontract or purchase order.

CODES

- ASME AG-1-1997 with 2000 addenda
- ASME B&PVC Section V 1983
- ASME B&PVC Section IX 1983
- ASME NQA-1-2000
- ASME NQA
- ASME NQA-1-2004, Part 1, Requirement 7, Paragraph 701, General, as tailored for WTP in 24590-WTP-3PS-G000-T0019
- AWS D1.1-1984, Structural Welding Code, Steel
- AWS D1.3-1981, Structural Welding Code, Sheet Steel

- AWS D1.6-2017, Structural Welding Code, Stainless Steel
- AWS D9.1-2018, Sheet Metal Welding Code
- OSHA 29 CFR 1910, Occupational Safety and Health Standards
 - 2.1.10.1 Subpart O Machinery and Machine Guarding
 - 2.1.10.2 Subpart S Electrical
- NFPA 70-1999, National Electrical Code
- NFPA 90A-1999, Standard for the Installation of Air-Conditioning and Ventilating Systems

STANDARDS

- ABMA 9-2015, Load Ratings and Fatigue Life for Ball Bearings
- ABMA 11-2014, Load Ratings and Fatigue Life for Roller Bearings
- AMCA 99-2404-1972, Drive Arrangement for Centrifugal Fans
- AMCA 99-2406-1966, Designations for Rotation and Discharge of Centrifugal Fans
- AMCA 210-1974, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
- AMCA 300-1967, Reverberant Room Methods for Sound Testing of Fans
- AMCA 301-1976, Methods for Calculating Fan Sound Ratings From Laboratory Test Data
- ANSI / API Std 670-2014, Machinery Protection Systems
- ASNT-SNT-TC-1A, ANST Recommended Practice, year edition(s) per 24590-WTP-3PS-G000-T0050 section 3.2.43.2.1
- ASTM A36-2019, Standard Specification for Structural Carbon Steel
- IEEE 1050-1996, IEEE Guide for Instrumentation and Control Equipment Grounding in Generating Stations
- IEEE 1202-2006 (R2012), IEEE Standard for Flame-Propagation Testing of Wire and Cable
- ISO 3744-2010, Acoustics - Determination of Sound Power Levels and Sound Energy Levels of Noise Sources Using Sound Pressure - Engineering Methods for an Essentially Free Field over a Reflecting Plane
- NEMA 250-2018, Enclosures for Electrical Equipment
- NEMA ICS 6-1993 (R2016), Enclosures
- NEMA MG 1-2016, Motors and Generators

BIDDER REGISTRATION AND PRE-QUALIFICATION

The BNI Acquisition Services Subcontracts/Purchasing group is responsible for collection, evaluation, and internal publication of potential bidders' information for the purpose of pre-qualifying them to bid on any particular subcontract or purchase order.

As part of this process, BNI requires all potential offerors to register at the Supplier and Contractor Portal at: <https://www.Bechtel.com/supplier/>

If your company has registered previously, then only supplemental information should be sent to the Bechtel National, Inc. representative noted below.

Information to be provided by potential bidders must include:

- Dun and Bradstreet Number
- Company Name
- Company Address
- Contact Phone Number
- Contact Person
- Email Address
- Safety Data and Information
- Applicable Work Experience and Projects
- Size of Business (Small, Large)

WTP BACKGROUND

Information about the WTP Project can be found on <http://www.hanfordvitplant.com>

CONTACT

Bechtel National, Inc.

450 Hills Street

Richland, WA 99354

Attn: Maggie Donnelson

Phone: 509-371-5400

Email Address: mdonnels@bechtel.com

Mailstop: N/A – Pre-Award information and Bids to be submitted electronically.

High Integrity Centrifugal Fan Datasheet					Datasheet No.		Rev No.	
					24590-HLW-MAD-C5V-00027		1	
1	Project:	RPP-WTP	Bldg.	HLW	Manufacturer:	*		
2	Project No:	24590	Room	H-0401 & H-0401A				
3	Site:	DOE Hanford	Elevation	58'-0"	Manufacturer	*		
4	Safety Classification	SS	Supporting	Ref. 5, 6, 12	Part No:			
5	Seismic Category	SC-1	Calculations		Quality Level	Q		
6	System No.	C5V	Drawing	Ref. 1, 2				
7	System Description:	Ref. 8		Fan Specification	Ref. 3			
8	Description:	Centrifugal Exhaust Fan		Environmental Qualification	Ref. 4			
9	Component Tag Numbers							
10		24590-HLW-MA-C5V-FAN-00004A	24590-HLW-MA-C5V-FAN-00004B	24590-HLW-MA-C5V-FAN-00004C	24590-HLW-MA-C5V-FAN-00004D			
11	V&ID	24590-HLW-M8-C5V-00007001	24590-HLW-M8-C5V-00007001	24590-HLW-M8-C5V-00007002	24590-HLW-M8-C5V-00007002			
12	Duty/Standby	Duty	Standby	Duty	Standby			
13	Room	H-0401	H-0401	H-0401A	H-0401A			
14	Speed Sensor	24590-HLW-JS-C5V-SE-3702	24590-HLW-JS-C5V-SE-3708	24590-HLW-JS-C5V-SE-3725	24590-HLW-JS-C5V-SE-3730			
15	Speed Transmitter	24590-HLW-JS-C5V-ST-3702	24590-HLW-JS-C5V-ST-3708	24590-HLW-JS-C5V-ST-3725	24590-HLW-JS-C5V-ST-3730			
16	Temperature Element	24590-HLW-JT-C5V-TE-3715	24590-HLW-JT-C5V-TE-3717	24590-HLW-JT-C5V-TE-3736	24590-HLW-JT-C5V-TE-3738			
17	Temperature Element	24590-HLW-JT-C5V-TE-3716	24590-HLW-JT-C5V-TE-3718	24590-HLW-JT-C5V-TE-3737	24590-HLW-JT-C5V-TE-3739			
18	Flow Element	24590-HLW-JF-C5V-FE-3705	24590-HLW-JF-C5V-FE-3711	24590-HLW-JF-C5V-FE-3728	24590-HLW-JF-C5V-FE-3733			
19	Terminal Box	24590-HLW-EJ-C5V-TB-00006	24590-HLW-EJ-C5V-TB-00007	24590-HLW-EJ-C5V-TB-00041	24590-HLW-EJ-C5V-TB-00042			
20	Motor	24590-HLW-EM-C5V-MTR-00018A	24590-HLW-EM-C5V-MTR-00018B	24590-HLW-EM-C5V-MTR-00018C	24590-HLW-EM-C5V-MTR-00018D			
21	Motor Main Junction Box	24590-HLW-EJ-C5V-JB-00062	24590-HLW-EJ-C5V-JB-00064	24590-HLW-EJ-C5V-JB-00126	24590-HLW-EJ-C5V-JB-00128			
22	Motor Heater Junction Box	24590-HLW-EJ-C5V-JB-00063	24590-HLW-EJ-C5V-JB-00065	24590-HLW-EJ-C5V-JB-00127	24590-HLW-EJ-C5V-JB-00129			
23	Design Conditions (Ref. 5 unless otherwise noted)							
24	Design Fan Capacity (Cold Start-up)	33,501	ACFM	Air Temperature °F (Cold Start-up, Inlet)	59	(min.)		
25	Design Fan Capacity (Hot Operation)	39,060	ACFM	Air Temperature °F (Hot Operation, Inlet)	120	(max.)		
26	Total Static Pressure (Cold Start-up)	21.9	in. WG	Air Temperature °F (Hot Off-normal, Inlet)	166 (Ref.13)	(max.)		
27	Total Static Pressure (Hot Operation)	44.6	in. WG	Air Density	Note 8			
28	Minimum Fan Efficiency	75	%	Design Airflow (Std Cond.) (Ref. 1, 2) (Note 6)	62,755	SCFM		
29	Fan Operating Speed	*	RPM	Fan Coast Downtime	*	seconds		
30	Temperature Derate Factor (Note 6)	*						
31	Power at Hot Operating Conditions	*	BHP	Power at Cold Start-up Temperature	*	BHP		
32	Assembly weight -Mtr Fan Base	*	lb	Fan Motor Operating Weight	*	lb		
33	Construction							
34	Design Fan Manufacturer	*		Design Fan Model Number	*			
35	AMCA Drive Arrangement	8		AMCA Inlet Box Position	N/A			
36	AMCA Motor Position	Direct Drive		AMCA Discharge	UB (Up Blast)			
37	AMCA Rotation	CCW		Fan Scroll Type	SWSI			
38	Fan Wheel							
39	Fan Wheel Type:	Backward Inclined (Backward Curved)		Fan Shaft Diameter	*			
40	Design Wheel Diameter	*		Actual Wheel Diameter	*			
41	Design Wheel Width	*		Actual Wheel Width	*			
42	Design Fan RPM	*		Actual Fan RPM	*			
43	Design Brake Horsepower	*		Actual Brake Horsepower	*			
44	Fan Bearing Type	See Ref. 3		Fan Bearing L-10 Life	200,000 Hours Minimum			

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45	Fan Materials						
46	Housing	304L SS		Fan Wheel		* SST	
47	Evase	NA		Mounting Frame		304L SS	
48	Shaft	* SST		Inlet Damper		NA	
49	Inlet Vane	NA		Discharge Damper		NA	
50	Inlet Screen	No		Bearing Special Features		See Ref. 3	
51	Mechanical Coupling	Falk Type Steelflex (or Equal)		Safety Guards Types		OSHA rated	
52	Fan Accessories						
53	Flanged Inlet	Yes		Flanged Inlet Dimensions		*	
54	Flanged Discharge	Yes		Flanged Discharge Dimensions		*	
55	Flanged Discharge Evase		No	Flanged Evase Dimensions		NA	
56	Split Housing	Yes		Split Housing Type		* (Note 9)	
57	Inlet Box		No	Inlet Box Type		NA	
58	Inlet Damper		No	Inlet Damper Type		NA	
59	Inlet Damper Motor		No	Inlet Damper Mfr and Model No		NA	
60	Inspection Door	Yes		Inspection Door Size		*	
61	Drain Connection	Yes		Drain Connection Size		*	
62	Gas Tight Shaft Seals	Yes		Manufacturer and Model Number		*	
63	Blower housing and shaft seals shall be "gas tight" in accordance with ASME AG-1, BA-4142.						
64	Isolation Base		No	Isolation Base Type		NA	
65				Isolation Base Manufacturer		NA	
66	Isolation Springs	Yes		Isolation Springs Mfr and Model No		*	
67				Isolation Springs Minimum Diameter		*	
68				Isolation Springs Deflection		*	
69				Isolation Springs Restraint Features		*	
70	Flexible Connection Inlet		Yes	Furnished by Seller			
71	Flexible Connection Inlet Type					*	
72	Flexible Inlet Connection Material					*	
73	Flexible Connection Manufacturer and Model No					*	
74	Flexible Connection Outlet		Yes	Furnished by Seller			
75	Flexible Connection Outlet Type					*	
76	Flexible Outlet Connection Material					*	
77	Flexible Connection Manufacturer and Model No					*	
78	Inlet Screen		No				
79	Inlet Screen Features	N/A					
80	Adjustable Speed Drive with disconnect switch			Furnished by Buyer			
81	Special Drive Features					*	
82	Fan Pedestal	Yes					
83	Fan Pedestal Description			Common mounting base for fan, motor, and bearings (Provide Unitary Base if Required for Isolators)			
84	Silencer	No		85 dB limit per Ref. 3.			
85	Insulation (Note 13)	Yes		Material		Flexible Removable (Mineral Fiber Blanket) (Ref.14 Sec. 8)	
86				Thickness		2 (Ref.14, Table A-1)	in.
87				Nominal Density		8 (Ref.14, Sec. 4.2.3)	lbs/ft ³

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88	Motor and Drive Requirements			
89		Buyer Specified	Seller Furnished	Units
90	Rated Horsepower (Ref. 5, Section 8.5)	400	*	HP
91	Synchronous Speed (Ref. 5, Section 8.1.2)	1800	*	RPM
92	Voltage	480	*	VAC
93	Phase	3	*	-
94	Frequency	60	*	Hz
95	Insulation Class	F	*	-
96	Temperature Rise Above 40°C Ambient	80	*	°C
97	NEMA Design Type (B, C, Other)	B	*	-
98	Efficiency (Standard, Premium)	Premium	*	-
99	Enclosure Type (TEFC - Severe Duty per IEEE Std. 841, TENV, WP11)	TEFC IEEE Std. 841	*	-
100	Service Factor for Inverter Duty Type Motors (Note 2 & 4)	1.0	*	-
101	Coupled Drive (Direct, Belt, Gear)	Direct	*	-
102	Bearing (Anti-friction, Sleeve)	Anti-friction	*	-
103	Bearing Seal (One end, Both ends)	Both Ends	*	-
104	Space Heater (Ref. 3)	Yes	*	W
105	Terminal Box, Location	NEMA 4	*	-
106	Shop Test - Manufacturer Standard Test (Ref. 10)	Yes	*	-
107	Shop Test - Routine Test (Ref. 10)	Yes	*	-
108	Shop Test - Full Test (Ref. 10)	Yes	*	-
109	Unusual Service Conditions	Inverter Duty	*	-
110	Flammable or Explosive Gases	No	-	-
111	Combustible, explosive, Abrasive or Conductive Dust	No	-	-
112	Operating Conditions (Wet, Dry)	Dry	*	-
113	Special Painting Requirements per IEEE Std. 841	Ref. 3	*	-
114	Manufacturer	-	*	-
115	NEMA Frame	-	*	-
116	Model Number	-	*	-
117	Serial Number / Manufacturer Date	-	*	-
118	Full Load Speed	-	*	RPM
119	Full Load Current	-	*	A
120	Full Load Torque	-	*	ft-lb
121	Power Factor @ 50% Load	Note 3	*	%
122	Power Factor @ 75% Load	Note 3	*	%
123	Power Factor @ 100% Load	Note 3	*	%
124	Efficiency @ 50% Load	Note 3	*	%
125	Efficiency @ 75% Load	Note 3	*	%
126	Efficiency @ 100% Load	Note 3	*	%
127	Locked Rotor Current @ 100% of Rated Voltage	Note 3	*	A
128	Locked Rotor Current @ 80% of Rated Voltage	Note 3	*	A
129	Allowable Stall Time @ Full Voltage	Note 3	*	sec
130	Allowable Stall Time @ 80% of Voltage	Note 3	*	sec
131	Losses @ Full Load	Note 3	*	W
132	Rotor Inertia (Wk ²) @ Motor Shaft Speed (For >250 hp only)	-	*	lb-ft ²
133	Starting Power Factor (For >75 hp only)	-	*	-
134	Subtransient Reactance and X/R (For >250 hp only)	-	*	-
135	Rotation (CW, CCW, Bi-Dir.) Facing Driven Equipment	CCW	*	-
136	Mean Time Between Failure (MTBF)	Note 5	*	hours
137	Starting Method (Full/Reduced Voltage, ASD Application)	ASD	-	-
138	Recommended Bearing Lubricant	Ref. 10	*	-
139	Motor Frame Size	-	*	-
140	Bearing L-10 Life	Ref. 10	*	-
141	Inverter Duty Type Motor	NEMA MG-1 Part 31	*	-
142	Conduit Box Construction	Ref. 10	*	-
143	Mounting Base	Arrangement 8	*	-
144	Disconnect Switch	Furnished by Buyer	-	-
145	Motor Pedestal (Common with Fan)	-	*	-
146	Construction (Horiz/Vertical Shaft)	Horizontal	*	-
147	Assembly Position	Horizontal	*	-
148	Motor Shaft Size	-	*	*

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149	Notes	
150	1. Asterisk (*) denotes data to be provided by SELLER through the submittal process as required on the G-321-E form.	
151		
152		2. Motor shall be applied within its rating based on service factor of 1.0.
153		
154		
155		3. Item is applicable for motor 100 HP and above.
156		
157		4. Motors shall meet the requirements of NEMA MG-1 Part 31 for Inverter duty type motors. Seller shall provide documentation verifying the motor type has been tested and meets the requirements of NEMA MG-1.
158		
159		
160		5. Seller shall provide a brief description and justification for the MTBF figure provided.
161		
162		6. Combined design flow rate is for both duty fans (or for both standby fans). Fans are installed in parallel arrangement. Off-normal operation may include any combination of 4 fans operating at significantly reduced fixed speed under hot or cold operating conditions. Seller to note temperature-related fan speed derate factor for maximum safe speed considering selected materials for fan bearings, shaft, and fan wheel for temperatures above the noted normal and abnormal operating temperature, up to a maximum of 250°F.
163		
164		
165		
166		
167	7. Seller shall provide all tagged components as listed on page 1. Analog to digital converter is not required.	
168		
169	8. Air Density (Ref. 5, Section 8.1) For Cold Start @ 59°F, elev. 740 ft, $\rho = 0.071 \text{ lb/ft}^3$ For Normal Hot Operation @ 120°F inlet, elev. 740 ft, $\rho = 0.063 \text{ lb/ft}^3$ For Off-normal Hot Operation @ 166°F inlet, elev. 740 ft, $\rho = 0.062 \text{ lb/ft}^3$ Fans and motors must be capable of stable operation at and between these design conditions.	
170		
171		
172	9. Seller shall identify any additional access required for servicing the fan wheel.	
173		
174		
175	10. Seller shall provide vibration isolators designed to withstand the forces generated by a design basis seismic event. (See Ref. 4.)	
176		
177		
178	11. Seller shall provide the maximum allowable load in the x, y & z direction for the inlet and outlet fan flanges. The connecting ductwork will be independently mounted from the building floor or structure.	
179		
180	12. Seller shall identify the required maintenance envelopes for the fans.	
181		
182	13. Insulation will be provided and installed by others. Seller shall include the weight of insulation in applicable calculations, including seismic. Insulation thickness for Heat Conservation (HC) (Ref. 14, Table A-1) shall be used, which is bounding to the Personnel Protection (PP).	
183		
184		
185		

References (for WTP Internal Use Only)				
Ref No.	Document Number	Revision	Title	
1	24590-HLW-M8-C5V-00007001	5	HLW Vitrification Building System C5V Plant Room V&ID Exhaust Fans	
2	24590-HLW-M8-C5V-00007002	1	HLW Vitrification Building System C5V Plant Room V&ID Exhaust Fans	
3	24590-HLW-3PS-MACS-T0001	0	HLW C5V Single Stage High Integrity Centrifugal Fans and Blowers(AG-1)	
4	24590-HLW-MAQ-C5V-00001	1	Equipment Qualification Datasheet for HLW C5V Exhaust Fans	
5	24590-HLW-MAC-C5V-00006	C	HLW C5V Exhaust Fan Sizing Calculation	
6	24590-HLW-M8C-C5V-00012	B	HLW C5V System Analysis Using FATE Software	
7	24590-WTP-SRD-ESH-18-001-01	0	Safety Requirements Document for the High-Level Waste (HLW) and Pretreatment (PTF) Facilities	
8	24590-HLW-3ZD-30-00003	0	HLW Ventilation System Design Description	
9	24590-HLW-3ZN-30-00004	NA	Update HLW HVAC SDD 24590-HLW-3ZD-30-00003 to Align With the New Issued 24590-WTP-PSAR-ESH-01-002-04, Rev 8. Preliminary Documented Safety Analysis to Support Construction Authorization; HLW Facility Specific Information	
10	24590-WTP-3PS-MUMI-T0002	3	Engineering Specification for Low Voltage Induction Motors	
11	24590-WTP-3PS-MD00-T0001	10	Engineering Specification for Heating Ventilation and Air Conditioning Systems Installation	
12	24590-HLW-MAC-C5V-00009	E	HLW Environmental Qualification Room Temperature Calculation	
13	24590-HLW-MAC-C5V-00014	A	HLW C5V Exhaust Duct Design Pressure and Temperature Calculation	
14	24590-WTP-3PS-NN00-T0001	3	Engineering Specification for Thermal Insulation for Mechanical Systems	

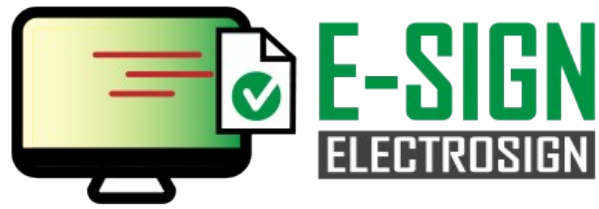
High Integrity Centrifugal Fan Datasheet	Datasheet No.	Rev No.
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Rev	Date	Description	Originator	Checker	Reviewer	Approver
0	2/3/2021	Initial issue. Issued for Procurement. Supersedes 24590-HLW-MAD-C5V-00022 Rev 5 and 24590-HLW-MAD-C5V-00023 Rev 5.	Cathy Christianson	Dan Cragin	Pat Sullivan	Gary Dalton
1		Revised to incorporate 24590-HLW-EIE- HV-21-0002, update reference revisions, include insulation requirements, and minor administrative changes. Changes do not impact margin.	Sam Sparks	Cathy Christianson	N/A	Gary Dalton

Originator
 By: SAM SPARKS - sasparks
 Org Name: HLW MECH SYSTEMS
 Placed: Jan 13, 2022

Checked
 By: Cathy Christianson - mcohnst
 Org Name: HLW Engineering / HVAC
 Placed: Jan 13, 2022

Approved
 By: Gary Dalton - gdalton
 Org Name: HVAC EGS
 Placed: Jan 19, 2022



This document has been digitally signed using the ElectroSign process.

Document for Signature

Document Number: 24590-HLW-MAD-C5V-00027 **Rev:** 1

Participants	Signature	Completed	Status	Result	Comments
Final Approver	1/19/2022 3:38 PM				
Dalton, Gary		1/19/2022 3:38 PM	Completed	Approve	



RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

HLW C5V Single Stage High Integrity Centrifugal Fans and Blowers (AG-1)

Content applicable to ALARA?

Yes No

ADR No.
24590-HLW-ADR-HV-02-001

Rev
3

Retroactive applicability:

N/A (alpha revision or revision 0)

Quality Level

Q

DOE Contract No.
DE-AC27-01RV14136

0		Originator By: Cathy Christianson - mcchrist Org Name: HLW Engineering / HVAC Placed: Jun 24, 2021	Checked By: Pat Sullivan - psulliva Org Name: HVAC Placed: Jun 24, 2021	NA	Approved By: Gary Dalton - gdalton Org Name: HVAC EGS Placed: Jun 30, 2021
REV	DATE	BY	CHECK	AUTHORIZATION	APPROVER
SPECIFICATION No. 24590-HLW-3PS-MACS-T0001					Rev 0

Revision History

Revision	Reason for Revision	Q Specification Revision Only Margin Reduced?		CM Only
		YES	NO	N/A
0	Issued for Purchase	N/A	N/A	N/A
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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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 Department of Energy's (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 US Department of Energy's (DOE) Office of River Protection (ORP). The waste treatment facilities will pretreat and immobilize the mixed waste (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. Benton, Franklin, and Grant counties surround the Hanford Site.

1.2 Equipment, Material, and Services Required

This specification applies to Component Tag Numbers (CTNs) 24590-HLW-MA-C5V-FAN-00004A, 24590-HLW-MA-C5V-FAN-00004B, 24590-HLW-MA-C5V-FAN-00004C, and 24590-HLW-MA-C5V-FAN-00004D¹ and their associated accessory CTNs identified on the fan datasheet.

Provide design, materials, fabrication, testing, inspection, preparation for shipment, submittals, and documentation of the Single Stage High Integrity Centrifugal Fans and Blowers (hereinafter called fans) and accessories in accordance with this specification including the following.

- 1.2.1 Fans, each complete with electric motors, and accessories as specified here and in referenced technical specifications and datasheets attached to the Material Requisition (MR).
- 1.2.2 Special tools required for installation and maintenance, including accessories for lifting the motors and fans.
- 1.2.3 Each fan/motor assembly shall include all components, accessories, and instruments fully assembled, wired, and skid mounted requiring only connection to the Buyer's electrical power, control systems, and ductwork.
- 1.2.4 Factory tests and Factory Acceptance Test (FAT) per this specification, referenced technical specifications and datasheets attached to the MR, and associated codes and standards.
- 1.2.5 Lifting eyes or lugs to facilitate lifting and handling of the fans. If spreader bars or special lifting devices are required, they shall also be furnished.
- 1.2.6 Services of an erection and/or startup supervisor, if requested by Buyer.

- 1.2.7 If the Seller believes that an inconsistency exists between this specification and the procurement documents and referenced codes and standards, the Seller shall immediately notify the Buyer by contacting the procurement representative and/or requesting resolution by submitting a request for information (RFI) or a supplier deviation disposition request (SDDR).

1.3 Work by Others

Any item not specifically listed as being supplied by the Buyer shall be provided by the Seller. The Buyer will provide the following:

- 1.3.1 Shipping of the fans and accessories
- 1.3.2 Unloading, storage, and installation labor of all materials and equipment at Buyer's jobsite
- 1.3.3 Foundation and anchor bolts
- 1.3.4 Ductwork external to the unit
- 1.3.5 Electric power supply
- 1.3.6 Wiring external to the fan motor and adjustable speed drive
- 1.3.7 Field testing and inspection
- 1.3.8 Integrated testing with adjustable speed drive

1.4 Definitions

- 1.4.1 **Quality Level:** Identifies the quality requirements to be applied to WTP Project's Systems, Structures and Components (SSCs), and activities based on safety classification and SSC characteristic. Identified quality levels are Q, and Commercial Material (CM). Applicable ASME NQA-1 requirements are shown on the Supplier Quality Assurance Program Requirement data sheet attached to the MR.
- 1.4.2 **Q:** A quality level that includes Safety Class (SC), Safety Significant (SS) and Air Permit (AP) affecting SSCs.
- 1.4.3 **Safety Class (SC):** An SSC whose preventive or mitigative function is necessary to limit radioactive material exposure to the public.
- 1.4.4 **Safety Significant (SS):** An SSC whose preventive or mitigative function is a major contributor to defense-in-depth and/or worker safety.
- 1.4.5 **Seismic Category:** WTP Project's seismic classifications of SSC's based on their safety function. Seismic categories utilized in this specification are Seismic Category I (SC-I) and Seismic Category III (SC-III).
- 1.4.6 **C3:** A secondary containment zone.

- 1.4.7 C5: Plant areas and associated ventilation ductwork that is in direct contact with radioactive material and which prevents the spread of radioactive material to adjacent zones under both normal and abnormal operating conditions.

1.5 Abbreviations/Acronyms

ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ABMA	American Bearing Manufacturers Association
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
ASNT	American Society for Nondestructive Testing
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
AWS	American Welding Society
CGD	Commercial Grade Dedication
CTN	Component Tag Number
dBA	A-weighted decibel (unit of sound pressure level)
EQD	Equipment Qualification Datasheet
ISO	International Standards Organization
MR	Material Requisition
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
OEM	Original Equipment Manufacturer
OSHA	Occupational Safety & Health Administration
PO	Purchase Order
QA	Quality Assurance
QVD	Quality Verification Documentation
RFI	Request for Information
RPP-WTP	River Protection Project-Waste Treatment Plant
RTD	Resistance Temperature Detector
SCFM	Standard Cubic Feet per Minute
SDDR	Supplier Deviation Disposition Request
SQR	Supplier Quality Representative
SSC	Structure, System, or Component
SSPC	Society for Protective Coatings
UL	Underwriters Laboratories, Inc.

1.6 Safety/Quality Classifications

Safety classification, quality level, and seismic category of high integrity centrifugal fans described in this specification are given on the fan datasheets identified in the MR. The safety functions of the high integrity centrifugal fans are given on the Equipment Qualification Datasheets (EQDs) identified in the MR.

2 Applicable Documents

2.1 Codes

- 2.1.1 ASME AG-1-1997 with ASME AG-1a Addenda 2000, Code on Nuclear Air and Gas Treatment
- 2.1.2 ASME B&PVC-1983, Section V – Nondestructive Examination
- 2.1.3 ASME B&PVC-1983, Section IX - Qualification Standard for Welding and Brazing
- 2.1.4 ASME NQA-1-2000, Quality Assurance Program Requirements for Nuclear Facility Applications
- 2.1.5 ASME NQA-1-2004, Part 1, Requirement 7, Paragraph 701, General, as tailored for WTP in 24590-WTP-3PS-G000-T0019
- 2.1.6 AWS D1.1-1984, Structural Welding Code, Steel
- 2.1.7 AWS D1.3-1981, Structural Welding Code, Sheet Steel
- 2.1.8 AWS D1.6-2017, Structural Welding Code, Stainless Steel
- 2.1.9 AWS D9.1-2018, Sheet Metal Welding Code
- 2.1.10 OSHA 29 CFR 1910, Occupational Safety and Health Standards
 - 2.1.10.1 Subpart O Machinery and Machine Guarding
 - 2.1.10.2 Subpart S Electrical
- 2.1.11 NFPA 70-1999, National Electrical Code
- 2.1.12 NFPA 90A-1999, Standard for the Installation of Air-Conditioning and Ventilating Systems

2.2 Industry Standards

- 2.2.1 ABMA 9-2015, Load Ratings and Fatigue Life for Ball Bearings

- 2.2.2 ABMA 11-2014, Load Ratings and Fatigue Life for Roller Bearings
- 2.2.3 AMCA 99-2404-1972, Drive Arrangement for Centrifugal Fans
- 2.2.4 AMCA 99-2406-1966, Designations for Rotation and Discharge of Centrifugal Fans
- 2.2.5 AMCA 210-1974, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating
- 2.2.6 AMCA 300-1967, Reverberant Room Methods for Sound Testing of Fans
- 2.2.7 AMCA 301-1976, Methods for Calculating Fan Sound Ratings From Laboratory Test Data
- 2.2.8 ANSI / API Std 670-2014, Machinery Protection Systems
- 2.2.9 ASNT-SNT-TC-1A, ANST Recommended Practice, year edition(s) per 24590-WTP-3PS-G000-T0050 section 3.2.43.2.1
- 2.2.10 ASTM A36-2019, Standard Specification for Structural Carbon Steel
- 2.2.11 IEEE 1050-1996, IEEE Guide for Instrumentation and Control Equipment Grounding in Generating Stations
- 2.2.12 IEEE 1202-2006 (R2012), IEEE Standard for Flame-Propagation Testing of Wire and Cable
- 2.2.13 ISO 3744-2010, Acoustics - Determination of Sound Power Levels and Sound Energy Levels of Noise Sources Using Sound Pressure - Engineering Methods for an Essentially Free Field over a Reflecting Plane
- 2.2.14 NEMA 250-2018, Enclosures for Electrical Equipment
- 2.2.15 NEMA ICS 6-1993 (R2016), Enclosures
- 2.2.16 NEMA MG 1-2016, Motors and Generators

2.3 Reference Documents/Drawings

- 2.3.1 24590-WTP-3PS-AFPS-T0001, Engineering Specification for Shop Applied Special Coatings for Steel Items and Equipment
- 2.3.2 24590-WTP-3PS-EKP0-T0001, Engineering Specification for Package Equipment
- 2.3.3 24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks
- 2.3.4 24590-WTP-3PS-SS90-T0002, Engineering Specification for WTP Project Tailoring of ANSI/AISC N690 & IEEE 323, 344 & 382

- 2.3.5 24590-WTP-3PS-G000-T0003, Engineering Specification for Packaging, Handling and Storage Requirements
- 2.3.6 24590-WTP-3PS-G000-T0014, Engineering Specification for Supplier Design Analyses
- 2.3.7 24590-WTP-3PS-G000-T0019, Acquisition of Commercial Items and Services for Use in Safety Applications at WTP.
- 2.3.8 24590-WTP-3PS-JQ06-T0005, Engineering Specification for Environmental Qualification of Controls and Electrical Systems
- 2.3.9 24590-WTP-3PS-JQ07-T0002, Engineering Specification for Instrumentation for Packaged Systems
- 2.3.10 24590-WTP-3PS-MUMI-T0002, Low Voltage Induction Motors
- 2.3.11 24590-WTP-3PS-SS90-T0001, Seismic Qualifications of Seismic Category I/II Equipment and Tanks
- 2.3.12 24590-WTP-3PS-G000-T0050, Engineering Specification for Supplier Documentation
- 2.3.13 24590-HLW-3ZD-30-00003, HLW Ventilation System Design Description
- 2.3.14 24590-HLW-3ZN-30-00004, Update HLW HVAC SDD 24590-3ZD-30-00003 to align with the new issued 24590-WTP-PSAR-ESH-01-002-04, Rev 8, Preliminary Documented Safety Analysis to Support Construction Authorization; HLW Facility Specific Information

3 Design Requirements

3.1 General

- 3.1.1 Design of the fans shall conform to ASME AG-1, Division II, Section BA.² Prior to fabrication, the supplier shall submit a compliance matrix that demonstrates how each of the AG-1 requirements are met.

3.2 Basic Function

- 3.2.1 The fans will provide the motive force required to transport and discharge air and gaseous effluents to atmospheres, as shown in the fan datasheets.
- 3.2.2 Fans shall be stable throughout the design conditions given on the datasheet.

3.3 Performance

- 3.3.1 Fans shall be tested in accordance with AG-1 BA-5121. Fans shall be capable of performing at conditions shown on the fan datasheets. Seller shall submit fan performance curves at 60%,

80%, 100%, and 110% design speed at design conditions specified on the datasheets, including unstable operating surge region/limit. Preliminary performance curves shall be provided prior to submitting equipment drawings. All certified fan performance data shall meet the requirements in AG-1 BA-8110.

- 3.3.2 Design basis performance and capacity data are as listed on the fan datasheets.
- 3.3.3 The equipment and appurtenances will be used in a plant that has design life of 40 years. The design objective for these centrifugal fans shall be based on a useful life expectancy of 40 years with periodic³ maintenance as recommended by the Seller. The supplier shall provide a brief description and justification for the Mean Time Between Failure figure provided on the fan datasheets.
- 3.3.4 The fans have safety functions as described on the EQD, and have a quality level of Q. The EQD also indicates the fans' safety classification and seismic category. Seller shall perform a functional analysis to determine whether a specific fan part's function is necessary for the parent item's safety function. Seller shall also perform a failure analysis to determine whether a specific part's failure can cause failure of the parent item's safety function. If so, then the part is considered safety with a quality level of Q and retains the seismic category assigned on the EQD. If not, then the part is not safety and can be assigned quality level of CM and seismic category of SC-IV. Seller shall include a column on drawing bill of materials to indicate the quality level and seismic category of each fan part.
- 3.3.5 Seller shall perform a Factory Acceptance Test (FAT) demonstrating that the fans are able to perform their safety functions identified on the EQDs in accordance with the process conditions identified on the fan datasheets.

3.4 Lifting and Handling Requirements

- 3.4.1 For lifting and handling requirements, see Spec 24590-WTP-3PS-G000-T0003.
- 3.4.2 Seller shall design, calculate, and provide lifting eyes or lugs and/or spreader bars that are suitable for the safe, balanced lifting, and handling of the equipment and submit the calculation for Buyer review.

3.5 Sound Ratings

This requirement covers noise requirements for fans, including all motors, equipment, and sub-systems furnished by the Supplier. The noise limit applies to operation of the equipment at rated load or full capacity, and during restart and shut down. When the equipment or a sub-system is operated cyclically or intermittently, the noise limits apply during all portions of the cycle.

- 3.5.1 Fan sound ratings shall conform to AMCA 301 and be tested in conformance to AMCA 300 or ISO 3744. Sound level data report shall be in accordance with AG-1 BA-4421.
- 3.5.2 The A-weighted sound pressure level at 3 feet from the surface of the fan casing shall not exceed 85 dBA. The limit applies on each of four sides of the fan at the elevation of the

centerline of the fan, but no less than 3 feet above grade or the platform upon which the fan is mounted. All sound pressure level limits apply to each fan system taken as a whole, and as installed.

- 3.5.3 If specified on fan datasheets, silencers shall be provided to meet the sound pressure level.

3.6 Environmental Qualification

- 3.6.1 Environmental equipment qualification of the fans, motors, instruments, and electrical accessories shall be conducted in accordance with specification 24590-WTP-3PS-JQ06-T0005, Engineering Specification for Environmental Qualification of Control and Electrical Systems and Components.
- 3.6.2 The environmental conditions for the plant rooms in which the fans are located are listed on the EQDs.

3.7 Seismic Qualification

- 3.7.1 Seismic qualification of fans shall be in accordance with the methods and procedures described in specification 24590-WTP-3PS-SS90-T0001 or 24590-WTP-3PS-FB01-T0001 based on the Seismic Category of the fans identified on the EQDs. Seismic calculations and analyses shall be in accordance with 24590-WTP-3PS-G000-T0014.
- 3.7.2 The Seismic Category of the fans are indicated on the fan datasheets and EQDs.
- 3.7.3 Any additional structural loading will be indicated on the fan datasheets. In-Structure Response Spectra (ISRS) curves for Seismic Category I/II equipment or items are identified on the EQDs.
- 3.7.4 In addition to seismic analysis, seismic testing of a sacrificial unit to determine operability shall be required when identified on the EQD. Material from the sacrificial units shall not be used in tagged equipment (permanent plant equipment).
- 3.7.5 The Buyer may witness the seismic testing of fans. See the MR for Buyer's Witness and Hold Points.

3.8 Mechanical Requirements

3.8.1 General

- 3.8.1.1 Fan housings shall be designed for both positive pressures of greater than 125 % of the design operating pressure of the fan and negative pressures as specified on the fan datasheets.
- 3.8.1.2 Fan inlets and outlets shall include allowances for the full dead weight of any flexible connections connected to the inlet and outlet.

- 3.8.1.3 Shaft speed shall not exceed 3600 rpm. Tip speed of rotating assembly shall not exceed 530 fps.
- 3.8.1.4 Fan housings shall be designed to prevent any internally propelled missiles from penetrating the housing.
- 3.8.1.5 Fan inlet and discharge connections shall be provided with temporary protective cover. These covers will be removed prior to connection to Buyer's piping and/or ductwork.
- 3.8.1.6 Unless specified otherwise on the fan datasheets, fan leakage criteria shall be in accordance with requirements of AG-1 BA-4142.
- 3.8.1.7 Fan drive arrangement shall be as shown on the fan datasheet. Drive arrangement designations shall be per AMCA 99-2404. Designations for rotation and discharge shall be per AMCA 99-2406.
- 3.8.1.8 When indicated on the fan datasheets, Supplier shall provide an evase for installation on fan discharge. Evase shall be all welded construction and provided with flanged and gasketed inlet and outlet.
- 3.8.1.9 When indicated on the fan datasheets that fans shall be of Spark Resistant Construction, fans shall be Type A in accordance with AMCA 99-0401.

3.8.2 Access Doors and Inspection Ports

- 3.8.2.1 If indicated on the fan datasheet, Seller shall provide a flanged, bolted, and gasketed access door, complete with handle, in fan housing to allow inspection. When an access door is indicated on the datasheet, and insulation is also indicated on the datasheet, the door shall be designed to allow for field installed insulation.
- 3.8.2.2 The access door, when required, shall be on the horizontal centerline of the fan housing. See specification section 3.13.4 for door gasket requirements.

3.8.3 Balance and Vibration Standards

- 3.8.3.1 The fan wheel/impeller and shaft shall be dynamically balanced in accordance with AG-1 BA-4161. The fan wheel shall be dynamically balanced prior to assembly into the housing. Final balancing shall be performed on the completed rotor (impeller and shaft) assembly. All vibration tests shall be in accordance with AG-1 BA-4162, with results documented and submitted to Buyer.
- 3.8.3.2 Soft foot is the condition where the bottoms of the equipment "feet" or "base" are not machined flat in the same plane or parallel with their mating (or mounting) surface creating a situation where all the "feet" or "base" are not equally supporting the weight of the equipment. Each foot must be checked for soft foot. Any vertical or angular soft foot that exceeds 0.003 inches is excessive and shall be corrected.

3.8.4 Bearings

- 3.8.4.1 Seller shall provide a "heat slinger" device attached to the fan shaft external to the housing to help in dissipation of heat for bearing protection, as required. The "heat slinger" shall be equipped with safety guards.
- 3.8.4.2 For all fans, it shall be possible to replace the bearings without disconnecting any piping and/or ductwork or disassembling of the fan housing.
- 3.8.4.3 Bearings for fans shall be heavy-duty pillow block, self-aligning, grease-lubricated ball bearings, or heavy duty pillow block self-aligning, grease-lubricated roller bearings, suitable for the maximum operating temperature as indicated on the fan datasheet.
- 3.8.4.4 Bearings for fans shall have a minimum L-10 service rating life of 200,000 hours, unless noted otherwise on the datasheets. Bearing rating life shall be established in accordance with ABMA 9 or 11, as applicable.
- 3.8.4.5 Provide seals to prevent loss of lubricant and admission of contaminants.
- 3.8.4.6 Provide extended lube lines and fittings as required to permit lubrication during operation.
- 3.8.4.7 Bearing lubricants shall be suitable for use in radiation levels as specified on the EQD.

3.8.5 Shafts

- 3.8.5.1 No contact shall be made between the shaft rotor and the housings, other than through the bearings.
- 3.8.5.2 Shafts shall be of the material specified on the fan datasheet and shall be turned, ground, and polished, with machined keyways for attaching impeller and drive coupling.
- 3.8.5.3 Impeller(s) are to be secured to the fan shaft by locknuts or set screws.
- 3.8.5.4 The fan impeller and shaft shall be rated for the design rpm listed on the fan datasheet.

3.8.6 Shaft Seals

Fans shall be furnished with shaft seals as specified on the fan datasheet.

3.8.7 Safety guards

- 3.8.7.1 Fans shall be provided with bolted drive guards that cover the shaft and bearings. Provisions shall be made for insertion of tachometer and access to lube fittings without removal of drive guards.
- 3.8.7.2 Safety guards shall be expanded metal with an angle framework or shall be formed plate types.

3.8.7.3 The guards shall comply with the requirements of OSHA 29 CFR 1910 Subpart O - Machinery and Machine Guarding.

3.8.8 Loadings

Fan assemblies shall be self-supporting, capable of carrying the static loads of the fan components and the stress imposed during shipment, installation, and operation.

3.9 Electrical Requirements

See 24590-WTP-3PS-EKP0-T0001 for electrical requirements, with the following exception. Replace all instances of 24590-WTP-3PS-JQ07-T0001, and any associated change documents, with 24590-WTP-3PS-JQ07-T0002.

3.10 Low Voltage Induction Motors

3.10.1 Motor drive combination shall be suitable for operation for the design conditions shown on the fan datasheet and environmental and seismic conditions shown on the EQD.

3.10.2 Induction motors shall be in accordance with Specification 24590-WTP-3PS-MUMI-T0002, Low Voltage Induction Motors, and as indicated on the motor data given in the fan datasheet except:

3.10.2.1 Motors may have cast iron rotor cages.

3.10.2.2 Motor space heaters are required for the purpose of long term storage. The motor space heaters do not have to be removable. See specification 24590-WTP-3PS-MUMI-T0002, section 3.4 for heater requirements.

3.10.3 Drive motors shall be specifically designed and constructed for use with adjustable speed drives in conformance with NEMA MG-1 Part 31 criteria. Manufacturer shall submit certification to the Buyer that the motor is compatible with an adjustable speed drive and will perform within the specified duty range without incident.

3.10.4 Transient voltage variations due to short circuits, disturbances from outside supplies, and their effect on plant operation cannot be avoided. The following criteria shall apply in such cases: Momentary voltage depression down to 80% of rated equipment voltage shall not affect equipment operations.

3.10.5 See the fan datasheet for required rated horsepower. The motor shall also have a service factor of 1.0 at its rated horsepower.

3.11 Instrumentation and Control Requirements

See 24590-WTP-3PS-JQ07-T0002 for instrumentation and control requirements.

3.12 Accessibility and Maintenance

- 3.12.1 Seller shall identify recommended accessibility and recommended spares for each piece of equipment in the Seller's applicable submittal, such as drawings and manuals.
- 3.12.2 Seller shall provide the inspection and maintenance requirements with the recommended intervals to be performed by Buyer.
- 3.12.3 Components that are to be removed, installed, or lifted to perform maintenance activities shall have lift points that are properly rated, permanently installed, and clearly marked.

3.13 Accessories

3.13.1 Unitary Inertia Bases

- 3.13.1.1 When indicated on the fan datasheet, fans shall be provided with a unitary inertia base.
- 3.13.1.2 Unitary inertia base shall provide a common support for the unit and its drive motor. Inertia base shall be fabricated from structural steel conforming to ASTM A36, at the minimum, and shall include pre-drilled mounting templates and sleeved anchor bolts for the fan and its drive motor. Inertia base frame shall be structural channel or beam frame with its depth at least one-tenth (1/10th) the longest dimension of the base, as a minimum.

3.13.2 Vibration Isolators

- 3.13.2.1 When installation is specified on the datasheet, Seller shall specify and supply vibration isolators. Supplier shall submit drawings showing locations for vibration isolator placement, the isolator manufacturer and model number, spring minimum diameter, and spring restraint features.
- 3.13.2.2 Spring mounts shall be selected to provide 2 in. minimum deflection at design loading and shall allow for 50 % additional travel to solid. Spring mounts shall incorporate seismic restraint capability for a seismic occurrence as defined in specification 24590-WTP-3PS-SS90-T0001 or 24590-WTP-3PS-FB01-T0001, as applicable. Spring mounts shall include enlarged base plates for seismic anchoring.
- 3.13.2.3 Each vibration isolator shall deflect equally under the conditions of dynamic loading.

3.13.3 Flexible Connectors

- 3.13.3.1 When specified on the fan datasheet, Supplier shall provide flexible connectors. Supplier shall specify the connector manufacturer and model number on the fan datasheet. Supplier shall submit assembly drawings including locations for, or placement of, flexible connectors.
- 3.13.3.2 Flexible connections shall meet the requirements of AG-1 SA-4410.
- 3.13.3.3 Flexible connections shall be bubble tight.

3.13.4 Gaskets

- 3.13.4.1 Gaskets shall meet the requirements of AG-1 BA-4331(d) and consider aging (BA-4122) and the environmental conditions (BA-4123) stipulated on the EQD. Seller shall submit an evaluation and/or testing that satisfies this requirement defining the gasket's qualified life and showing the gaskets can withstand the environmental conditions stated on the EQD.
- 3.13.4.2 An acceptable criterion for compression of gasket material shall be established by the Seller on the basis of the gasket chosen. AG-1 Nonmandatory Appendix SA-C paragraph C-1211(a) provides recommendations for gasket seal design.

4 Materials

4.1 Construction

- 4.1.1 Materials of construction shall conform to ASME AG-1, Section BA, Article BA-3000, Table BA-3100, NFPA 90A, and the fan datasheets as applicable.
- 4.1.2 The ASME and/or ASTM material numbers and grades shall be identified and shall be indicated on the fabrication drawings and in the material lists.
- 4.1.3 Fan bearing pedestals and motor bases shall be fabricated from structural steel shapes and plates properly reinforced for maximum rigidity.
- 4.1.4 Fan housings shall be fabricated from materials specified in the fan datasheet.
- 4.1.5 Seller shall submit for Buyer review Certified Material Test Reports (CMTRs) and Manufacturer's Certificates of Compliance that meet the requirements of ASME AG-1 BA-3400.

4.2 Prohibited Materials

- 4.2.1 See 24590-WTP-3PS-G000-T0003 for restrictions on materials coming into contact with stainless steels.
- 4.2.2 Asbestos and Teflon shall not be used in any component of the fans or accessories.

4.3 Special Requirements

When evaluating and dedicating new or replacement commercial grade items (CGI) and commercial grade services (CGS) for use in safety applications the requirements in specification 24590-WTP-3PS-G000-T0019, Acquisition of Commercial Items and Services for Use in Safety Applications at WTP, shall be followed.

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

- 4.4.1 Materials for the fans shall be segregated from other materials.
- 4.4.2 Seller shall submit their material control procedures that govern tasks to identify, track, or verify material to be used in the finished product.

5 Fabrication

5.1 Fabrication of Fans

- 5.1.1 Fabrication of fans shall be as specified in ASME AG-1 Article BA-6000.
- 5.1.2 Fan wheels / impellers shall be of the type and fabricated from materials specified in the fan datasheets.

5.2 Welding

- 5.2.1 All fabrication, welding, brazing, inspection and repair procedures of fan wheels, fan housing, housing framing and supports shall conform with AG-1 AA-6300 and AA-6400, and the following as applicable:
 - 5.2.1.1 AWS D1.1, Structural Welding Code, Steel
 - 5.2.1.2 AWS D1.3, Structural Welding Code, Sheet Steel
 - 5.2.1.3 AWS D1.6, Structural Welding Code, Stainless Steel
 - 5.2.1.4 AWS D9.1, Sheet Metal Welding Code
- 5.2.2 Repairs required as a result of weld rejection by either Buyer or Seller's final inspection shall be fully documented in accordance with Seller's QA program. Weld repair records shall be included with document package.
- 5.2.3 Welding procedures and procedure qualification records shall be submitted to Buyer for review and permission to proceed prior to use. Each procedure shall be prepared and qualified in accordance with the requirements of the above listed standards or ASME B&PVC, Section IX.

5.3 Painting

Painting and Special Protective Coatings shall meet the requirements in 24590-WTP-3PS-AFPS-T0001. Follow Appendix D item 1.11 for structural steel and item 5.10 for electrical components.

6 Tests and Inspections

6.1 General

- 6.1.1 Inspection and testing of fans shall conform to AG-1, Section BA, Article BA-5000. Welds shall be inspected in accordance with AG-1 AA-6330.
- 6.1.2 Seller shall conduct and shall be responsible for the shop tests called for in this specification and in applicable standards and referenced documents. Seller shall furnish all facilities necessary for the performance of such tests.
- 6.1.3 Seller shall submit an Inspection and Test Plan for Buyer review and permission to proceed status code prior to beginning any testing. The plan shall identify all inspections and tests to be performed on the fans, including all Buyer Hold and Witness Points from the MR/PO Part 2 Attachment SQ. The plan shall list the Seller's procedure used for each inspection or test.

6.2 Personnel Qualifications

- 6.2.1 Personnel performing nondestructive examination or reviewing nondestructive examination results shall be qualified in accordance with ASNT-SNT-TC-1A, Level II or Level III. The use of AWS Certified Weld Inspectors (CWI), in lieu of ASNT-SNT-TC-1A qualification, is acceptable for welding visual inspections only.
- 6.2.2 Seller shall submit the qualifications of personnel performing inspections and tests per AG-1 BA-8110.

6.3 Non-Destructive Examinations

- 6.3.1 Seller shall perform Non-Destructive Examination (NDE). Non-Destructive examinations may include visual, ultrasonic, radiographic, magnetic particle, liquid penetrant, and eddy current examination procedures.
- 6.3.2 Non-Destructive Examination procedures shall be submitted to Buyer for review and permission to proceed prior to use.
- 6.3.3 All pressure boundary parts made by casting shall be demonstrated to be surface-defect free by penetrant examination using Type I Method A techniques in accordance with ASME B&PVC Section V.
- 6.3.4 Seller shall perform all welding inspections in accordance with AG-1 AA-6300. As a minimum all welds shall be 100% Visually Tested (VT). Seller shall submit all NDE reports for Buyer review per the MR/PO G-321-E.

6.4 Shop Tests

- 6.4.1 Seller shall perform standard factory tests, which, as a minimum, includes the tests listed below as well as tests called out in referenced specifications.
- 6.4.2 Seller shall submit all inspection and test procedures for Buyer review and permission to proceed status code prior to testing.
- 6.4.3 Seller shall perform test for fan performance. Performance testing shall be done for similar sized fans.
 - 6.4.3.1 Fan performance tests shall be conducted in accordance with AMCA standards and shall be done in AMCA certified facilities.
- 6.4.4 Seller shall perform functional performance tests for electrical equipment in accordance with 24590-WTP-3PS-EKP0-T0001.
- 6.4.5 Seller shall perform controls and instrumentation testing in accordance with 24590-WTP-3PS-JQ07-T0002.
- 6.4.6 Seller shall perform leak testing on fans in accordance with AG-1 BA-5142.
- 6.4.7 Vibration performance shall be checked and reported at 10% increments of full speed fan tests. Vibration testing shall not be performed within +/- 20% of the fan's critical speed.
- 6.4.8 Seller shall perform the Factory Acceptance Test described in specification section 3.3.4.
- 6.4.9 Seller shall document and certify all test results and submit the test reports as part of the QVD package per the MR/PO G-321-V.

6.5 Site Tests

Buyer startup personnel will perform tests after initial installation. Buyer may need and request Seller assistance during startup as needed.

7 Preparation for Shipment

7.1 General

- 7.1.1 All packaging, handling, storage, and shipping of the fan assemblies shall be in accordance with AG-1 Article BA-7000 and 24590-WTP-3PS-G000-T0003.
- 7.1.2 Seller shall submit drawings for Buyer review and permission to proceed status code showing center of gravity, rigging attachment points, rigging, and handling for shipment to the site, and for rigging into position in the building.

7.2 Cleanliness

Prior to surface preparation and coating application, visually examine welds, the fan impeller, air stream surfaces of the fan housing, and the air stream surfaces of all furnished accessories. Remove all dirt, oil, and grease, loose mill scale, weld spatter and other foreign matter on surfaces to be painted in accordance with Seller's cleaning and coating procedures. Cleaning requirements in 24590-WTP-3PS-G000-T0003 apply.

7.3 Tagging

Seller shall provide nameplates, tagging, and marking for all tagged items identified on the datasheet, to meet the requirements of AG-1 BA-9000 and include Buyer purchase order number.

8 Quality Assurance

8.1 QA requirements specific to item(s) or service

8.1.1 The quality assurance program requirements applicable to the fans are those specified in the following documents:

8.1.1.1 ASME NQA-1, marked as applicable in Q data sheet of ANSI/ASME NQA-1 (2000) Quality Assurance Program Requirements, attached to the Material Requisition.

8.1.1.2 ASME NQA-1-2004, Part 1, Requirement 7, Paragraph 701, General, as tailored for WTP in 24590-WTP-3PS-G000-T0019

8.1.1.3 ASME NQA-1 (2000), Part II, Subpart 2.2, QA Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants

8.1.1.4 ASME AG-1 Article AA-8000

8.2 Program QA elements

The successful bidder must pass a pre-award audit by the Buyer. Supplier shall demonstrate that their quality program complies with the procurement quality requirements listed in Quality Assurance Program Requirements Datasheet attached to the MR. Each Supplier is required to flow-down required QA program requirements to each successive tier in the supply chain. The Supplier shall allow Buyer, its agent, and DOE access to their facility and any lower tier subcontractor's facility and records pertaining to this purchase order for the purpose of QA Audits and Surveillance at mutually agreed times. The Supplier must be added on to the Buyer's evaluated suppliers list prior to work proceeding.

9 Configuration Management

Equipment and/or components covered by this specification are identified with component tag numbers shown in the fan datasheets. Each item shall be identified in accordance with specification section 7.3.

10 Documentation and Submittals

10.1 General

- 10.1.1 Submittals shall be of the form and quality described in MR/PO Part 2 Attachment DD and 24590-WTP-3PS-G000-T0050.
- 10.1.2 Seller shall provide submittals as listed in sections 10.2, 10.3, and 10.4 below. Submittals shall be in accordance with the schedule and media type requirements given on MR/PO Form G-321-E, *Engineering Document Requirements*.
- 10.1.3 Upon formal submittal by the Seller, each submittal will be reviewed by the Buyer for compliance with the PO, specifications, datasheets, codes, and standards. The Buyer will assign status codes to the documents as described in MR/PO Part 2 Attachment DD. While the Buyer will review each submittal with the full intent of identifying every non-compliant issue, the responsibility for meeting the Buyer specifications, datasheets, codes, and standards resides completely with the Seller.
- 10.1.4 Seller shall obtain permission to proceed status code, as described in MR/PO Part 2 Attachment DD, before use of the document unless indicated on the MR/PO Form G-321E as not requiring permission to proceed.
- 10.1.5 Seller shall make a complete set of Buyer-reviewed G-321-E documents available to the Buyer's SQR at the time the quality surveillance activities are being conducted.
- 10.1.6 Seller shall provide quality verification documentation in accordance with section 10.5 below and MR/PO Form G-321-V, *Quality Verification Document Requirements*.

10.2 Submittals Prior to Fabrication

10.2.1 Schedules

15EX in accordance with MR/PO Part 2 Attachment DD.

10.2.2 Drawings and Datasheets

Drawings shall show the following information:

- 10.2.2.1 The outline dimensions of fan, including outline and detail drawings for each component (motor, etc.). These drawings shall reflect the "as-shipped" configuration of the equipment

and instrumentation. As a minimum, interface control drawings shall contain overall dimensions of the fan and motor, materials of construction, instrumentation interfaces and equipment mounting information including bolt hole sizes and quantities of bolts required.

- 10.2.2.2 Mounting dimensions and information required for the design of supports and foundations, including any special assembly instructions.
- 10.2.2.3 Operating weights of fan assembly including motor components.
- 10.2.2.4 The space required for the removal of components.
- 10.2.2.5 The locations of access doors.
- 10.2.2.6 The weights of individual components.
- 10.2.2.7 The locations and identification of parts that are included in the parts list.
- 10.2.2.8 Assembly drawings providing sufficient detail to facilitate assembly of the component parts of the fan. Assembly drawing bill of materials shall identify the quality level (Q or CM) and seismic category of individual parts in accordance with specification section 3.3.4.
- 10.2.2.9 Overall single line diagram showing all electrical equipment per 24590-WTP-3PS-EKP0-T0001.
- 10.2.2.10 Overall layout showing location of electrical items per 24590-WTP-3PS-EKP0-T0001.
- 10.2.2.11 Interconnection diagram and cable schedule showing details of all internal connections and Buyer external connections per 24590-WTP-3PS-EKP0-T0001.
- 10.2.2.12 Individual equipment schematic diagrams, wiring diagrams, general arrangement drawings, foundation details and junction/terminal box details per 24590-WTP-3PS-EKP0-T0001.
- 10.2.2.13 Certified outline and dimensional drawings shall show the size and location of electrical, pneumatic, and service connections and information necessary to locate and mount the equipment if it is to be mounted by the Buyer per 24590-WTP-3PS-JQ07-T0002.
- 10.2.2.14 The ASTM or equivalent designation for materials.
- 10.2.2.15 Preliminary fan performance curves in accordance with specification section 3.3.1.
- 10.2.2.16 Identify all devices with the Buyer's tag numbers, where applicable.
- 10.2.2.17 Completed Bechtel Datasheets providing data for all fields indicated by an asterisk (*) on the datasheet. Also, the completed EQD if asterisked fields are indicated on the EQD.

10.2.3 **Calculations, Certifications and Reports**

- 10.2.3.1 Lifting eye calculations

- 10.2.3.2 Seismic calculations
- 10.2.3.3 Gasket evaluation in accordance with specification section 3.13.4.1.
- 10.2.3.4 CMTRs and Manufacturer's Certifications of Compliance in accordance with specification section 4.1.5.
- 10.2.4 **Procedures and Plans**
 - 10.2.4.1 Software Validation and Verification documentation
 - 10.2.4.2 Welding procedures
 - 10.2.4.3 Procedures for repairs of rejected items or parts.
 - 10.2.4.4 Cleaning and coating procedures per specification 24590-WTP-3PS-AFPS-T0001.

10.3 Submittals Prior to Testing

- 10.3.1 **Procedures and Plans**
 - 10.3.1.1 Inspection and test plan identifying all inspections and tests to be performed on the fans. Plan shall include Buyer Hold and Witness Points from MR/PO Part 2 Attachment SQ, and list the procedure used for each inspection or test.
 - 10.3.1.2 Electrical component performance test procedures
 - 10.3.1.3 Shipping preparation and storage procedures per specification 24590-WTP-3PS-G000-T0003.
 - 10.3.1.4 Test procedures for fan performance
 - 10.3.1.5 Test procedures for fan housing and shaft leakage tests
 - 10.3.1.6 Test procedures for sound, over-speed, vibration, and mechanical running tests
 - 10.3.1.7 Commercial Grade Dedication (CGD) Procedures and Plans per specification 24590-WTP-3PS-G000-T0019
 - 10.3.1.8 Seismic test procedures that comply with specification 24590-WTP-3PS-SS90-T0001 or 24590-WTP-3PS-FB01-T0001 as applicable based on seismic category, and 24590-WTP-3PS-SS90-T0002.
 - 10.3.1.9 Environmental qualification test procedures in accordance with 24590-WTP-3PS-JQ06-T0005
 - 10.3.1.10 Non-Destructive Examination procedures

10.3.2 **Qualifications**

Seller shall submit personnel qualifications in accordance with specification section 6.2.

10.4 Submittals Prior to Shipment

10.4.1 **Drawings**

Drawings showing lifting, rigging, and shipping information per specification sections 7.1.1 and 7.1.2.

10.4.2 **Manuals**

Manuals and instructions shall include:

- 10.4.2.1 Erection and installation manuals which provide complete, detailed procedures for installing and placing equipment in initial operation. The manuals shall include all erection and installation drawings.
 - 10.4.2.2 Operation and maintenance manuals in accordance with AG-1 BA-9300 and which provide complete, detailed descriptions of components and accessories with datasheets showing design, construction, and performance data for equipment. Manuals shall include drawings required for operation (duplication of drawings shall be avoided, drawings submitted to fulfill other requirements shall be referenced with Buyer provided numbering), maintenance and repair, maintenance requirements, instructions, and operational troubleshooting guides. All manuals/drawings shall include OEM part numbers.
 - 10.4.2.3 Instruction manuals shall cover all major components such as fans, motors, controls, and instrumentation, including those purchased from a subcontractor. Seller shall obtain such manuals and lists and submit them to the Buyer.
 - 10.4.2.4 Seller shall provide instructions regarding site short- and long-term storage up to 5 years, and preparation and protection of equipment after installation and prior to operation.
 - 10.4.2.5 Where manuals include information applicable to several components, sizes or models, non-applicable information shall be lined-out.
 - 10.4.2.6 Schedule of maintenance and part replacements required to maintain the equipment qualification in accordance with requirements in AG-1 BA-9300(b) and 24590-WTP-3PS-JQ06-T0005.
 - 10.4.2.7 Parts list, and cost for parts and items subject to deterioration and replacement. Seller to state shelf life and storage requirements for spare parts.
- ### 10.4.3 **Data, Reports, Results and Releases**
- 10.4.3.1 Seismic test reports per specification 24590-WTP-3PS-SS90-T0001 or 24590-WTP-3PS-FB01-T0001 as applicable.

- 10.4.3.2 CGD Results and CGD Release per specification 24590-WTP-3PS-G000-T0019.
- 10.4.3.3 Software documentation per 24590-WTP-3PS-G000-T0014.
- 10.4.3.4 Environmental qualification test report in accordance with 24590-WTP-3PS-JQ06-T0005.
- 10.4.3.5 Fan performance documentation and data in accordance with specification section 3.3.1.

10.5 Quality Verification Documentation

10.5.1 Inspection and Test Reports

- 10.5.1.1 Records of repairs of rejected items or parts.
- 10.5.1.2 Welding inspection reports and welding repair reports if required.
- 10.5.1.3 Electrical component performance test reports
- 10.5.1.4 Fan housing and shaft seal leakage test reports
- 10.5.1.5 Fan performance test reports, including fan curves
- 10.5.1.6 Sound level data report per specification section 3.5.1
- 10.5.1.7 Fan wheel/shaft vibration, over-speed, and mechanical test reports
- 10.5.1.8 NRTL Field Evaluation Reports
- 10.5.1.9 Non-Destructive Examination reports

10.5.2 Materials Certificates/Statistics

- 10.5.2.1 Material test reports of chemical and physical properties shall be provided for all stress components of the fans, including the fan impeller and its components, fan shaft, and housings in accordance with AG-1 BA-3400.
- 10.5.2.2 Manufacturer's Material Certificate of Conformance shall be provided for scrolls, housing side plates, inlets, support framing integral to the fan, and weld filler metal in accordance with AG-1 BA-3410.
- 10.5.2.3 Certificates of calibration referenced to NIST traceable standards required for any calibrated instrumentation provided with the equipment.

Appendix A

Endnotes Denoting Upper Tier Requirements

Appendix A

Endnotes

(WTP Internal Information Only)

¹ 24590-WTP-PSAR-ESH-01-002-04, Rev 9, Preliminary Documented Safety Analysis to Support Construction Authorization; HLW Facility Specific Information, Section 4.4.6.1.4, page 4.4-111, 1st bullet

² 24590-HLW-3ZD-30-00003, Rev 0 HLW Ventilation System Design Description, Section 3.4.10.28

³ 24590-HLW-3ZD-30-00003, Rev 0 HLW Ventilation System Design Description, Section 3.4.6.7



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