ISSUED BY
RPP-WTP PDC

R11223092

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

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

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.

Content applicable to ALARA? ☐ Yes ☒ No

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SPECIFICATION No. 24590-WTP-3PS-MACS-T0004 **Rev** 6

Revision History

Revision	Reason for Revision
0	Issued for Purchase
1	Added information for multi-stage blowers including Ellis & Watts' input and definitions of abbreviations in spec, incorporated SCNs 24590-WTP-3PN-MACS-00008, 00009 & 00010,made editorial changes, clarified coating requirements and re-issued for purchase.
2	Incorporated SCNs 24590-WTP-3PN-MACS-00016, adding additional acceptable exceptions/clarifications from Supplier, and 24590-WTP-3PN-MACS-00018, allowing use of ASME PTC-10-1997 test procedure for performance testing of multi-stage blowers. Clarified required number of wire for dual element RTD. Changed Par. 3.9.4 to remove requirement to mount signal conditioner to ASD cabinet & specified preferred Foundation Fieldbus converters. Changed Par. 8.1 to clarify QA program requirements. Incorporated editorial comments and re-issued for purchase. Added issue dates for referenced codes and standards as noted in parent codes or standards listed in SRD. Where Engineering Equivalency Evaluation has been done, dates of latest equivalent editions have been added instead of dates shown in parent codes or standards. Deleted AMCA 99 - Standards Handbook.
3	Incorporate 24590-WTP-SDDR-HV-06-00007. Deleted ASDs from scope. Modified Q & Safety Class definitions, electrical requirements, RTD requirements, vibration criteria, & submittal requirements. Added industry standards and Appendicies B & C. All revisions are retroactive.
4	Removed Appendices B & C - Industry standards applicable on a system level, not at the level of the components. Added Industry Standards ISO 3744-1995 & ISO 1940-1:2003 relating to requirements for multi-stage blowers. Added requirements for deriving control power supplies form Buyer's supplied power.
5	Major Revision, No revision bars were used. Incorporated Specification Change Notices 24590-WTP-3PN-MACS-00028 & -00030. -Added definitions to Section 1.4 for Safety Class, Safety Significant. Changed definition of Q in Section 1.4 -Removed from Section 2.2 references to ASCE 4-98, AMCA 99-0401-1986, 2000, all references to UL standards due to misapplication. -Reorganized Sections 3 and 4 for clarity. Split requirements for single stage and multi-stage blowers for clarity. -Added clarifications to Section 6.5. -Added two sections to Section 6.6 specify standards for the performance testing of single and multi-stage blowers. -Added section to Section 10.2.1 requiring submittal of assembly drawings.
6	Supersedes 24590-WTP-3PS-MACS-T0001 Rev 6. Major Revision, no change bars used. Streamlined specifications 24590-WTP-3PS-AFPS-T0001, 24590-WTP-3PS-EKP0-T0001, and 24590-WTP-3PS-JQ07-T0001. Removed duplicate sources of information. Added requirement for AG-1 compliance matrix. Revised to remove Multi-Stage Blowers

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Attachment A Tailored version of specification 24590-WTP-3PS-AFPS-T0001, Shop Applied Special Protective Coatings for Steel Items and Equipment A-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 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

Design, furnish materials, fabricate, test, and package the Single Stage High Integrity Centrifugal Fans and Blowers (hereinafter called Blowers) and accessories in accordance with this specification including:

1.2.1 Blowers, each complete with electric motors, and accessories as specified here and in referenced technical specifications and data sheets attached to the Material Requisition (MR).

1.2.2 Special tools required for installation and maintenance, including accessories for lifting the motors and blowers.

1.2.3 Each blower/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 Services of an erection and/or startup supervisor, if requested by Buyer.

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.

1.3 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 Ductwork external to the unit

1.3.5 Electric power supply

1.3.6 Wiring external to the blower motor and adjustable speed drive

1.3.7 Field Testing and Inspection

1.3.8 Integrated testing with Adjustable Speed Drive

1.4 Definitions

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.
Q	A quality level that includes Safety Class (SC), Safety Significant (SS) and Air Permit (AP) affecting SSCs.
Safety Class (SC)	An SSC whose preventive or mitigative function is necessary to limit radioactive material exposure to the public.
Safety Significant (SS)	An SSC whose preventive or mitigative function is a major contributor to defense-in-depth and/or worker safety.
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).
C3	A secondary containment zone.
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

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
dBA	A-weighted decibel (unit of sound pressure level)
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 Act
QA	Quality Assurance
RPP-WTP	River Protection Project-Waste Treatment Plant
RTD	Resistance Temperature Detector
SCFM	Standard Cubic Feet per Minute
SSC	Structure, System, or Component
SSPC	Society for Protective Coatings
UL	Underwriters Laboratories, Inc.

1.6 Safety/Quality Classifications

Safety Class, Quality Level, and Seismic Category of high integrity centrifugal fans described in this specification are noted in Fan Data Sheets attached to the MR. The Safety Functions of the high integrity centrifugal fans are listed in Appendix 2 of the data sheets.

2 Applicable Documents

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the document referenced herein and the contents of this specification, Seller shall notify Buyer and obtain approval for its disposition.

Effective dates of codes and standards shall be as shown in ASME AG-1-1997 with ASME AG-1a Addenda 2000, unless noted otherwise. If effective dates of Codes and Standards to be used by Seller are different from those shown on ASME AG-1-1997 and its addenda, Seller shall provide justification for use of these versions.

References contained within brackets [ex: 24590-WTP-3PS-MACS-XXXXX] are for WTP internal use and not applicable to the seller.

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-1995, Section IX - Qualification Standard for Welding and Brazing

2.1.3 ASME NQA-1-2000, Quality Assurance Program Requirements for Nuclear Facility Applications

2.1.4 AWS D1.1-2000, Structural Welding Code, Steel

2.1.5 AWS D1.3-98, Structural Welding Code, Sheet Steel

2.1.6 AWS D1.6-99, Structural Welding Code, Stainless Steel

2.1.7 AWS D9.1-2000, Sheet Metal Welding Code

2.1.8 AWS D14.6-96, Welding of Rotating Elements of Equipment

2.1.9 OSHA 29 CFR 1910, Occupational Safety and Health Standards

2.1.9.1 Subpart O Machinery and Machine Guarding

2.1.9.2 Subpart S Electrical

2.1.10 NFPA 70-1999, National Electrical Code

2.2 Industry Standards

2.2.1 ABMA 9-1990, Load Ratings and Fatigue Life for Ball Bearings

2.2.2 ABMA 11-1990, Load Ratings and Fatigue Life for Roller Bearings

2.2.3 AMCA 99-86, Standards Handbook

2.2.4 AMCA 99-2404-1978, Drive Arrangement for Centrifugal Fans

2.2.5 AMCA 99-2406-1983, Designations for Rotation and Discharge of Centrifugal Fans

2.2.6 AMCA 210-1999, Laboratory Methods of Testing Fans for Rating

2.2.7 AMCA 300-2005, Reverberant Room Method of Sound Testing of Fans

2.2.8 AMCA 301-1990, Method for Calculating Fan Sound Ratings From Laboratory Test Data

2.2.9 ANSI / API Std 670, Machinery Protection Systems.

2.2.10 ASNT-SNT-TC-1A-2001, ANST Recommended Practice

2.2.11 ASTM A36-01, Standard Specification for Structural Carbon Steel

2.2.12 IEEE 1050-1996, IEEE Guide for Instrumentation and Control Equipment Grounding in Generating Stations

2.2.13 IEEE 1202 IEEE Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies

2.2.14 ISO 3744-1995, Acoustics - Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Engineering Method in an Essentially Free Field over a Reflecting Plane

2.2.15 NEMA 250, Enclosures for Electrical Equipment

2.2.16 NEMA ICS 6, Enclosures

2.2.17 NEMA MG 1-1998, Motors and Generator

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, as tailored in Attachment A.

2.3.2 [24590-WTP-3PS-EKP0-T0001, Engineering Specification for Package Equipment, as contained in Section 3.9]

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-G000-T0001, Engineering Specification for Supplier Quality Assurance Program Requirements

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-T0001, Engineering Specification for Instrumentation for Package Systems, as contained in Section 3.11]

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-LIST-CON-08-0001, Restricted Materials list WTP Safety Assurance

3 Design Requirements

3.1 General

3.1.1 Design of the Blowers shall conform to ASME AG-1, Section BA. Prior to fabrication, the supplier shall submit a compliance matrix that demonstrates how each of the AG-1

requirements are met. For AG-1 requirements that do not apply to the equipment being procured, the supplier shall show how the intent of the requirements is being met.

3.1.2 The Blowers will provide the motive force required to move ventilation air in the RPP-WTP ventilation systems and gaseous effluent in process systems, as shown in the Fan Data Sheets.

3.2 Basic Function

3.2.1 The blowers will provide the motive force required to transport and discharge air and gaseous effluents to atmospheres, as shown in the Blower Data Sheets.

3.2.2 Blowers shall be stable throughout its entire range from free flow to shut off conditions.

3.3 Performance

3.3.1 Blower performance ratings shall be tested in accordance with AG-1 Section BA 5121. Blowers shall be capable of performing at conditions shown on the Blower Data Sheets.

3.3.2 Design basis performance and capacity data are as listed on the Blower Data Sheets.

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 periodic 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 Blower Data Sheets.

3.4 Lifting and Handling Requirements

3.4.1 For lifting and handling requirements, see Spec 24590-WTP-3PS-G000-T0003.

3.5 Sound Ratings

This requirement covers noise requirements for blowers, 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 Blowers 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 ASME AG-1 BA-4421.

3.5.2 The A-weighted sound pressure level at 3 feet from the surface of the blower casing shall not exceed 85 dBA. The limit applies on each of four sides of the blower at the elevation of the centerline of the blower, but no less than 3 feet above grade or the platform upon which the blower is mounted. All sound pressure level limits apply to each blower system taken as a whole, and as installed.

3.5.3 If sound pressure level exceeds 85 dBA at 3-feet, Seller shall obtain Buyer permission to proceed in the form of a submittal stating estimated sound power level.

3.5.4 If specified on Blower Data Sheets, silencers shall be provided to meet the sound pressure level.

3.6 Environmental Qualification

3.6.1 Environmental equipment qualification of the blowers, 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 blowers are located are listed on the Environmental Qualification data sheets attached to the blower data sheets.

3.7 Seismic Qualification

3.7.1 Seismic qualification of blowers shall be in accordance with the methods and procedures described in Specification 24590-WTP-3PS-SS90-T0001, "Seismic Qualification of Seismic Category I/II Equipment and Tanks", or 24590-WTP-3PS-FB01-T0001, "Structural Design Loads for Seismic Category III/IV Equipment and Tanks".

3.7.2 The Seismic Category of the blowers will be indicated on the Blower Data Sheets.

3.7.3 Any additional structural loading will be indicated on the Blower Data Sheets. In-Structure Response Spectra (ISRS) curves for Seismic Category I/II equipment or items are attached to the blower data sheets.

3.7.4 In addition to seismic analysis, seismic testing of a sacrificial unit to determine operability shall be required when the Equipment Qualification data sheet states the equipment must be operational after a seismic event. 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 blowers.

3.8 Mechanical Requirements

3.8.1 General

3.8.1.1 Blower housings shall be designed for both positive pressures of greater than 125 % of the design operating pressure of the blower and negative pressures as specified on the blower data sheets.

3.8.1.2 Blower 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 unless approved by Buyer. Tip speed of rotating assembly shall not exceed 530 fps unless approved by Buyer.

3.8.1.4 Blower housings shall be designed to prevent any internally propelled missiles from penetrating the housing.

3.8.1.5 Blower 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 If specified on the blower data sheets, braided stainless steel 316L flexible hoses with stainless steel 316L flanges shall be provided to mate with the blowers' inlet and outlet flanges. Stainless steel connectors shall have flexible core of annular corrugated stainless steel 316L tubing. Braid for the connectors shall be stainless steel 304. End fittings shall be 150# raised face stainless steel 316L flanges conforming to ANSI dimensions. Connectors shall be shipped loose for field installation.

3.8.1.7 Unless specified otherwise on data sheets, blowers shall be "Gas Tight" in accordance with requirements of Section BA 4142 of ASME AG-1.

3.8.1.8 Blower drive arrangement shall be as shown on Blower Data Sheet. Drive arrangement designations shall be per AMCA 99-2404. Designations for rotation and discharge shall be per AMCA 99-2406.

3.8.1.9 When indicated on the Blower Data Sheets, 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.

3.8.1.10 When indicated on the Blower Data Sheets that blowers shall be of Spark Resistant Construction, blowers shall be Type A in accordance with AMCA 99-0401-86.

3.8.2 Access Doors and Inspection Ports

3.8.2.1 If indicated on Blower Data Sheets, Seller shall provide a flanged, bolted, and gasketed access door, complete with handle, in blower housing to allow inspection. Access door shall be raised design to allow for field installed 2.5 in. thickness insulation when required.

3.8.2.2 The access door, when required, shall be on the horizontal centerline of the blower. Door gasket and seal pads shall meet requirements of ASME AG-1 Article FE-3130.

3.8.3 Balance and Vibration Standards

3.8.3.1 The blower wheel/impeller and shaft shall be dynamically balanced in accordance with Section BA-4161 of ASME AG-1. The blower 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 ASME AG-1, Section 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 must be corrected.

3.8.4 Bearings

3.8.4.1 Seller shall provide a "heat slinger" device attached to the blower 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 blowers, it shall be possible to replace the bearings without disconnecting any piping and/or ductwork or disassembling of the blower housing.

3.8.4.3 Bearings for blowers 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 Blower Data Sheets.

3.8.4.4 Bearings for blowers shall have a minimum L-10 service rating life of 200,000 hours, unless noted otherwise on the data sheets. 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 Environmental Qualification data sheet attached to the Equipment data sheet.

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 blower data sheet 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 blower shaft by locknuts or set screws.

3.8.5.4 The blower impeller and shaft shall be rated for 110% of the design rpm listed on the Blower Data Sheets.

3.8.6 Shaft Seals

3.8.6.1 Blowers shall be furnished with shaft seals as specified on the Blower data sheet .

3.8.6.2 Shaft seals shall be fully capable of withstanding the required test pressures before, during, and after blower operation.

3.8.7 Safety guards

3.8.7.1 Blowers 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

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

3.9 Electrical Requirements

[Source: 24590-WTP-3PS-EKP0-T0001, Rev 3]

3.9.1 Criteria for Acceptability of Electrical Equipment
[Section 2.0, 24590-WTP-3PN-EKP0-00005]

- All electrical equipment for facility and equipment wiring, as defined by the National Electrical Code NFPA 70-1999, shall be Approved. Approval will be in accordance with Article 90-4, "Enforcements", Article 90-7, "Examination of Equipment for Safety," and Article 110-3, "Examination, Identification, Installation, and Use of Equipment."
- Approved means "Acceptable to the Authority Having Jurisdiction" (AHJ), as defined in Article 100 of NFPA 70-1999. Only the WTP Electrical AHJ can provide the approval.
- "Equipment" is defined by the NFPA 70 as, "A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like used as a part of, or in connection with an electrical installation". As used here, the entire mechanical assembly is not considered an electrical installation, only the electrical and/or electronic components, and the interconnecting wiring.
- Listing and labeling by an OSHA Recognized NRTL is the primary means (Method 1 below) of obtaining WTP AHJ approval for electrical equipment, devices and materials.
- All Control Panels shall be UL labeled by a certified UL 508A shop.
- Electrical Equipment that is installed on (standard or custom fabricated) Mechanical Equipment shall comply with the requirements stated above.
- Electrical Equipment, that is part of a Mechanical Packaged Equipment assembly, being field-evaluated and labeled at the factory by a NRTL is an alternate method of obtaining WTP AHJ approval.

3.9.1.1 Method 1 (Primary): Listed, Labeled or Certified (i.e. UL508A) [Section 2.1, 24590-WTP-3PN-EKP0-00005]

The WTP AHJ shall approve and accept electrical equipment without additional examination if it is Listed, Labeled, or Certified by a US NRTL, as recognized by OSHA under 29 CFR 1910-Subpart S and is acceptable for the application, environment and other requirements of NEC Article 110. For a listing of and Typical Registered Certification Marks of US NRTL's recognized by OSHA go to http://www.osha.gov/dts/otpca/nrtl/nrt1mrk.html.

3.9.1.2 Method 2 (Alternate): Field Evaluation by a NRTL [Section 2.2, 24590-WTP-3PN-EKP0-00005]

3.9.1.2.1 Electrical equipment that is part of an overall electrical or mechanical assembly having a NRTL safety evaluation or a field evaluation, which states the equipment has been accepted or otherwise deemed safe by the NRTL recognized by OSHA under 29 CFR 1910-Subpart S, using US standards, will be evaluated by the WTP AHJ for acceptability. If found acceptable no further examination of the equipment is required.

3.9.1.2.2 The supplier shall submit all field evaluation reports completed by an OSHA recognized NRTL to the Buyer for review and approval by the AHJ. These field evaluation reports shall show compliance to the applicable USA Electrical Standard(s) recognized by OSHA that are listed on the OSHA website http://www.osha.gov/dts/otpca/nrtl/allstds.html.
The NRTL Label will be as shown on the OSHA website with whatever additional markings that are necessary to indicate acceptability for use in the USA http://www.osha.gov/dts/otpca/nrtl/nrtlmrk.htm.

3.9.1.2.3 The supplier shall submit a Certificate of Compliance (C of C) document for review and approval by the AHJ that lists the USA Electrical Standard(s) that each electrical material or equipment is evaluated to for it's NRTL Listing. Only those standards that are listed on the OSHA website http://www.osha.gov/dts/otpca/nrtl/allstds.html are acceptable to the AHJ. The certification shall confirm that the NRTL Label for each electrical component will be as shown on the OSHA website including the additional markings required to indicate acceptability for use in the USA http://www.osha.gov/dts/otpca/nrtl/nrtlmrk.html.

3.9.1.3 If a supplier is unable to meet the criteria in Method 1 or Method 2, the supplier shall request in writing, a variance by the WTP Electrical AHJ. [Section 2.3, 24590-WTP-3PN-EKP0-00005]

3.9.2 Power Protection and Disconnecting Means

3.9.2.1 Enclosures with incoming power supply, shall have a manually actuated disconnecting means mounted on or close to the enclosure, in an easily accessible location.

3.9.2.2 Devices in panels utilizing power shall have suitable over current protection. Power shall not be "daisy chained" from device to device; however, bridge or comb jumpers may be used on the supply side of the circuit breaker or a fuse block.

3.9.3 Space heaters in enclosures, when furnished, shall be rated 240 V AC with required heat output when operated with 120 V AC. [Section 5.4.5]

3.9.4 Cables and Wiring
[Section 5.5]

3.9.4.1 Other than the special cables furnished by Supplier, cables shall be in accordance with the following:[Section 5.5.2]

a) Low voltage power and control cables shall be stranded copper, 600 V type XHHW-2 or Buyer-approved equivalent.

b) Where applicable, cables shall be rated for the radiation dose rates and service life in the environment specified by the primary specification.

c) Internal wiring shall be stranded copper, flame-retardant, 600 V, synthetic heat resistant (SIS), or machine tool wire (MTW), or high-flexible thermoset.

d) The minimum size of conductor will be as follows (not including cabling integral to components):

DUTY	External Conductor Size (AWG)	Internal Wiring in enclosures Size (AWG)
Power and Lighting (480 V and below only)	**12**	**14**
Current Transformer Wiring	**10**	**10**
Control Circuits (120 V AC / 125 V DC) and Instrument power circuits	**14**	**16**

e) Approximately 10% spare conductors shall be included in multi-conductor 300 V analog and low-level signal cables. Spare conductors shall be terminated on the terminal blocks. [24590-WTP-3PN-EKP0-00004]

3.9.4.2 Interconnecting wiring or cabling for packaged units furnished by supplier, shall be terminated and tested according to this specification. [Section 5.5.3]

3.9.4.2.1 Internal wiring shall be continuous from terminal to terminal without splices (except devices with pig tails). Bridge or comb jumpers are preferred to wire jumpers on terminal strips. Jumpers shall not be installed on field side of the terminal strip. [Section 5.5.3.1]

3.9.4.2.2 Circuits of different voltages (service level) shall be terminated on physically separate terminal strips and clearly labeled to show the circuit voltage. Terminal blocks shall be segregated according to signal type. [Partial Section 5.5.3.3]

3.9.4.2.3 AC power shall be routed through separate wireways or separated with a divider from 24 VDC discrete and analog instrument signals within enclosures. Power and signal cabling shall not be run in parallel, except in separate wireways, and should cross at a 90-degree angle only. [Section 5.5.3.4]

3.9.4.3 The Supplier shall furnish terminal boxes or control panels as follows: [Partial Section 5.5.4]

3.9.4.3.1 Instrumentation cables shall be terminated in separate junction boxes from the power and control cables.

3.9.4.3.2 Where cables supplied and installed by Buyer are run to the package unit, the Supplier shall provide space for installing and terminating the cables.

3.9.4.4 Wiring for electronic, instrument, communication and signal cables shall be segregated from both power and control cables. [Section 5.5.5]

3.9.5 Conduit System

3.9.5.1 Wiring shall be installed in metal conduit. Minimum conduit size shall be ¾ inch. ½ inch conduit is allowed when connecting to devices with ½ inch hubs. [Section 5.6.1.1]

3.9.5.2 Liquid-tight flexible metallic conduit shall preferably be used to isolate the transmission of vibration to the conduit system, and for connection to equipment which may be periodically removed. [Section 5.6.1.2]

3.9.5.3 Where conduit is exposed to potential water spray (outdoor or indoor), it shall be sloped for drainage. A stainless steel breather shall be installed at the high point of the conduit system, and a stainless steel drain shall be installed at the low point of vertical conduit runs complying with UL and NFPA standards. [Section 5.6.1.4]

3.9.5.4 Conduit connections to junction boxes shall be made using watertight threaded hubs or factory threaded hubs. [Section 5.6.1.5]

3.9.5.5 Enclosures shall be designed for front access only unless otherwise specified. All components and equipment in enclosure shall be accessible and removable from the front. Enclosures shall be suitably rated for the environment specified. [Section 5.6.4]

3.9.6 Non-current carrying metallic parts of electrical equipment shall be bonded together and made electrically continuous. Two grounding pads shall be furnished at diagonally opposite corners at the edge of skids for connection by the Buyer to the area ground grid. [Section 5.7.1]

3.9.7 Electrical equipment on the packaged unit shall be bonded to the package unit skid. [Section 5.7.2]

3.9.8 Nameplates
[Section 5.10]

3.9.8.1 Permanent nameplates or labels shall be provided to identify terminal blocks within the compartments.

3.9.8.2 Exterior nameplates shall be made of laminated, beveled plastic of manufacturer's standard, with black lettering or numbering on a white background and shall be

permanently affixed on the exterior. The method of affixing shall not violate the NEMA rating of the enclosure. [Section 5.10.2]

3.9.8.3 Interior labels for all devices, parts and components shall be machine printed, permanent and self-adhesive labels.

3.10 Low Voltage Induction Motors

3.10.1.1 Motor drive combination shall be suitable for operation for the design conditions shown on the Blower Data Sheets.

3.10.1.2 Induction motors shall be in accordance with Specification 24590-WTP-3PS-MUMI-T0002, Low Voltage Induction Motors, and as indicated on the motor data sheets appended to the Blower Data Sheets except:

- Motors may have cast iron rotor cages.
- Motors space heater 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.

3.10.1.3 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 provide certification to the Buyer that the motor is compatible with an adjustable speed drive and will perform within the specified duty range without incident.

3.10.1.4 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.

3.10.1.5 The motor shall have a rated horsepower minimum of 115% of the design brake horsepower (bhp) listed on the Blower Data Sheets. The motor shall also have a service factor of 1.15 at its rated horsepower.

3.11 Instrumentation and Control Requirements

[Source: 24590-WTP-3PS-JQ07-T0001, Rev 2]

3.11.1 The Buyer will provide normal power for the Supplier's instruments. Each source will be delivered at 120 VAC, single phase, 60 Hz, grounded system. 480 VAC, 3 phase, 60 Hz power will be provided as required for motors. All other voltages required by the Supplier shall be derived from the Buyer provided 120 VAC or 480 VAC. [Section 1.7.3]

3.11.2 Table 1 of this specification includes a list of recommended suppliers of instruments. Bidder's proposal shall include cost associated with the use of Buyer designated instruments. [Appended Section 3.4.1, 24590-WTP-3PN-JQ07-00012]

Table 1. Instrument Supplier List

Description	Supplier	Comments
Temperature Sensor(RTD)	Daily Thermetrics	
	IST Conax Nuclear	ITS OK for Rad service
	Emerson (Rosemount)	
	Temp-Pro Inc.	
	Thermoelectric	OK for Rad service
	United Electric	
Speed Sensor	Air-Pax	
	Electro-Sensors	

3.11.3 Instrument ranges shall be selected such that the normal operating point is between 35% and 75% of the range of the instrument. Except where the Buyer has specifically identified manufacturer and model, all the instruments shall be selected by the Supplier in accordance with guidelines provided herein. The instruments described below shall be selected to meet the required safety classification, specified quality, and the design criteria stated herein and in the primary equipment specification. The systems designed and fabricated shall meet the specified reliability and availability for each system or component.

The Supplier may suggest alternative instruments based on their past experience with similar applications subject to the Buyer's review and concurrence. [Section 3.4.5]

3.11.4 Temperature measurement devices shall be selected that are optimized for the application and environment of the measurement services. This includes installation constraints, ambient conditions, and process conditions of the measurement devices. The following describes the Buyer's requirements for specific types of temperature measuring elements and systems. [Section 3.4.5.2]

- All temperature elements, Thermocouples (T/Cs) or Resistance Temperature Devices (RTDs), shall be installed in thermowells to permit removal without process disturbance except where there is no risk to personnel from the process fluid during removal of the measuring element, i.e. shell skin, motor bearings and motor windings. Where a thermowell is not used, a permanent label shall be affixed to the primary element, indicating that there is no thermowell.

- Sheathed RTDs with transmitters shall be used for remote temperature indication.

- RTD elements shall be Platinum with a nominal resistance of 100 Ohm at 0 °C (32 °F). The resistance-vs.-temperature characteristic curve shall conform to DIN 43760, IEC 60751 with a temperature coefficient of 0.00385 ohms/ohm/°C. Three wire element design shall be used.

- RTDs shall be sheathed with Magnesium Oxide insulation. The sheath shall be 316SS and ¼" diameter as a minimum. All T/Cs or RTDs shall be duplex design, spring loaded, and supplied with a connection head with internal grounding screw and external ground terminal. All elements shall be connected in the connection head.

- Temperature measurements using RTDs shall use remote mounted transmitters with the appropriate input/output voltage isolation and located in the field or panel to connect an isolated signal to the Buyer's or Supplier's control system. [Section 3.4.5.2.1]

3.11.5 If specified on the data sheets, the Supplier shall provide and install non-contacting vibration and position sensor probes for machine monitoring of both radial vibration. and thrust position of the shaft. The installation of all bearing thermocouple and shaft position monitoring equipment shall be in accordance with API 670. Bearing thermocouples shall be type E calibration. [Section 3.4.5.16.1, *Instrumentation*, 24590-WTP-3PS-JQ07-T0001]

3.11.6 If required on Blower Data Sheet, speed transmitters shall have sensors of non-contact type. [Altered Section 3.4.5.16.2]

3.11.7 All enclosures, cabinets, panels, and racks shall be designed and fabricated to be in full compliance with NFPA 70-1999. [Partial Section 3.6]

3.11.7.1 All enclosures shall be designed for front access only unless otherwise specified. All components and equipment in the enclosure shall be accessible and removable from the front. Enclosures shall be indoor per the NEMA 250 and ICS 6 standards based on the environmental specification requirements. A NEMA rating of 12 shall be the minimum acceptable requirement for indoor enclosures. In areas where radioactive contamination is likely, only stainless steel enclosures shall be used. [Section 3.6.1]

3.11.7.2 All packaged systems and equipment controls shall be pre-wired to terminal blocks in permanently mounted enclosure.

The terminal blocks shall be designed for easy interconnection to Buyer's control and communication circuits.

Access to enclosure internal components or equipment shall not require the use of hand tools. Access to any component within the enclosure for maintenance or replacement shall not be prevented by proximity to other components within the enclosure. Equipment mounted in the rear of the enclosure shall be on a back-panel and positioned to facilitate removal and replacement. Enclosure back-panels shall be fabricated from low-carbon steel and shall be finished with semi-gloss or gloss white paint. Enclosures shall be sized to allow clearance between the enclosed components, cables, print pockets, and components mounted on the door. [Partial Section 3.6.3]

3.11.7.3 The enclosure grounding system shall be installed in conformance to IEEE Guide 1050-1996, section 5.3.1 "Single point grounding system". Instrument junction box shall only have an equipment safety ground. The grounding bus shall be constructed with solid copper, and all connections shall be drilled and tapped. The ground bus shall be drilled and tapped for an additional 20 percent spare terminations.

The equipment safety ground bus shall be solidly bolted to the enclosure structure. A bolted compression type 2/0 terminal lug shall be installed at each end of the bus to facilitate connection of Buyer's 2/0 AWG stranded copper ground cable.

All removable metal components, instruments, or electrical devices shall be connected via individual conductors to the equipment safety ground bus. Components shall not be grounded to each other via a common wire connecting the components to the equipment safety ground bus. Enclosure door and back-panel shall be connected to the equipment safety ground bus via individual conductors. Ground conductors connected to the equipment safety ground bus shall have an insulation color code of green.

The isolated signal ground bus shall be electrically isolated from the enclosure structure and the safety ground bus. A bolted compression type 2/0 terminal lug shall be installed at each end of the isolated ground bus to facilitate connection either to another isolated signal ground bus in a connected adjacent enclosure or to Buyer's 2/0 AWG stranded copper ground cable.

Instrument cable shields and signal common conductors shall be connected to the isolated signal ground bus. Each signal ground conductor shall be fastened to the isolated signal ground bus. For junction boxes with signal wiring going back to the Buyer's control system, the cable shield shall be terminated on a isolated terminal block and carried back to a ground supplied by the Buyer. Ground conductors connected to the isolated signal ground bus shall have an insulation color code of green with yellow tracer. [Section 3.6.5]

3.11.7.4 The Supplier shall mount, connect and wire each instrument or control device such that adjustment, maintenance, removal and replacement may be accomplished in a safe manner without interruption of service to adjacent but unrelated equipment and without placing undue stress on installed wiring or devices. Accommodations for strain relief shall be made when routing wire to hinged enclosure doors and shall be wrapped with spiral wire wrap.

No more than two wires shall be connected to one terminal point and only if the terminal is rated for the two wires. Wire splicing shall not be used unless approved by the Buyer. Bridge or comb jumpers are preferred to wire jumpers on terminal strips. Jumpers shall not be installed on the field side of the terminal strip.

Terminal blocks shall be selected to accommodate the function and electrical requirements associated with each wiring application. They shall incorporate the following features:

1. Space saving design
2. Screw clamp wire connection

3. Single level configuration
4. Integral test facilities
5. DIN-rail (35mm) mounted

Isolating type terminal blocks shall be Weidmuller "W" series, Allen Bradley 1492-WKD3TP, Phoenix Contact, or Buyer approved equal. Non-isolating feed-thru terminal blocks shall be Weidmuller "W" series, Allen Bradley 1492-W4, Phoenix Contact, or Buyer approved equal. All terminal blocks shall be identified by a unique terminal block number and approved by the Buyer.

For all enclosures, each incoming power supply shall have a manually actuated electrical power disconnect device mounted on/in the enclosure in an easily accessible location. The electrical power disconnect device may be a single device or multiple devices for individual circuits. Each device that uses 120 VAC for power shall have individual connections protected via rail mounted circuit breakers. The circuit breakers used for individual control or power circuit protection in the enclosure shall be thermal magnetic breakers such as Weidmuller CB, Allen Bradley type 1492-GH, Phoenix Contact, or Buyer approved equal. They shall be Dual-In-Line, DIN-rail mountable TS35, TS32, or equivalent. Power shall not be "daisy chained" from instrument to instrument; however, the bridge or comb jumpers may be used on the supply side of the circuit breakers. A fuse and circuit breaker directory shall be contained in a holder permanently affixed on the inside of each door or back-panel and protected by a clear window.

AC power shall be routed through separate wireways or separated with a divider from 24 VDC discrete and analog instrument signals within enclosures. Power and signal cabling shall not be run in parallel, except in separate wireways, and should cross at a 90-degree angle only.

All instrument signal cables shall be of the type and specification as listed in Table 2 - Instrumentation Cable Schedule. Power cable, wire size and type shall be in accordance with Section 3.9.4.1 d).

Table 2. Instrumentation Cable Schedule

Cable Code	Cable Description	Specific Cable Spec.	Comments	Circuit Identification	Cable General Specification
1TSPR#16	Single twisted pr. #16 AWG, 300 V, ITC, PLTC	Single twisted pair with overall foil shield	Individual instrument signals, instrument 24 vdc power	Black, White	Cables UL listed as ITC and PLTC, 300 V insulation. UL 1581 listed for 70,000 BTU vertical tray flame test; 100% foil polyester/aluminum individual and overall shields with 22AWG Drain wire. Each circuit shall have a minimum of 6-8 twists/ft.
2TSPR#16	Two twisted shielded pr # 16AWG, 300V, ITC, PLTC	individually twisted shielded pairs with overall foil shield		Black, White conductors - individual circuits numbers	

All wires and cables external to an enclosure shall be of the instrument tray cable (ITC) type, flame-retardant (passes IEEE 1202 vertical flame test), and have a 90 °C continuous rating in wet or dry locations. All cable insulation and jacket material shall be resistant to heat, moisture, impact, ozone, and meet or exceed the following requirements:

- 300 V rated for low voltage instrument cables (operating at 150 volts or less and 5 amperes or less)
- 600 V rated for power/motor control cables (up to 480 VAC and 250 VDC)

The wire insulation color for power wiring shall be of the following:

• Black	Ungrounded conductors more than 50 VAC
• White	Grounded conductors more than 50 VAC
• Green	Equipment grounding wire
• Green/Yellow tracer	Isolated instrument grounding wire
• Light Blue	Ungrounded supply voltage less than 50 V (DC or AC)
• Violet	Switched ungrounded voltage less than 50 V (DC or AC)
• White/Blue tracer	Grounded or return supply voltage less than 50 V (DC or AC)

[Partial Section 3.6.6]

3.11.7.5 The enclosures shall be designed so that tools and test equipment may be used to accomplish all necessary adjustments, maintenance, cleaning, testing, and calibration. If specialized tools are needed for adjustments, maintenance, cleaning, testing, and calibration the Supplier shall provide two sets per order to Buyer upon delivery. Test points and calibration areas shall be accessible, clearly identified, and labeled. Adequate space shall be provided for removal and replacement of individual instruments or components located inside the enclosure. Equipment mounted in the rear of the enclosure shall be positioned to facilitate removal and replacement from the front of the enclosure. [Section 3.6.7]

3.11.7.6 Buyer will provide the enclosure name, service description, and wire marker syntax and name/number.

Safety Labels shall not be attached to removable items that could be replaced in a different orientation.

Each wire shall be clearly identified with a wire marker at each end by means of heat shrinkable plastic sleeves or other Buyer approved permanent type wire marker in black text on white background. Open markers or "C" type sleeves that can be applied after a conductor is terminated will not be accepted. Minimum character size for wire marker shall be no less than 3/32 inch. The wire markers shall be attached within a maximum of 2 inches from the termination of the wire. Orientation of the wire marker shall be such that its identification is visible when viewed from the front of the enclosure looking in. [Partial Section 3.6.8]

3.11.8 All Supplier provided wiring shall be identified at each end with a numbering system that is cross-referenced on all appropriate drawings. The wire-numbering scheme shall be proposed by the Supplier with Buyer's concurrence. Ferrules or wire markers shall be indelibly and clearly marked in black on white plastic, heat shrinkable sleeves. Open markers or "C" type sleeves that can be applied after a conductor is terminated will not be accepted. Junction box (JB) terminals shall have adequate space between them and the JB internal walls so connected cables and individual wire numbers can be easily read without disturbing the wiring within the JBs.

All cables provided by the Supplier shall be clearly identified with a heat shrink type label. [Section 3.7.8]

3.11.9 Instrument mounting locations shall be selected with consideration of both function operation and accessibility requirements for maintenance. Instrumentation should not be mounted on vibrating equipment or light duty support. Instrument mounting bolting and hardware shall be 316 SS. [Section 3.8.8]

3.11.10 Each instrument shall be installed so as to allow adequate safe access for both operation and maintenance. [Section 3.8.8.2]

3.11.11 Each Instrument shall have nameplate information that includes the following:

- Manufacturer's Name
- Manufacturer's model and serial number
- Buyer's Purchase Order No.
- Buyer's Item No.
- Buyer's Tag Number
- Power Rating
- Electrical Area Classification
- Approvals and Listing per NEC

Where the combination of manufacturer's standard nameplate and instrument body stampings are unable to accommodate all of the required and applicable information, a separate stainless steel nameplate shall be provided to include the Buyer's tag number, PO number, and all of the applicable missing information. This separate stainless steel nameplate shall have the information impressed, stamped or etched directly on the stainless steel surface. The nameplate, where physically possible, shall be secured to the body of the instrument by corrosion resistant screws tapped into a low stress area of the assembly, so the structural integrity and functional capability of the assembly are not impaired. If it is not physically possible to secure the nameplate to the body of the instrument, then the nameplate shall be attached using a stainless steel wire. [Section 8.1]

3.12 Accessibility and Maintenance

3.12.1.1 Seller's recommended accessibility and recommended spares for each piece of equipment shall be included in the Seller's submittal.

3.12.1.2 Seller shall provide the inspection and maintenance requirements with the recommended intervals to be performed by Buyer.

3.13 Accessories

3.13.1 Unitary Inertia Bases

3.13.1.1 When indicated on the Blower Data Sheets, blowers 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 data sheet, the vibration isolators shall be Supplier specified and supplied. Supplier shall specify the isolator manufacturer and model number, spring minimum diameter, and spring restraint features on the Blower Data Sheet.

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 Specifications 24590-WTP-3PS-SS90-T0001, Seismic Qualification of Seismic Category I/II Equipment and Tanks or 24590-WTP-3PS-FB01-T0001, Structural Design Loads for Seismic Category III & IV Equipment and Tanks. Spring mounts shall include enlarged base plates for seismic anchoring.

3.13.2.3 Submittal drawings shall show locations for vibration isolator placement on blower assemblies when installation is specified on the data sheet.

3.13.2.4 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 data sheet, Supplier shall provide flexible connectors. Supplier shall specify the connector manufacturer and model number on the blower data sheet.

3.13.3.2 When specified on the data sheet, submittal drawings shall show locations for or placement of flexible connectors on blower assemblies.

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 and the Blower Data Sheets 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 Blower bearing pedestals and motor bases shall be fabricated from structural steel shapes and plates properly reinforced for maximum rigidity.

4.1.4 Blower housings shall be fabricated from materials specified in Blower Data Sheets.

4.2 Prohibited Materials

4.2.1 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 materials with halogen content of more than 200 ppm shall not be used in direct contact with stainless steel.

4.2.2 Asbestos and Teflon shall not be used in any component of the blowers or accessories.

4.2.3 Certain chemicals and materials are restricted from use at WTP. Restricted chemicals and materials are given in 24590-WTP-CON-08-0001, Restricted Materials List. Inclusion of these chemicals/materials requires specific authorization from the Buyer (WTP Safety Assurance).

4.3 Special Requirements

4.3.1 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.

5 Fabrication

5.1 Fabrication of Blowers

5.1.1 Fabrication of blowers shall be as specified in ASME AG-1, Article BA-6000.

5.1.2 Blower wheels / impellers shall be of the type and fabricated from materials specified in Blower data sheets.

5.2 Welding

5.2.1 All fabrication, welding, inspection and repair procedures of blower wheels, blower housing, housing framing and supports shall conform with the following, as applicable:

- AWS D1.1, Structural Welding Code, Steel
- AWS D1.3, Structural Welding Code, Sheet Steel
- AWS D1.6, Structural Welding Code, Stainless Steel
- AWS D9.1, Sheet Metal Welding Code

- AWS D14.6, Welding of Rotating Elements of Equipment

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.

5.2.4 Welds shall be inspected in accordance with ASME AG-1, Article AA-6330.

6 Tests and Inspections

6.1 General

6.1.1 Inspection and testing of blowers shall conform to ASME AG-1, Section BA, Article BA-5000. Seller shall conduct and shall be responsible for the shop tests called for in this specification and in applicable standard and referenced documents. Seller shall furnish all facilities necessary for the performance of such tests.

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. Qualifications of personnel performing inspections and tests shall be verified by the Seller.

6.3 Non-Destructive Examinations

6.3.1 Seller shall perform Non-Destructive Examinations. 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 BPVC Section V.

6.3.4 As a minimum all welds shall be 100% Visually Tested (VT) and pressure boundary welds shall be Liquid Penetrant Tested (PT). NDE reports shall be submitted for review and acceptance.

6.4 Shop Tests

Buyer's Inspector will indicate tests and inspections that the inspector intends to witness after review of Seller's work plan. Seller shall perform standard factory tests, which, as a minimum, includes the following tests listed below, as well as tests called out in referenced specifications.

Test procedures shall be submitted for acceptance and permission to proceed prior to testing.

All test results shall be certified, documented, and submitted to Buyer for review, and permission to proceed. All test reports shall be accepted by Buyer based on the acceptance criteria outlined in the Supplier's accepted test procedures.

The Inspector may witness the following required shop tests:

6.4.1 Test for blower performance. Performance testing shall be done for similar sized blowers.

6.4.1.1 Blower performance tests shall be conducted in accordance with AMCA standards and shall be done in AMCA certified facilities unless otherwise approved by Buyer. Inspection and test procedures shall be submitted to Buyer.

6.4.2 Functional performance test for electrical equipment.

6.4.2.1 The Supplier's shop tests shall include the following:

a) Megger test before termination of all wires pulled into conduit.
b) Continuity check of all wiring for conformance with drawings
c) Complete functional test of all apparatus and equipment
[24590-3PS-WTP-EKP0-T0001, Rev 3. Section 6.1.1]

6.4.2.2 The Supplier shall notify the Buyer at least two weeks prior to any final tests. The Buyer or his representative reserves the right to inspect the equipment and/or witness the tests at the factory. [24590-3PS-WTP-EKP0-T0001, Rev 3. Section 6.1.2]

6.4.2.3 The Supplier shall isolate all instruments and control systems before performing a megger test. [24590-3PS-WTP-JQ07-T0001, Rev 2, Section 6.2.2]

6.4.2.4 All wiring [provided by the Seller shall be verified by a 100 % point to point continuity test. Wiring errors detected shall be corrected and/or drawings corrected as appropriate prior to Buyer's inspection. [24590-3PS-WTP-JQ07-T0001, Rev 2, Section 6.2.3]

6.4.3 Blowers shall be tested and accepted for leakage in accordance with Section BA-5142 of ASME AG-1.

6.4.4 Vibration performance shall be checked and reported at 10% increments of full speed blower tests. Vibration testing shall not be performed within +/- 20% of the blower's critical speed.

6.5 Site Tests

Buyer startup personnel will perform test after initial installation. Buyer may request Seller assistance during startup.

7 Preparation for Shipment

7.1 General

7.1.1 Blower assemblies shall be packaged, shipped, handled and stored in accordance with ASME AG-1 Article BA-7000 and WTP specification 24590-WTP-3PS-G000-T0003, Engineering Specification for Packaging, Handling and Storage Requirements.

7.2 Cleanliness

Seller's cleaning procedures shall be submitted to Buyer for information. Prior to surface preparation and coating application, visually examine welds, the blower impeller, air stream surfaces of the blower 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.

7.3 Painting and Special Protective Coatings

Painting and Special Protective Coatings shall meet the requirements in 24590-3PS-WTP-AFPS-T0001, as tailored in Attachment A.

7.4 Tagging

A stainless steel nameplate shall be attached to each centrifugal fan showing the manufacturer's name, shop location, date of manufacture, serial number, equipment rating, equipment tag numbers, weight of assembly, maximum speed, other information required by Paragraph BA-9110 of ASME AG-1 and Buyer purchase order number. Instruments shall be identified with Buyer provided tag numbers.

8 Quality Assurance

8.1 QA requirements specific to item(s) or service

8.1.1 The quality assurance program requirements of this specification are those specified in the following documents:

ASME NQA-1, marked as applicable in Q data sheet of ANSI/ASME NQA-1 (2000) Quali1ty Assurance Program Requirements, attached to the Material Requisition.

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

24590-WTP-3PS-G000-T0001, Engineering Specification, *Supplier Quality Assurance Program Requirements*

8.1.2 The successful bidder must pass a pre-award survey by the Buyer. Supplier shall demonstrate that their quality program is in compliance with the procurement quality requirements listed in Quality Assurance Program Requirements Datasheets. 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.

8.2 Supplier Deviation

8.2.1 Each supplier shall be required to identify and promptly document all deviations from the requirements of the procuring documents. In addition, the supplier shall be required to described the recommended disposition based on appropriate analysis. Submittals of request for deviations from lower-tier suppliers shall be through the prime supplier to WTP.

8.2.2 Supplier-proposed deviations from procurement documents shall be initiated by use of Supplier Deviation Disposition Request (SDDR) form.

9 Configuration Management

Equipment and/or components covered by this specification are identified with Component Identification System numbers shown in Blower Data Sheets. Each item shall be identified in accordance with Section 7.4.

10 Documentation and Submittals

10.1 General

Seller shall submit to Buyer Engineering and Quality Verification documents in the forms and quantities shown in Form G-321-E, *Engineering Document Requirements*, and Form G-321-V, *Quality Verification Document Requirements*, attached to the MR.

10.2 Submittals

The Seller shall submit the following:

10.2.1.1 The Seller shall submit, prior to fabrication, a matrix showing how the supplier meets the requirements of AG-1 Section BA.

10.2.1.2 Functional description of the electrical operation of the package. [Section 9.1.1, 24590-WTP-3PS-EKP0-T0001, Rev 3]

10.2.1.3 Material list with specific model number, manufacturer and catalogue cut sheets shall be submitted as part of the product data. [Section 9.1.6, 24590-WTP-3PS-EKP0-T0001, Rev 3

10.2.1.4 Supplier shall provide a list of recommended spare parts as follows: [Section 9.1.8.1, 24590-WTP-3PS-EKP0-T0001, Rev 3]

10.2.1.4.1 Startup/warranty spare parts - are those parts that may be required at any time during equipment installation, startup, testing and unit operation through the warranty period.

10.2.1.4.2 Operational spare parts - are those parts that required replacement at regular intervals to maintain continuous operation of the supplied equipment and/or system.

10.2.1.4.3 Capital spare parts - are major parts or equipment that provide reliable equipment operation throughout the plant life and having a significant lead time for manufacturer and delivery.

10.2.1.4.4 The spare parts list shall include pricing and delivery information valid for one year after delivery of the equipment. [Section 9.1.8.2, 24590-WTP-3PS-EKP0-T0001, Rev 3]

10.2.1.5 Instrument installation details shall be submitted for the Buyer's review and one month prior to proceeding with instrument installations. [Section 11.2.4,24590-WTP-3PS-JQ07-T0001 Rev 2]

10.2.1.6 Supplier shall provide manufacturer's technical literature for all technical components and instrumentation provided within the Supplier's package. [Section 11.2.12, 24590-WTP-3PS-JQ07-T0001 Rev 2]

10.2.1.7 Supplier shall provide a brief description and justification for the Mean Time Between Failure figure provided on the Blower Data Sheets.

10.2.2 Drawings

Drawings shall show the following information:

10.2.2.1 The outline dimensions of blower, 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 blower 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 blower 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 blower.

10.2.2.9 Overall Single line diagram showing all electrical equipment. [Section 9.1.2, 24590-WTP-3PS-EKP0-T0001, Rev 3]

10.2.2.10 Overall layout showing location of electrical items. [Section 9.1.3, 24590-WTP-3PS-EKP0-T0001, Rev 3]

10.2.2.11 Interconnection diagram and cable schedule showing details of all internal connections and Buyer external connections. [Section 9.1.4, 24590-WTP-3PS-EKP0-T0001, Rev 3]

10.2.2.12 Individual equipment schematic diagrams, wiring diagrams, general arrangement drawings, foundation details and junction/terminal box details. [Section 9.1.5, 24590-WTP-3PS-EKP0-T0001, Rev 3]

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. [Section 11.2.3, 24590-WTP-3PS-JQ07-T0001 Rev 2]

10.2.2.14 The ASTM or equivalent designation for materials.

10.2.2.15 Blower performance curves at 60%, 80%, 100%, and 110% design speed at design conditions specified on the data sheets. Preliminary performance curves shall be provided prior to submitting equipments drawings. Blower performance curves including unstable operating surge region/limit.

10.2.2.16 Identify all devices with the Buyer's tag numbers, where applicable

10.2.3 Procedures

Procedures are to be submitted to Buyer for approval prior to use and shall include:

10.2.3.1 Welding procedures

10.2.3.2 Procedures for repairs of rejected items or parts.

10.2.3.3 Cleaning and coating procedures per specification 24590-WTP-3PS-AFPS-T0001 as tailored in Attachment A.

10.2.3.4 Electrical component performance test procedures

10.2.3.5 Seller's shipping preparation and storage procedures per specification 24590-WTP-3PS-G000-T0003.

10.2.3.6 Test procedures for blower performance.

10.2.3.7 Test procedures for blower housing and shaft leakage tests.

10.2.3.8 Test procedures for sound, over-speed, vibration, and mechanical running tests.

10.2.3.9 Commercial Grade Dedication Procedures and Plans per specification 24590-WTP-3PS-G000-T0019.

10.2.3.10 Software Validation and Verification plan per specification 24590-WTP-3PS-G000-T0014.

10.2.3.11 Seismic compliance documentation for permission to proceed per specification 24590-WTP-3PS-SS90-T0001 or 24590-WTP-3PS-FB01-T0001 as applicable.

10.2.3.12 Environmental qualification test procedures in accordance with 24590-WTP-3PS-JQ06-T0005.

10.2.3.13 Non-Destructive Examination procedures

10.2.4 Inspection and Test Reports

10.2.4.1 Inspection and test plan for Buyer review and approval.

10.2.4.2 Records of repairs of rejected items or parts.

10.2.4.3 Welding inspection reports and welding repair reports if required.

10.2.4.4 Electrical component performance test reports

10.2.4.5 Blower housing and shaft seal leakage test reports

10.2.4.6 Blower performance test reports, including blower curves

10.2.4.7 Sound power levels

10.2.4.8 Blower wheel/shaft vibration, over-speed, and mechanical test reports

10.2.4.9 NRTL Field Evaluation Reports

10.2.4.10 Seismic Compliance documentation per specification 24590-WTP-3PS-SS90-T0001 or 24590-WTP-3PS-FB01-T0001 as applicable.

10.2.4.11 Commercial Grade Dedication Package per specification 24590-WTP-3PS-G000-T0019.

10.2.4.12 Software Validation and Verification report per specification 24590-WTP-3PS-G000-T0014.

10.2.4.13 Environmental qualification test report in accordance with 24590-WTP-3PS-JQ06-T0005.

10.2.4.14 Non-Destructive Examination reports

10.2.5 Calculations

10.2.5.1 Calculations shall be in accordance with 24590-WTP-3PS-G000-T0014, Engineering Specification for Supplier Design Analysis.

10.2.6 Manuals

Manuals and instructions shall include:

10.2.6.1 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.

10.2.6.2 Operation and maintenance manuals which provide complete, detailed descriptions of components and accessories with data sheets 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.

10.2.6.3 Instruction manuals shall cover all major components such as blowers, motors, controls, and instrumentation, including those purchased from a subcontractor. The Seller shall obtain such manuals and lists, and submit them to the Buyer.

10.2.6.4 The Seller shall provide instructions regarding site long and short and long term storage up to 5 years, and preparation and protection of equipment after installation and prior to operation.

10.2.6.5 Where manuals include information applicable to several components, sizes or models, non-applicable information shall be lined-out.

10.2.7 Certificates of Conformance

10.2.7.1 Seller shall certify lifting eyes or lugs and/or spreader bars are suitable for the safe, balanced lifting, and handling of the equipment.

10.2.8 Schedules

Lists and schedules shall include:

10.2.8.1 Schedule of engineering, fabrication, and testing.

10.2.8.2 Parts list, and cost for parts and items subject to deterioration and replacement. Seller to state shelf life and storage requirements for spare parts.

10.2.8.3 Schedule of maintenance and part replacements required to maintain the equipment qualification in accordance with requirements in section 6 of specifications, 24590-WTP-3PS-JQ06-T0005, Engineering Specification for Environmental Qualification of Control and Electrical Systems.

10.2.9 Materials Certificates

10.2.9.1 Material test reports of chemical and physical properties shall be provided for all stress components of the blowers, including the blower impeller and its components, blower shaft, and housings in accordance with ASME AG-1, BA-3400.

10.2.9.2 Manufacturer's Material Certificate of Conformance shall be provided for scrolls, housing side plates, inlets, support framing integral to the blower, and weld filler metal in accordance with ASME AG-1, BA-3410.

10.2.9.3 Certificates of calibration referenced to NIST traceable standards required for any calibrated instrumentation provided with the equipment.

10.2.10 Data

Data shall include:

10.2.10.1 Buyer's data sheets, completely filled out by the Seller, showing all information required to determine that the units are of the design and materials specified herein, including motor data sheets.

10.2.10.2 Buyer's equipment qualification data sheets, completely filled out by the Seller, showing all information required to determine that the units are of the design and materials specified herein, including motor data sheets.

10.2.10.3 Acoustic data report. Sound test data from similar equipment previously tested can be submitted in lieu of test for the purchased equipment.

Attachment A Tailored version of specification 24590-WTP-3PS-AFPS-T0001, Shop Applied Special Protective Coatings for Steel Items and Equipment

NOTE: Only the sections and appendices contained in this Attachment apply to the Single Stage High Integrity Centrifugal Fans and Blowers specification.

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1 Scope

1.1 This specification defines the minimum requirements for Special Protective Coating (SPC) materials/coating systems, surface preparation, application, and inspection of protective coatings to be shop applied. Items and surfaces to be coated shall be coated in accordance with this specification. Unless indicated otherwise in the base technical specification/material requisition or purchase order, all coats will be shop applied. Finish color shall be ANSI 70 Gray unless indicated otherwise in Section 2.0 of the Material Requisition (MR). [Section 1.1]

1.2 All Special Protective Coatings (SPC's) are designated as Commercial Grade (CM) and non-safety. [Section 1.2]

2 General

2.1 Responsibility

2.1.1 The SELLER shall supply all personnel, coating materials and all necessary surface preparation, application, inspection and other equipment as required. [Section 2.1.1]

2.1.2 The SELLER shall unload, inspect, and store all inbound steel items and equipment scheduled for coating when manufactured by others. Items found to be damaged or otherwise unsuitable for coating shall be identified and segregated for evaluation by the SELLER. [Section 2.1.2]

2.1.3 The SELLER shall store all coating materials, perform surface preparation, coating application and inspection in accordance with this specification and Buyer reviewed procedures. The coating systems and associated coating materials used shall be in accordance with Appendix A or the Material Requisition (MR) when coatings are specifically identified. [Section 2.1.3]

2.1.4 The SELLER shall perform all inspections and tests contained in this specification as necessary prior to verification by the BUYER. [Section 2.1.4]

2.1.5 The SELLER shall provide application and inspection documentation for all coating Work in accordance with this specification. [Section 2.1.5]

2.1.6 The SELLER shall provide environmental control equipment as necessary for coating application and curing. [Section 2.1.6]

2.1.7 The SELLER shall provide erection marking. Marks for color-coding of bulk materials and erection marking shall be fully compatible with the coating system specified. [Section 2.1.7]

2.1.8 The SELLER shall touch-up and repair defective or damaged coating in accordance with procedures submitted and reviewed by the BUYER. [Section 2.1.8]

2.1.9 The SELLER shall protect all coated surfaces prior to shipment and provide suitable coverings, padding and strapping to protect coated items during shipment. [Section 2.1.9]

2.1.10 The SELLER shall only use inspection equipment that is currently (in date) calibrated. [Section 2.1.10]

2.2 Surfaces Not To Be Coated

2.2.1 Hold back coating from weld areas- [Section 2.2.1]

2.2.1.1 Three (3) to Four (4) inches for **shop** welds when using epoxy or other types of organic coatings. [Section 2.2.1.2]

2.2.1.2 Note - The above coating hold back dimensions are only for items previously coated prior to welding. These coating hold back dimensions do not apply to shop welds that will be coated after welding is completed. This Section of the shop coating spec does not have anything to do with coating hold back requirements associated with visual inspection of welds during hydro testing. Coating hold back requirements associated with weld inspection must come from the prevailing code. [Section 2.2.1.4]

2.2.1.3 If the coating hold back at field welds is greater than 50% of the surface area of the item then the item does not required shop coating, however the items shall be blasted to remove all mill scale. [Section 2.2.1.5]

2.2.1.4 The coating hold back shall be sufficient to expose the entire shop weld for visual inspection on items fabricated prior to coating. [Section 2.2.1.6]

2.2.2 Name and instruction plates, etc. [Section 2.2.2]

2.2.3 Rubber or similar nonmetallic parts. [Section 2.2.3]

2.2.4 Machined surfaces. [Section 2.2.4]

2.2.5 Non-Ferrous metals unless otherwise specified. [Section 2.2.5]

2.2.6 Stainless Steel surfaces, unless specifically required by the BUYER (areas where stainless steel is welded to carbon steel the coating overlap onto the stainless steel shall be approximately 1" or as otherwise specified.) [Section 2.2.6]

2.3 Definitions

2.3.1 Batch- A quantity of coating made in one production run. A unique batch number is assigned for each production run of the coating material, curing agent, zinc powders, fillers and thinner. [Section 2.3.1]

2.3.2 Dry Film Thickness (DFT)- The thickness of an applied coating, once dry or cured. Usually expressed in mils (each mil is 1/1000 inch). [Section 2.3.3]

2.3.3 Fish Eyes (cratering)- Formation of holes or visible depression in the coating film. Usually from a contaminated particle on the surface prior to applying the coating. [Section 2.3.4]

2.3.4 Holiday- A Pinhole, skip, discontinuity, or void in the applied coating film. [Section 2.3.5]

2.3.5 Mfg. Std. Coating- A manufacturers standard coatings system applied to off the shelf items or standard line items of routine manufacture that are not specifically manufactured for the WTP project. [Section 2.3.7]

2.3.6 NIST- National Institute of Standards and Technology. [Section 2.3.8]

2.3.7 Pinholes- Minute holes visible in the applied coating without magnification that appears to penetrate one or more layers of the coating film. [Section 2.3.10]

2.3.8 Profile- The surface roughness resulting from surface preparation by abrasive blasting or other authorized methods. (Refer to Section 7.3.6). [Section 2.3.11]

2.3.9 Sag- The running of freshly applied coating on a vertical surface due to being applied too thick. (Same definition for runs and drips) [Section 2.3.13]

2.3.10 Training and Certification- Training shall include an understanding of the specification, work procedures and manufacturers published instructions. Certification shall include a documented performance test demonstrating quality work verifiable by the BUYER. (Refer to Sections 4.5, 5.1.6, 7.1.2, and 8.1.1.1) [Section 2.3.16]

2.4 Safety

2.4.1 The SELLER shall comply fully with OSHA Hazard Communication Standard 29CFR 1910. Material Safety Data Sheets (MSDS) for all materials, including thinners and cleaning solvents, shall be obtained from the materials manufacturer and upon request made available, at the place and time of Work, for review. [Section 2.4.2]

2.4.2 The Volatile Organic Compound (VOC) content of all materials shall comply with Federal, State and Local or other Regulatory requirements. [Section 2.4.3]

3 Applicable Documents

3.1 Codes and Standards

3.1.1 American Society for Testing and Materials (ASTM)

ASTM E337- R96; 02	Test for Relative Humidity by Wet-and-Dry Bulb Psychrometer
ASTM D3276- 00; 05	Standard Guide for Painting Inspectors (Metal Substrates)
ASTM D4285- 99	Test Method for Indicating Oil or Water in Compressed Air
ASTM D4417- 99; 03	Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4537- 96; 04; 04a	Standard Guide for Establishing Procedures to Qualify and Certify Inspection Personnel for Coating Work Inspectors in Nuclear Facilities.
ASTM D4940- 98; 03	Test for Conductimetric Analysis of Water Soluble Ionic Contaminants of Blasting Abrasives
ASTM D5064-01	Standard Practice for Conducting a Patch Test to Assess Coating Compatibility

3.1.2 The Society for Protective Coatings (SSPC)

SSPC-AB1 6/1/97;7/1/07	Mineral Slag Abrasive
SSPC-PA2 5/1/04	Measurement of Dry Paint Thickness with Magnetic Gages
SSPC-SP1 11/1/82;11/1/04	Solvent Cleaning

SSPC-SP10 11/1/04 Near White Metal Blast Cleaning
SSPC-SP11 11/1/87; 11/1/04 Power Tool Cleaning to Bare Metal
SSPC-VIS 1 6/1/02; 11/1/04 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning

3.1.3 Occupational Safety and Health Administration (OSHA)

OSHA 29 CFR 1910 Occupational Safety and Health Standards

4 Submittals

4.1 SELLER shall prepare detailed written procedures for material receiving, marking, storage, handling, surface preparation, environmental control, application, curing, inspection, testing, touch-up/repair, application personnel qualification, inspector qualification, (G321- E , category 28.0) and proposed documentation forms as described within this specification. The final procedure and documentation forms shall be submitted and reviewed with BUYER's permission to proceed prior to the start of coating Work. (G321-E category 15.0). Submittal requirements for manufacturers standard coating are found in Section 6.2. [Section 4.1, 24590-WTP-3PS-AFPS-T0001, rev 4]

4.2 The SELLER shall identify the specific products by manufacturer and catalog number and shall submit the coating manufacturer's latest published product data sheet, application instructions and Material Safety Data Sheets (MSDS). Conflicts, if any, between the SELLER's normal procedures, the coating manufacturer's recommendations, and this specification shall be brought to the attention of the BUYER for resolution and written permission to proceed. (G321-E category 11.0) [Section 4.4, 24590-WTP-3PS-AFPS-T0001, rev 4]

4.3 The SELLER shall submit original or copies of original Coating Manufacturer's Product Identity Certification Records for each and every batch of coating material used on the WTP project (Appendix B)(Refer to G321V category 13.0) [Section 4.5, 24590-WTP-3PS-AFPS-T0001, rev 4]

4.4 The SELLER shall submit a daily inspection record as part of the Work procedures that includes all the elements provided in Appendix C as a minimum. An entry for Wet Bulb is not required when the accepted device used to measure humidity and dew point does not require a wet bulb. (Refer to Section 8.1.9 and 10.2) (G321V category 15.0)
[Section 4.6, 24590-WTP-3PS-AFPS-T0001, rev 4]

4.5 The SELLER shall provide a personnel training and certification plan for applicators and inspectors. (Refer to Section 2.3.10, 5.1.6, 7.1.2, and 8.1.1.1).
[Section 4.8, 24590-WTP-3PS-AFPS-T0001, rev 4]

5 Quality Plan

5.1 General

5.1.1 The SELLER shall control the quality of items and services to meet the requirements of this specification, applicable codes and standards, associated procurement documents, referenced herein. The SELLER shall prepare and maintain documentation to provide evidence of compliance with reviewed procedures and this specification. A copy of the coating inspection documentation shall be included in the shipping documentation. [Section 5.1.1]

5.1.2 The SELLER, including any lower-tier organizations engaged by him, shall be subject to surveillance inspection by the BUYER representative until completion or termination of the procurement. This surveillance inspection does not relieve the SELLER from the responsibility for conformance to the requirements of procurement documents, this specification and authorized procedures. [Section 5.1.2]

5.1.3 The BUYER representative shall be provided with a work activity schedule and shall be notified of all required inspection points prior to the scheduled date for coating activities (Refer to MR Section 5.0). [Section 5.1.4]

5.1.4 If the SELLER's proposed Work plan or procedures differ from the requirements of this specification, the SELLER shall specifically identify and explain all differences in writing and submit them to the BUYER for review and verification prior to the start of Work (e.g., Supplier Deviation Disposition Request- SDDR). [Section 5.1.5]

5.1.5 All pre-established witness and hold points shall be witnessed by the BUYER unless a written waiver has been issued. [Section 5.1.6]

5.1.6 The SELLER's coating inspectors shall have previous experience in coating inspection and shall receive documented training in the specific project coating requirements, ASTM standards and other relevant standards including the reviewed work procedures. All coating inspectors working on steel items or equipment shall be trained and qualified meeting the requirements of Section 8.1.1.1. [Section 5.1.7]

6 Materials

6.1 Coating Materials

6.1.1 Coating materials including the primer, intermediate and finish coat on a given item, shall all be from the same manufacturer. One exception to this rule is when upgrading a Manufacturer's Standard (Mfg. Std.) coating using a compatible epoxy tie-coat and suitable topcoat coating system (refer to Section 6.2). [Section 6.1.2]

6.1.2 Appendix A tables contain the specified Special Protective Coatings for the WTP project. Appendix A contains the generic coating systems and approved coating materials. [Section 6.1.3]

6.1.3 Repair materials shall be the same as those originally used. Repair materials shall be in pre-measured units, and only complete kits shall be mixed. Splitting or breaking down pre-measured units of multi-component coating materials may be considered if the SELLER prepares a procedure that requires accurate measurement of all materials and Seller's QC inspector monitoring/verification of each and every mix. This procedure must be submitted to the BUYER for review and permission to proceed. [Section 6.1.4]

6.2 Manufacturer's Standard Coating

6.2.1 Components and equipment which are normally mass-produced, inventoried, and supplied from stock generally have been coated with the Manufacturer's Standard Coating (Mfg. Std.) system. Included are small valves, pumps and rotating equipment, filters and electrical equipment such as switchgear, control panels, instrumentation, motors, transformers and electrical enclosures. Items and equipment which are specifically fabricated for the WTP project shall be coated per this specification unless the item is shown to be too delicate to properly coat per the specific requirements contained in the MR. [Section 6.2.1]

6.2.1.1 The SELLER may submit an alternate coating to the specified or Mfg. Std. System, by identifying the coating materials, surface preparation, application and inspection on Appendix D including the coating material's latest published technical data sheet and MSDS, to the BUYER for review and permission to proceed. [Section 6.2.1.1]

6.2.1.2 All Mfg. Std. Coatings must be identified on an Appendix D and submitted to the BUYER along with technical data sheets and MSDS'. A small, easily replaceable item where coating touch-up is not practical (e.g., very small, too delicate, low cost and easily replaceable) and can only be purchased with the manufacturer's standard coating, an Appendix D Manufacturer's Standard Coating Data Sheet is not required. [Section 6.2.1.2]

6.3 Machined-Surfaces Coating

6.3.1 Machined surfaces not specified to be coated with a specific coating system shall be protected with a solvent cutback asphalt temporary preservative (Daubert Chemical Tectyl 891, EF Houghton Chemical Rust Veto 342 or authorized equivalent). Temporary preservative applied to carbon steel that is overlapped onto stainless steel must meet the same chemical requirements as listed in Section 6.4. All equivalents must be identified on an Appendix D form and submitted along with the manufacturer's latest published data sheet and MSDS for review and permission to proceed by the BUYER. [Section 6.3.1]

6.4 Coating Over Stainless Steel

6.4.1 All coating materials, thinners, solvents and cleaning materials used on SS shall be shown to comply with the following requirements:[Section 6.4.1]

Leachable halogen content shall not exceed 200 ppm

The total sulfur content shall not exceed 400 ppm

The total of low melting point metals such as lead, zinc, copper, tin, antimony and mercury shall not exceed one (1) percent. Of this, mercury should not exceed 50 ppm. These low melting metals shall not be intentionally added during the manufacture of the coating.

6.4.2 Sherwin Williams Macropoxy 646 and Carboline Carboguard 890 have been tested and meet the requirements above. Only these materials are approved for direct contact with stainless steel.

6.5 Batch Information

6.5.1 Each container of coating material used by the SELLER shall be marked with the following: [Section 6.5.1]

- The manufacturer's name
- The product designation
- Batch or lot number
- Location and date of manufacture
- The shelf life expiration date

6.6 Abrasives

6.6.1 Abrasives for blast cleaning shall be clean, free of oil or contaminants, and dry. The particle size shall be capable of producing the specified surface profile. Mineral and slag abrasives shall meet the requirements of SSPC AB-1. The first batch/lot of bulk, non-packaged, abrasives shall be tested for water-soluble contaminants and the conductivity shall not exceed 500 micro siemens/cm when tested in accordance with ASTM D4940. As an alternate, a chloride ion test kit, such as the Chlor*Test "A" manufactures by Chlor Rid International Inc, or BUYER accepted equal may be used. The maximum allowable chloride level is 200ppm. [Section 6.6.1]

6.6.2 When using reclaimed steel grit/shot abrasive, the particle size shall be capable of producing the specified angular surface profile (minimum 50% steel grit in original mix and all adds shall be 100% steel grit). Reclaimed abrasives already in use and the first batch/lot of new abrasive shall be tested for water-soluble contaminants and conductivity. Conductivity shall not exceed 500 micro siemens/cm when tested in accordance with ASTM D 4940. As an alternate, a chloride ion test kit, such as the Chlor*Test "A" manufactures by Chlor Rid International Inc, or BUYER accepted equal may be used. The maximum allowable chloride level is 200ppm. [Section 6.6.2]

7 Application

7.1 General

7.1.1 It shall be the SELLER's responsibility to stop the surface preparation and coating at any time when conditions exist that might adversely affect the quality. The BUYER representative may reject any prepared or coated surfaces not in compliance with this specification. [Section 7.1.1]

7.1.2 All painters (e.g., surface preparation personnel and paint/coating material application personnel), shall be individually qualified and certified in accordance with the SELLER's written description that includes classroom training and capability demonstration using the WTP project specification, and the SELLER's procedures as reviewed by the BUYER. [Section 7.1.2]

7.1.3 Care shall be taken to avoid blasting or grinding away critical markings, which identify welders, joint numbers, or other markings, which identify the item. Where such data appears in the area to be coated, it shall be protected. SELLER's are responsible for assuring their sub-suppliers are instructed concerning these requirements. [Section 7.1.3]

7.2 Pre-Surface Preparation

7.2.1 Prior to mechanical cleaning, the surfaces to be coated shall be cleaned in accordance with SSPC SP1 to remove oil, grease, dirt, and other foreign matter that can interfere with the proper bonding of the coating. Any remaining sharp edges, weld spatter, or burrs found after the start of coating Work shall be completely removed by grinding or other means. Pneumatic tools shall not be used unless they are fitted with effective oil and water traps on the exhaust air. If the steel items or equipment was shipped or stored so that the surface could have been contaminated with soluble salts (e.g., above deck ship transport, truck transport on dirt roads close to ocean, storage), the area shall be pressure water washed (2,000-5000psi) with demineralized water to remove as much soluble salt contamination as possible prior to abrasive blasting. [Section 7.2.1]

7.3 Surface Preparation

7.3.1 Prior to the start of Work, the SELLER shall examine all surfaces to be coated to determine their acceptability for the specified coating application. If the surfaces are found to be unacceptable, the SELLER shall return the surface to an acceptable condition. Coating work shall not commence until corrective action has been taken. Commencement of coating work prior to the taking of correctable action shall preclude any subsequent claim by the SELLER. The BUYER may require corrective action at the SELLER's expense. [Section 7.3.1]

7.3.2 Prior to blast cleaning items to be coated, they shall be visibly dry with the surface temperature of at least 5°F above the dew point. When using automatic blasting equipment that recycles steel abrasive, the steel need only be visibly dry. [Section 7.3.2]

7.3.3 All surfaces to be coated shall be pre-cleaned per SSPC SP 1 where oil, grease, and other contaminants are present. [Section 7.3.3]

7.3.4 Abrasives shall meet the requirements of Section 6.6. [Section 7.3.4]

7.3.5 Surfaces to be coated shall be blast cleaned in accordance with the surface preparation requirements specified in SSPC SP10. Where abrasive blasting will damage the items or is impractical, SSPC-SP11 Power Tool Cleaning to bare Metal may be substituted only in limited areas and only with BUYER's permission to proceed (e.g. SDDR). [Section 7.3.5]

7.3.6 Abrasive blasting carbon steel shall result in an angular surface profile 1.5 to 3.0 mils deep as measured using a profile comparator or Testex Press-O-Film replication tape, in accordance with ASTM D4417 method A or C. [Section 7.3.6]

7.3.6.1 Methods established for measuring surface profile produced by abrasive blast cleaning are not valid or conclusive on surfaces that are excessively rough prior to blast cleaning (e.g. rough mill finishes, heavy rusting or pitting [SSPC-VIS 1 Condition D or rougher], cast surfaces, weld beads or physically damaged surfaces). Therefore, to accurately determine the surface profile produced by blast cleaning, profile measurements shall be taken in areas

exhibiting the least surface roughness. For example, SSPC-VIS 1 pre-blast Conditions A, B or C typically result in a blasted surface that is acceptable for surface profile measurement. [Section 7.3.6.1]

7.3.6.2 If excessive surface roughness covers the entire item, then a smooth, clean ASTM A36 steel plate (e.g., SSPC-VIS 1 Condition A, B or C), approximately 6" square and at least $^1/_4$" thick, shall be blasted using the identical abrasive, pressure, nozzle, blasting equipment and method used on the actual item. The surface profile measured on the smooth plate is regarded as an accurate measurement of the profile produced by that blasting method, and shall be recorded as the surface profile for the actual item. A new plate shall be blasted and measured at a frequency accepted in the SELLER'S procedures (refer to Section 8.1.9). [Section 7.3.6.2]

7.3.7 Recycled abrasive blasting using a steel grit/shot mix is acceptable. The maximum amount of shot in the original mix shall be 50%. All additions of abrasive shall be steel grit. The stabilized working mix shall be maintained by frequent small additions of new grit abrasive commensurate with consumption. Infrequent large additions of grit shall be avoided. Steel grit or shot is not acceptable for use on stainless steel surfaces. [Section 7.3.7]

7.3.7.1 The working abrasive mix shall be maintained clean of contaminants by continuous effective operations of cleaning machine scalping and air wash separators. Reclaimed grit used for abrasive cleaning shall be tested for the presence of oil/grease by immersing a sample in clean tap water and checking for oil flotation. Tests shall be made at the start of blasting and at a minimum of every four (4) hours thereafter. If oil is evident, the contaminated abrasive shall be cleaned or replaced. All surfaces blasted since the last successful test shall be completely cleaned of contamination then re-blasted using clean abrasive. [Section 7.3.7.1]

7.3.8 Blast cleaning shall not be performed in the immediate area where coating or curing of coated surfaces is in progress. All surfaces and equipment, which are not to be coated, shall be suitably protected from blast cleaning. [Section 7.3.8]

7.3.9 Burrs, slivers, scabs, lamination, and weld spatter which become visible after blasting shall be removed. The tools and manner employed to remove weld defects and sharp edges shall not burnish or destroy the profile. If the profile or roughness is reduced, it shall be re-blasted to produce the profile and roughness as required. The exhaust of pneumatic grinders shall not impinge on the cleaned surface. If the surface becomes contaminated, it shall be cleaned of contamination and re- blasted. Carbon steel tools or implements specifically employed for coating surface preparation shall not be used on stainless steel surfaces. [Section 7.3.9]

7.3.10 If visible rust occurs or if the cleaned surface becomes wet or otherwise contaminated, these surfaces shall be re-cleaned to the degree specified. Cleaned surfaces remaining uncoated overnight shall be visually reinspected 100% for required cleanliness prior to coating or shall be re-cleaned to the specified cleanliness prior to applying the coating. [Section 7.3.10]

7.3.11 After surface preparation is complete and before coating, pressurized air or a vacuum shall be used to remove all dust and abrasive residue. The air shall be clean and dry as verified in accordance with Section 8.1.6 so as not to contaminate the prepared surface. [Section 7.3.11]

7.3.12 Machined surfaces shall be wiped with clean solvent before the application of coating and shall be protected from damage due to blasting and coating operations. [Section 7.3.12]

7.3.13 Machined portions of pipe flanges and other machined mating faces which will not be exposed after final fit-up shall be masked or covered and protected from surface preparation and coating activities. The remaining part of the flange face and exposed surfaces shall then be blasted and coated (bolt holes need only to be sufficiently coated for visible coverage. No dry film thickness required.). [Section 7.3.13]

7.3.14 Equipment shall have all openings plugged, masked, and/or blinded sufficiently to protect internals before abrasive blasting. After the coating operation is complete all internals shall be blown clean and/or vacuumed to remove any dust or abrasive blast media that may have entered the coated equipment. [Section 7.3.14]

7.3.15 The abrasive mixture and the compressed air shall be clean, dry and oil free. Moisture traps, in addition to oil and water extractors mounted on the compressor, shall be used in compressed air lines to remove oil and moisture from air close to the point of use. (Refer to Section 7.3.7.1 and 8.1.6)[Section 7.3.15]

7.3.16 All valves, valve actuators and motors that will be shop coated shall be blasted and coated prior to assembly. Areas of assembled items that are not coated prior to assembly and subject to damage during blasting must be carefully protected from abrasive damage or abrasive contamination. [Section 7.3.16]

7.4 Coating Application

7.4.1 The coating shall be applied in accordance with reviewed procedures (refer to Section 4.1). The coating manufacturer's recommendations for the application temperature and the curing temperature and times (between coats and after last coat) of the specified material shall become a part of this specification. Application and curing temperatures above or below the limits allowed by this specification (Refer to Section 7.4.4) shall be submitted to the BUYER for review (e.g., SDDR). [Section 7.4.1]

7.4.2 Coatings shall be applied using properly sized and type of equipment for the size & complexity of the item being coated. The equipment shall be clean with all components in good working order. [Section 7.4.2]

7.4.3 Surfaces that will become inaccessible shall be coated before assembly, tagging, fitting, or welding. Inaccessible surfaces includes lap joint flanges, nozzle necks, lap joint stub ends, lap rings, bolt holes, flanges for exchangers and vessels, and welded joints that become inaccessible after assembly. [Section 7.4.3]

7.4.4 Coatings shall be applied only when the surface to be coated is clean and dry. The substrate temperature shall be a minimum of 5°F above the dew point during coating application and until the applied coating is no longer moisture sensitive per the coating manufacturer's published data or written recommendations. The substrate and air temperature during coating application and curing shall be a minimum of 50°F (Inorganic zinc primers 40°F) and a maximum of 110°F. The relative humidity during coating application shall not exceed 85 percent. Measure humidity in accordance with ASTM E 337 (Sections 1.0-19.0) or using an alternate method reviewed and accepted by the BUYER. Deviations from the above listed minimum and maximum substrate/air temperature and humidity limits may be allowed when in accordance with the coating manufacturer's published or written recommendations and are accepted by the BUYER. The one firm limit is that the minimum substrate or air temperature

shall not be less than 35 °F regardless of the coating manufacturer's published or written recommendations. [Section 7.4.4]

7.4.5 The SELLER shall record all batch numbers for each coating component used along with other information necessary for the BUYER to relate the batch to the item for which it was applied. (Refer to Appendix C)[Section 7.4.5]

7.4.6 All coatings shall be thoroughly mixed until they are smooth and free from lumps, then strained through a screen of at least 30 mesh. Zinc filled coatings shall be continuously agitated from the time initially mixed and while being applied. Other coating materials shall be mixed in accordance with the coating manufacturer's published recommendations. All multi-component coating materials shall be in pre-measured units. Splitting or breaking down pre-measured units is not permitted. See Section 6.1.3 for requirements for mixing repair materials. [Section 7.4.6]

7.4.7 Alternating coats shall have a visible color difference to insure full coverage over previous coats. Touch-up of individual small spots < 6 sq. in, do not require a visible color difference when individually marked for repair and the mark remains in place until the repair is accepted. [Section 7.4.7]

7.4.8 Dry film thickness of each coating shall be in accordance with Appendix A/Table 1 Acceptable Coating Materials or as specified in the MR. (Refer to Section 8.3.2 & 8.3.3). [Section 7.4.8]

7.4.9 Relative to the ambient and surface temperatures the minimum and maximum drying times between coats shall be in strict accordance with the coating manufacturer's latest published technical data sheets. [Section 7.4.9]

7.4.10 Runs, sags, voids, drips, overspray, loss of adhesion, bubbling, peeling, or inadequate cure are not permitted. Where possible, defects shall be corrected as detected during application of the coating. [Section 7.4.10]

7.4.11 Spray equipment, brushes and rollers shall be cleaned using only manufacturer recommended solvents/cleaners. [Section 7.4.11]

7.5 Remedial Work

7.5.1 The completed coating on each item shall have the correct dry film thickness and shall be free of damage and visible defects. [Section 7.5.1]

7.5.2 Repair of Dry Film Thickness (DFT) deficiencies
[Section 7.5.2]

7.5.2.1 Defects such as runs, sags, overspray and embedded particles shall be corrected by sanding to remove the defect. When the defects are in the finish coat, all areas sanded must be overcoated with the finish coat. If the DFT of primer or intermediate coat is reduced to less than the specified minimum, the area shall be abraded with 80 grit sand paper or flapper wheel and an additional layer of coating shall be applied until sufficient thickness is achieved. If noticed during application, the sags or runs may be brushed out. [Section 7.5.2.1]

7.5.3 Repair of Damage
[Section 7.5.3]

7.5.3.1 All damaged and loosely adhering coating shall be removed and the surface thoroughly cleaned using 80 grit sanding disc, 80-grit flapper wheel or 3M Clean-N-Strip. Edges of the breaks shall be feathered and the resulting surfaces shall be roughened. The designated number of prime and finish coats shall be applied. [Section 7.5.3.1]

7.5.4 Loss of adhesion, delamination blisters, bubbling and fish eyes in the applied coating require the coating to be removed and reapplied in accordance with this specification. [Section 7.5.4]

8 Inspection

8.1.1 The SELLER shall have the full responsibility for the coating application quality in accordance with this specification and shall be responsible for stopping Work activities when conditions develop that could adversely affect the quality of the completed work. All Work is subject to the BUYER's inspection surveillance. [Section 8.1.1]

8.1.1.1 All coating Work inspection personnel shall be trained, qualified and certified in accordance with the SELLER's reviewed procedures. The inspectors shall meet or exceed the minimum capability requirements for a Level I coatings inspector as described in ASTM D4537 Section 6.2. The SELLER's inspector training, qualification and certification procedures and plan shall include classroom training on the WTP project specification, and the SELLER's reviewed procedures using the guidelines provided in ASTM D5498. The SELLER's inspector must demonstrate his/her capability of using the inspection equipment and performing all the required inspections. Additional coating work inspection guidance is found in ASTM D3276 and ASTM D6237 which may also be used in developing procedures for training and certifying coating work inspectors. [Section 8.1.1.1]

8.1.2 The BUYER representative shall be the final authority on the specification compliance for surface preparation and material application. Any coating, which in the BUYER representative's judgment, has not been applied in conformance with this specification, shall be rejected. [Section 8.1.2]

8.1.3 The BUYER representative shall have access to each part of the process and shall have the right and opportunity to witness any of the Quality Control Tests. [Section 8.1.3]

8.1.4 The SELLER shall furnish the necessary testing and inspection instruments, properly calibrated and maintained. If equipment is suspected of being out of calibration, it shall be re-calibrated and certificates made available for verification to the BUYER. Such equipment shall be available for use by the BUYER in conducting surveillance of the work. Calibration of testing and Inspection instruments shall be traceable to NIST or Buyer authorized alternative standards. [Section 8.1.4]

8.1.5 The SELLER shall halt the coating Work and make corrections to the procedures, as necessary to correct repetitive faults found in the Work. [Section 8.1.5]

8.1.6 Prior to using compressed air, the quality of the air downstream of the separator shall be tested in accordance with the requirements of ASTM D4285 by blowing the air onto a clean white

blotter or cloth for two (2) minutes at a distance of no more than twelve (12) inches to check for any contamination, oil, or moisture. "This test shall be performed at the start of work and every 4 hours thereafter". The test shall also be made after any interruption of the air compressor operation or as required by the BUYER. The air shall be used only if the test indicates no visible contamination, oil, or moisture. If contaminants are evident, the equipment deficiencies shall be corrected and the air stream shall be re-tested. Moisture separators shall be bled continuously. All lines shall be tested individually prior to use. Surfaces determined to have been blown down or blasted with contaminated air shall be cleaned of all contamination then re-blasted with clean air and abrasive. Coatings determined to have been applied using contaminated air shall be removed and reapplied using clean air. [Section 8.1.6]

8.1.7 Inspection points shall be established as follows:
[Section 8.1.7]

- Prior to the start of Work.
- Immediately following the surface preparation
- Immediately prior to the coating application
- Following the application of each coat
- Following the curing of the coating
- Final inspection and sign-off, in accordance with the project requirements

8.1.8 Any defects disclosed by inspection shall be re-inspected after correction.
[Section 8.1.8]

8.1.9 The SELLER shall keep the records indicated below, and submit these records to the BUYER (refer to Section 4.4 and Appendix C). The following lists the frequencies: [Section 8.1.9]

Coating/Inspection Step		Required Frequency
1.	Pre-Surface Prep	100% visual on Pre- Surface
	Surface Preparation	100% on Surface Prep/Cleanliness
	Profile	Profile first item of each type per shift and every 20 items thereafter or other frequency as BUYER accepted in SELLER's procedures.
2.	Environmental/Air Quality	At the start of each work and every 4 hours thereafter or more often during changing conditions.
3.	Recirculated Abrasive	At the start of work and every 4 hours thereafter
4.	Thickness Per SSPC PA2	On large items five (5) spot reading per 100 sq.ft. On items < 100 sq.ft. four (4) spot readings On items less than 4" (valves, fittings, components, etc) two (2) spot readings, For repair spots < 6 sq. inches and > 1 sq. inch. Two (2) spot readings For repair spots < 1 sq. inch one (1) spot reading For small chips/nicks/scratches and pinhole size repair spots need only a visual. For complex surfaces such as structural steel (steel beams) the frequency of dry film thickness readings shall be in accordance with SSPC-PA2 Appendix 3 section A3.4.1 excluding any readings on the flange toes. In accordance with figure A.3 "The Surface of a Steel Beam" the following locations are acceptable for the test readings- 1, 3, 4, 5, 7, 9, 10 and 11; and the following locations are excluded from test readings- 2, 6, 8, 12. For beams less than 20'-0" two (2) sets of 8 spot readings shall be taken. For beams 20'-0" thru 60'-0" three (3) sets of 8 spot readings shall be taken.
5.	Visual on Applied Coating.	100% of all items

8.2 Surface Preparation Inspection

8.2.1 Verify environmental conditions and compressed air quality (refer to Section 7.3.2, 8.1.6). [Section 8.2.1]

8.2.2 Verify recirculated grit is grease and oil free (refer to Section 7.3.7). [Section 8.2.2]

8.2.3 Verify surface cleanliness and profile (refer to Sections 7.3.5, 7.3.6 and 8.1.9). [Section 8.2.3]

8.2.4 Grease free chalk shall be used to mark local areas, which do not meet the specified requirements (e.g., soapstone and crayons are not acceptable). [Section 8.2.4]

8.3 Coating Application

8.3.1 Environmental conditions and compressed air quality shall be verified per Sections 7.3.2, 7.4.4, 8.1.6 and 8.1.9. [Section 8.3.1]

8.3.2 Dry coating thickness (DFT) shall be measured with a magnetic film thickness gage such as an Elektro-Physik "Mikrotest" or Positector 2000, Positector 6000 or BUYER authorized equal in accordance with SSPC PA2. The number and location of dry film thickness readings shall be in accordance with section 8.1.9.4. [Section 8.3.2]

8.3.2.1 The gage shall have an appropriate range that is suitable to measure the thickness expected and record calibration accuracy in accordance with SSPC PA 2 at the start of work, against certified coating thickness calibration standards for non-magnetic coating of steel, traceable to NIST or BUYER authorized alternative standards. The calibration standards shall be in date, and 1.5 mil to 20.0 mil range, unless otherwise specified. [Section 8.3.2.1]

8.3.3 Any surface with a measured thickness outside of the limits described in Section 7.4.8 shall be rejected. These areas shall be reworked or re-cleaned and re-coated at the SELLER's expense. The average of the required number of readings shall be within the specified dry film thickness range. Any of the required spot readings may be as low as 80% of the minimum specified or 120% of the maximum specified as long as the average of all the readings is within the specified range. An individual spot reading that conforms to this criteria conforms to the specified dry film thickness. [Section 8.3.3]

9 Storage, Handling and Shipping of Coating Materials

9.1 Coating Materials

9.1.1 Coating materials shall not be stored in direct sunlight or exposed to inclement weather (e.g. rain, snow, sleet, freezing rain, dew point condensation, see also Section 9.1.4). Materials shall remain under cover until ready to use. [Section 9.1.1]

9.1.2 Coating material shall be delivered in manufacturer's original unopened containers. Each container shall be clearly identified with the manufacturer's name, product designation, batch number, date of manufacture and shelf life expiration date. [Section 9.1.3]

9.1.3 The maximum shelf life allowed for coating materials used on the WTP project is 24 months from the date of their manufacture. Coating materials that are older than 24 months or that exceed the manufacturer's published shelf life, if less than 24months, shall not be used and shall be placed on HOLD and segregated from other coating materials. A one-time shelf life

extension of no less than three (3) months and no more than six (6) months, may be issued by the coating manufacturer. The shelf life extension shall be based on laboratory testing of retain samples taken at the time of manufacture or by testing a sample provided from the actual coating material in question. Where testing verifies an outdated coating material still complies with its original design criteria, it is acceptable for shelf life extension. Expiration date stickers, provided by the coating manufacturer, shall be affixed to each container prior to release from HOLD. The stickers shall include the product number, batch/lot number, the new expiration date and suitably marked to indicate that they came from the coating manufacturer. A new Appendix B shall be provided by the coating manufacturer that includes the test results and specifically indicates it was provided to document shelf life extension including new expiration date. Coating materials that have not been stored or handled in accordance with Sections 9.1.4 through 9.1.7, may not have their shelf life extended. [Section 9.1.4]

9.1.4 Coating material shall be protected from moisture, direct sunlight and temperatures below 40°F or above 100°F unless otherwise allowed by the coating manufacturer's latest published instructions and verified by the BUYER. [Section 9.1.5]

9.1.5 Coating material containers where the airtight seal has been broken or any of the contents are lost, shall not be used and shall be clearly marked and segregated from useable coating material. [Section 9.1.6]

9.1.6 Coating material containers shall not be opened except for immediate use. [Section 9.1.7]

9.1.7 Unused material shall be returned to storage as soon as possible at the end of each Workday. Materials left out for more than eight (8) hours in an uncontrolled storage area (areas without environmental controls that are exposed to ambient weather) shall not be used and shall be clearly marked and segregated from useable coating material. [Section 9.1.8]

9.1.8 All required coating material certifications (Appendix B forms) for each batch of material delivered to the SELLER shall be available at the time of material receipt. Materials delivered to the shop without the required documentation shall not be used and the SELLER shall tag and place discrepant materials into a hold area clearly separated from acceptable material. Once required documentation is received or otherwise corrected and found to be acceptable, the discrepant material may then be taken off hold status and used. [Section 9.1.9]

9.2 Steel Items and Equipment

9.2.1 The SELLER shall be solely responsible for the condition of the steel items and equipment from the time they are received until they have been delivered to the BUYER. [Section 9.2.1]

9.2.2 All booms, hooks, clamps, forks, supports, and skids used in handling or storing coated items shall be designed and maintained in such a manner as to prevent any damage to the items or to the coating and shall be reviewed by the BUYER's representative. Chains and wire rope in direct contact with the coated items are not acceptable. Fabric lifting and tie down straps shall be used. [Section 9.2.2]

9.2.3 The SELLER shall inspect all items upon receipt for shipping and handling damage. Any visible damage observed at this point shall be noted on the receipt inspection report. [Section 9.2.3]

9.2.4 All coated steel items and equipment shall be stored on padded supports as necessary to preclude damage to the coating. The supports shall be properly spaced and leveled. [Section 9.2.4]

9.2.5 The BUYER's representative will have authority to stop any storage or handling activity, if there is a possibility of damage to the coating. [Section 9.2.5]

9.2.6 All steel items and equipment damaged by the SELLER shall be repaired in accordance with the specification at the SELLER's expense. Only repair procedures reviewed by the BUYER shall be used. [Section 9.2.6].

10 Documentation

10.1 The SELLER shall provide a record of all materials used (related to individual batch number- refer to Appendix B). [Section 10.1, 24590-WTP-3PS-AFPS-T0001, rev 4]

10.2 The SELLER shall provide a record of all required daily inspections (Example- Appendix C) that includes pre-surface preparation, compressed air cleanliness, environmental conditions, surface preparation and roughness, location of field repairs coated, application, visual inspection, dry film thickness, holiday testing and all touch-up/repair. This record shall include the coating and thinner materials used and the ID of the items coated to provide traceability. [Section 10.2, 24590-WTP-3PS-AFPS-T0001, rev 4]

10.3 All quality documentation shall be available for review by the BUYER representative within 24 hours from the time it is generated. [Section 10.3, 24590-WTP-3PS-AFPS-T0001, rev 4]

10.4 SELLER documentation forms or the way that the actual Work will be documented shall be provided by the SELLER as part of the procedures submittal for review by the BUYER. [Section 10.4, 24590-WTP-3PS-AFPS-T0001, rev 4]

Appendix A Coating Materials/Coating Systems

TABLE 1 - PREQUALIFIED COATING PRODUCTS

Coating Number	Generic Products	Dry Film Thickness (mils)	Carboline	Sherwin Williams
P04	High Build Epoxy	4.0-6.0	Carboguard 890	Macropoxy 646

NOTES to Table 1, Appendix A:

1) All versions of the above coating materials shall comply the WTP project VOC requirements of 3.8 lbs./gal and shall also comply with more restrictive local VOC requirements where the work is being performed. In the event the listed coating materials or acceptable versions of the listed coating materials do not meet the local VOC requirements an alternate VOC compliant material may be submitted for review.

TABLE 2 – COATING SYSTEM CODES

SYSTEM CODE	H
COAT 1	P04
COAT 2	P04
COAT 3	
COAT 4	

NOTES to Table 2, Appendix A:

1) The surface preparation for all coating systems shall be SSPC SP10 Near White Blast with a surface profile of 1.5 to 3.0 mils unless otherwise noted in this specification or the material requisition. For coating repairs, surface preparation shall be in accordance with SSPC SP11.

*1a) System Code H shall be used for all carbon steel of the mounting frame/support structure. Some overlap onto the stainless steel fan housing is acceptable, but coating of stainless steel should be avoided. Finish color shall be ANSI 70 Gray.

*1b) Motor housing may be coated with System Code H or a Manufacturer's Standard epoxy coating system consisting of two coats. The vendor shall provide a completed Appendix D, product datasheets and MSDS for each component of the Manufacturer's Standard coating material (refer to Section 6.2.1) Finish color shall be ANSI 70 Gray.

Appendix B Coating Manufacturer's Product Identity Certification Record

Project Name: _____ Coating Manufacturer: _____
Project Number: _____ Purchase Order Number: _____
Project Location: _____ Contract Number: _____
Coating Applicator: _____ Generic Coating Type: _____
Product Name: _____ Product Number: _____

(For multi-component products, provide data for all components on one or more Appendix B forms).
(Provide the standard range and actual batch values for each test)

TEST RESULTS		**Component A Batch No.**		**Component B Batch No.**	
Test	**Test Method Used**	**Standard Range**	**Batch Actual**	**Standard Range**	**Batch Actual**
Weight per Gallon					
Viscosity					
Flash Point (Typical)					
% Solids by Volume (Typical)					
Cure to recoat time @ 50F, 70F, & 90F (typical)					
Batch Size					
Date of Mfg.					
Shelf Life					
Expiration Date					

COMMENTS:

I hereby certify that the coating materials described above were manufactured with the same formulation, raw materials, production methods, and quality control standards as the coating materials originally tested and/or accepted for use at the River Protection Project-Waste Treatment Plant (WTP) Project site, located in the 200 East Area of the Hanford Site in Washington State in accordance with the requirements of WTP specification 24590-WTP-3PS-AFPS-T0001, 24590-WTP-3PS-AFPS-T0003,24590-WTP-3PS-AFPS-T0004, 24590-WTP-3PS-AFPS-T0006 and 24590-WTP-3PS-PX04-T0004.

Signed: _____ Date: _____
Title: _____ Company: _____

Appendix C Surface Preparation and Coating Inspection Form

Page __ of ___

REPORT NO:_____ DATE: _____
PROJECT:_____ DAY: M T W T F S S
SUBCONTRACTOR/SELLER:_____ SHIFT: _____
EQUIPMENT/AREA:_____ INSPECTOR: _____
SUBSTRATE: STEEL/CONCRETE/OTHER- _____ COATING SPEC NO/REV:_____
ENVIRONMENTAL CONDITIONS:

WORK ACTIVITY						
TIME						
DRY BULB TEMP. °F						
WET BULB TEMP. °F						
RH %						
DEW POINT °F						
SURFACE TEMP. °F						
BLOTTER TEST						

PRE-SURFACE PREPARATION:
SP-1:_____ MASKING/PROTECTION:_____ SURFACE DEFECTS:_____

SURFACE PREPARATION:
METHOD:_____ ABRASIVE TYPE/SIZE/STORAGE:_____
CLEANLINESS SPEC:_____ ACTUAL:_____PROFILE SPEC:_____ ACTUAL:_____
EQUIPMENT:_____

COATING MATERIALS & MIXING:
PRODUCT(S)_____
BATCH NO(S)/QUANTITIES/EXPIRATION DATE:_____/_____/_____
THINNERS/THINNING RATIO:_____/_____/_____
STORAGE:_____ MIXING: _____ INDUCTION TIME:_____
MATERIAL TEMPERATURE:_____ POT LIFE EXPIRATION TIME:_____
COATING/LINING APPLICATION START TIME:_____ FINISH TIME:_____
COAT: PRIMER/PRIMER T.U./SECOND/SECOND T.U./THIRD/THIRD T.U./OTHER
METHOD:_____ WFT:_____ RECOAT TIME/TEMP:_____ CURE TIME/TEMP:_____
EQUIPMENT:_____

APPLIED COATING:
VISUAL INSPECTION (FILM IMPERFECTIONS):_____
DRY FILM THICKNESS: SPEC:_____ ACTUAL:_____ METHOD:_____
HOLIDAY TEST:_____ METHOD:_____ OTHER TESTING:_____ METHOD:_____
TOUCH-UP AND REPAIR:_____ FINAL CURE:_____

COMMENTS: (*Use reverse side or attach extra pages*)

_____/_____
INSPECTOR'S SIGNATURE/DATE

Appendix D Manufacturer's Standard Coating Data Sheet

The SELLER proposes the following Manufacturer's Standard (Mfg. Std.) or alternate coating system that is suitable for the exposure conditions of steel items and equipment in radiation and non-radiation areas.

1. **^Equipment Description:** _____
   - A. Tag Number _____
   - B. Part(s) i.e. skirt, shell, channels, lugs, etc.* _____
   - C. Design/Operating Temperatures, designate °F or °C..... _____ °F _____ °C
   - D. Does Equipment Receive Steam out (Yes/No), Temperature _____ °F _____ °C
   - E. Insulated/Uninsulated _____
   - F. Fireproofing (Yes/No) _____
   - ^G. Carbon Steel (CS), Stainless Steel (SS), other (List) _____
2. **^Seller:** _____
3. **^Surface Preparation:** SSPC No./Profile _____ / _____
4. **Coating System Designation:** (Code)

	First Coat	Second Coat	Third Coat
^A. Type of Coating.....			
^B. Coating Mfg./No.**			
^C. Dry Film Thickness (Min/Max in mils)/(µm) ...			
D. Wet/Film Thickness (Min/Max in mils)/(µm)			
E. Curing Method.....			
^F. Color.....			
G. Dry to Recoat.....			
H. Pot Life.....			
L. Thinner / %.....			

5. **Total DFT of System:** (Mils/µm)(Min/Max) ..... _____ / Min. _____ / _____ Max.
6. **Material Storage:** Temperature Requirements (Min/Max) _____ / _____
7. **Shelf Life:** _____ Months
8. **Application Environmental Limits:**
   - A. Temperature Ambient and Surface (Min/Max) _____ / _____ _____ / _____
   - B. Humidity (Min/Max) _____ / _____
   - C. Surface Temp ≥5°F above Dew Point temp. (Yes/No) _____
9. **Protection of surfaces that will be inaccessible after equipment installation (such as underside of base plates, interior of fans, vessels or equipment housings)** _____
10. **Rust Preventative for machined faces:** (**Mfg./No.) _____
11. **Quantity of touch-up coating supplied:** _____ ***None***
12. **Additional information:** (attach extra page as necessary) _____

* Use additional copies of this form for each part described in 1 above that requires a different coating system. A completed copy of this data sheet shall be submitted to CONTRACTOR/BUYER with the initial vendor data submittal.

** Include manufacturer's technical data sheets and MSDS for each proposed coating & preservative.

^ Mandatory data entry. Other entries should be completed where information is available from sub vendor or from coating material technical data sheets.