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Section 10 of 13

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PROJECT:	Final DBVS Design	145579-V-SP-004	REV. 4
PROJECT NO:	145579	EXHAUST FANS	
CLIENT:	AMEC E&E - Richland, Washington		

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**APPENDICES**

- A Control of Suspect/ Counterfeit Items (TFC-ESHQ-Q\_C-C-03)
- B Exhaust Fan requirement schedule per AG-1, Section BA, Fans and Blowers

**ATTACHMENTS**

- 145579-V-DS-004.1 Exhaust Fan Data Sheet
- 36-VIT-515 Vibration Transmitter
- 36-TE-516 Resistance Temperature Detector
- 36-VIT-518 Vibration Transmitter
- 36-TE-519 Resistance Temperature Detector
- F-145579-36-V-0007 Off Gas Area – Scrub & Stack Area Plan
- H-14-106796 Off Gas Area – FDNS Plans & Sections

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**ABBREVIATIONS AND ACRONYMS**

°C	Degrees Celsius
°F	Degrees Fahrenheit
µm	Micrometers
AC	Alternating Current
AMCA	Air Moving and Control Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society of Nondestructive Testing
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWS	American Welding Society
CFR	Code of Federal Regulations
CH2M HILL	CH2M HILL Hanford Group, Inc.
CoC	Certificate of Conformance
CWI	Certified Welding Inspector
DBVS	Demonstration Bulk Vitrification System
DOE	Department of Energy
ft <sup>3</sup>	Cubic Feet
hp	Horsepower
Hz	Hertz
IEEE	Institute of Electrical and Electronic Engineers
lb	Pound
lbm	Pound Mass
mA	Milliamp
MCS	Monitoring and Control System
mph	Miles Per Hour
NCR	Nonconformance report
NDE	Nondestructive Examination
NEC	National Electrical Code

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NEMA	National Equipment Manufacturers Association
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
NOx	Oxides of Nitrogen
NQA	Nuclear Quality Assurance
OGTS	Off Gas Treatment System
PLC	Programmable Logic Controller
psig	Pounds Per Square Inch Gauge
PVC	Polyvinyl Chloride
QA	Quality Assurance
RGS	Rigid Galvanized Steel
SAE	Society of Automotive Engineers
SOx	Oxides of Sulfur
SS	Stainless Steel
TBD	To Be Determined
TEFC	Totally Enclosed Fan Cooled
TM	Trademark
UBC	Uniform Building Code
UL	Underwriters Laboratories
V	Volt
vol	Volume



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## 1.0 SCOPE

### 1.1 PURPOSE

AMEC is part of a team that has been selected by the CH2M HILL Hanford Group, Inc. (CH2M HILL) to design, fabricate, test, and deploy a Demonstration Bulk Vitrification System (DBVS) to receive, dry, and immobilize waste from an underground storage tank located in the 200 West Area of the Hanford Nuclear reservation. A main subsystem of the DBVS is the Off-Gas Treatment System (OGTS). The primary function of the OGTS is to filter radioactive particulate and reduce NOx and SOx emissions produced from the melt process. A major component of the OGTS are Off-Gas Exhaust Fans or blowers that will provide large negative pressures in order to transport the off gas exhaust through the extensive series of filtration devices and then push it through the off-gas exhaust stack.

Throughout this specification, Contract Responder shall act as the Seller and AMEC shall act as the Buyer.

Any discrepancies noted in this specification or between this specification and other documentation shall be noted and referred to the Buyer for resolution before proceeding with design or fabrication of the item in question.

### 1.2 SCOPE OF SUPPLY

The Seller's Scope of Supply shall include, but not be limited to, the design, analysis, fabrication, inspection, testing, documentation, packaging, and shipping of the following components associated with the Exhaust Fans. All equipment shall be mounted on a common mounting skid for operation.

**Fans** – The Exhaust fans or blowers

**Fan Motor** – TEFC housing, NEMA rated

**Fan Drive** – Direct drive or belt drive

**Safety Guards** – To enclose all moving parts, attached to mounting base.

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**Mounting base** – Vibration isolating, rigid steel frame, motor slide base, to mount fan and motor, also referred to as 'skid'.

**Flange Connection** – The Seller shall provide a flexible inlet and exhaust duct connection along with details.

**Factory Acceptance Testing** – and associated test reports

**Field Support and Start-up Assistance** – Seller to provide per diem rates for technical field support during construction and system start-up.

**Special Tools** – Seller to provide special tools, lifting spreader bars, maintenance tools or equipment required to service, maintain and operate the Exhaust Fans.

**Work not included** in the Seller Scope of Supply is as follows:

- (a) Site installation of Exhaust Fans.
- (b) Design and manufacture of connecting systems to and from the Exhaust Fans to the rest of the OGTS such as, process off-gas stream ducting, any electrical supply, starters, local pushbuttons, local disconnect switches, MCS and PLC connections.

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## 2.0 APPLICABLE DOCUMENTS

Documents applicable to the work scope are shown in Table 2-1 and Table 2-2. The latest issue and addenda to the documents in effect at the time of procurement (unless otherwise specified) shall apply and form a part of the basis of design for this specification to the extent specified in the applicable sections of this document. In the event of a conflict between documents referenced herein and the requirements of this specification, the requirements of this specification shall take precedence. All conflicts shall be brought to the attention of the Buyer for resolution.

## 2.1 GOVERNMENT DOCUMENTS

Table 2-1: Applicable Government Documents

Code/Standard	Title
10 CFR 830	Nuclear Safety Management
29 CFR 1910	Occupational Safety and Health Standards – Code of Federal Regulations
47 CFR 15	Code of Federal Regulations, Telecommunication, Federal Communications Commission, Radio Frequency Devices.
DOE-RL-92-36	Hanford Site Hoisting and Rigging Manual

## 2.2 NON-GOVERNMENT DOCUMENTS

Table 2-2: Applicable Non-Government Documents

Code/Standard	Title
AFBMA 9 or 11	Anti-friction Bearing Manufacturers Association
AMCA 201, 210, 300	Fans and Systems
AMCA 204	Balance Quality and Vibration Levels for Fans
ANSI C63.16	American National Standard Guide for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment
ASCE 7-98	<i>Minimum Design Loads for Buildings and Other Structures</i> , American Society of Civil Engineers, Reston, Virginia.
ASME AG-1	Code on Nuclear air and Gas Treatment
ASME B18.2.1	Square and Hex Bolts and Screws, Inch Series
ASME B30.20	Below-The-Hook Lifting Devices

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Table 2-2: Applicable Non-Government Documents

<b>Code/Standard</b>	<b>Title</b>
ASME NQA-1-1994* (See Note at end of Table)	Quality Assurance Requirements for Nuclear Facility Applications
ASNT-TC-1A	American Society for Nondestructive Testing - Recommended Practice
ASTM A193	Standard specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A194	Standard specification for Carbon and Alloy Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A307	Standard specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A354	Standard specification for Quenched and Tempered Alloy Steel Bolts, Studs and other Externally Threaded Fasteners
ASTM A36	Standard specification for Structural Steel
ASTM A563	Standard specification for Carbon and Alloy Steel Nuts
ASTM F436	Standard Specification for Hardened Steel Washers
AWS D1.1	Structural Welding Code – Steel
AWS D1.6	Structural Welding Code – Stainless Steel
HNF 2962	List of EMI/EMC Requirements, Numetec Hanford Corporation for Fluor Daniel Corporation Hanford, Inc, Richland, WA
HNF-SD-GN-ER-501	Natural Phenomena Hazards, Hanford Site, Washington
IEEE C62.41	IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
IEEE Std C37.90.2	Standard for Withstand Capability of relay Systems to Radiated Electromagnetic Interference from Transceivers
ISA 5.1	Instrument Symbols and Identification
NEMA MG-1	Motors and Generators
NFPA 70	National Electric Code
TFC-ENG-STD-12	<u>Tank Farm Equipment Identification Numbering and Labeling Standard</u>
SAE J429	Mechanical and Material Requirements for Externally Threaded Fasteners
SAE J534	Lubrication Fittings
UBC 1997	Uniform Building Code

\*The relevant requirements of NQA-1 are included in Section 4.0

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### 3.0 TECHNICAL REQUIREMENTS

The following section is a proposed process description of the Exhaust Fans system and components. The Seller shall provide a similar process operating description, including the calculated operating temperatures for their equipment, if their equipment deviates in operation from that described below.

See Technical Data Sheet 145579-V-DS-004.1 for complete list of inlet conditions and exhaust requirements.

### 3.1 ITEM DEFINITION

The Exhaust Fans will provide the negative pressure to move the exhaust gas through the OGTS.

#### 3.1.1 Item Diagram

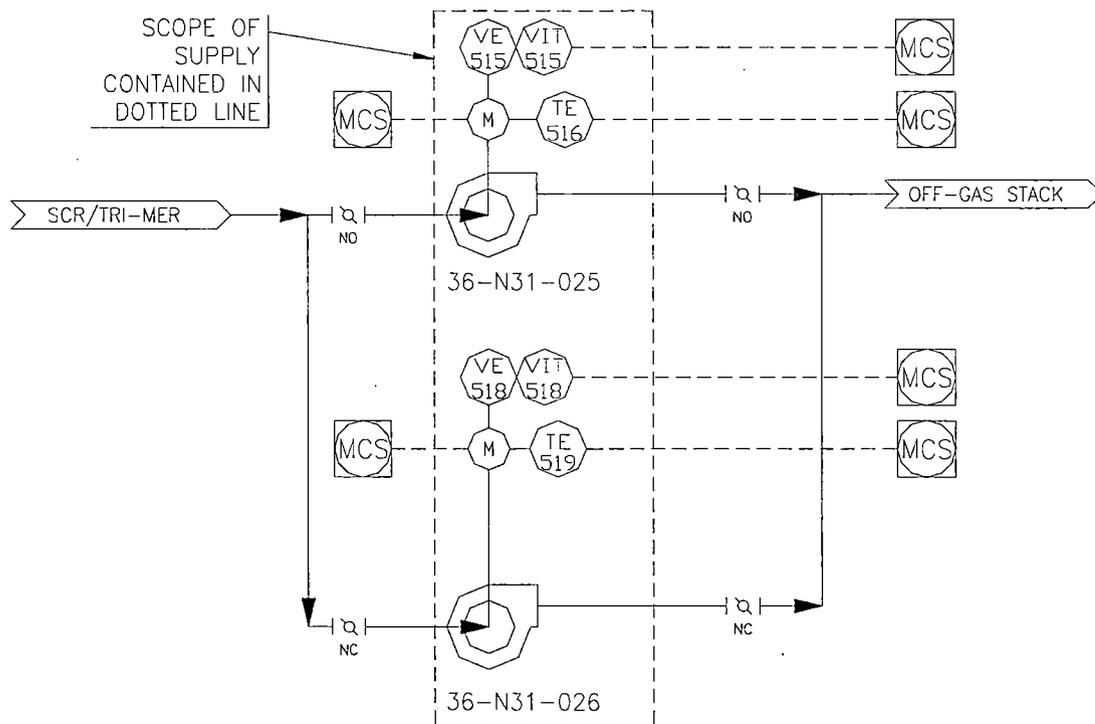


Figure 3-1: Exhausts Fan System Diagram

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### 3.1.2 Interface Definition

The Seller shall provide actual power requirements and performance specifications in their proposal.

Any utility or instrumentation connections shall be specified and brought out to a common interface point on the drive base.

## 3.2 CHARACTERISTICS

### 3.2.1 Functional Characteristics

As specified on the Technical Data Sheet, 145579-V-DS-004.1. Table 3-2 lists air stream properties.

Table 3-1: SCR Outlet Air Stream Properties

Properties	Data
Design Air Flow Rate	11,400 acfm nominal[USN1]
Estimated Temperature <sup>(a)</sup>	248 °F
Estimated inlet Pressure <sup>(a)</sup>	-120 in. w.g.
Relative Humidity	100%
Chemical Components	SO <sub>2</sub> = 1.1 ppmV NO <sub>x</sub> = 92 ppmV HCl = 0.1 ppmV

ppmV = parts per million by volume.

w.g. = water gauge.

<sup>(a)</sup>The Seller shall verify design conditions based on performance criteria of selected equipment.

The Exhaust Fan housings shall be pressure and leak tested per AG-1 section BA 5142 assuming atmospheric suction pressure to the fans.

### 3.2.2 Physical Characteristics

The Exhaust Fans shall be drive base mounted, and not exceed the footprint shown on the drawing, H-14-106796. If the footprint is not configuration friendly, please provide the proposed footprint in the sellers proposal.

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### 3.2.3 Reliability

The Bulk Vitrification plant is expected to operate 24 hours per day, 7 days per week. Service work will be done during scheduled downtimes. The service life is 2 years and the operating life is 5 years.

### 3.2.4 Maintainability

Maintainability characteristics of the design (lubrication, parts replacement and repair, spares, modular construction, test points, etc.), should include, but not be limited to, the following:

- (a) Maintenance and Repair Cycles - Expected inspection of the Exhaust Fans will be once per week by the Buyer. The Seller shall provide typical maintenance schedule.
- (b) Spares and Spare Parts - The Seller shall identify recommended spares and spare parts.
- (c) Service and Access - Exhaust Fans shall be designed for ease of service (access openings/spacing, self-test capability, inspection windows, test fixtures, sealed bearings, etc.). The Seller shall identify requirements for service (remove and replace only, bench repair, special tools, remote handling/maintenance, etc.).
- (d) The casing shall be of split design to permit removal of the impeller without dismantling ductwork.

### 3.2.5 Environment

This equipment is to be operated outdoors. Any equipment and related enclosures installed outside shall be designed to operate and be stored in the climatic and environmental conditions listed below, and UBC 1997

- (a) Ambient air temperature range is -25°F to 115°F;
- (b) Relative humidity ranges from near 0 to 100%;

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- (c) Maximum precipitation is 2.5 inches in a 24-hour period;
- (d) Sand and dust concentrations are  $1.10 \times 10^{-5}$  lbm/ft<sup>3</sup> with a typical size of 150  $\mu$ m;
- (e) Solar radiation is expected to be a maximum 900 Langley's over a 12 hr period;
- (f) Three – second gust wind velocity of 85 mph “3-second gust wind velocity” and importance factor of 1.15 and exposure category C (ASCE 7-98)..
- (g) UBC 1997 section 1632, equation 32-2, seismic zone 2B, soil profile Sc, and occupational category 1.

### **3.2.6 Transportability and Storage**

The Exhaust Fans shall be sized for transport using local roadways and freeways (i.e., less than 14 feet tall, 8 feet 6 inches wide, and 53 feet long; while mounted on the transport trailer). The system shall be separated into the largest components/sections (if necessary) to minimize system teardown time, readying for transport, and reassembly effort.

Parts removed for transport shall be match marked for assembly upon delivery.

### **3.2.7 Safety**

The Exhaust Fans shall be designed to maintain the safety of operators, general public, and equipment. The Seller shall provide all necessary guards, lockouts, and other safety equipment for safe operation.

## **3.3 DESIGN AND CONSTRUCTION**

The Seller shall provide all design calculations necessary for the Exhaust Fans, which includes, but is not limited to, motor-sizing calculations, drive components sizing calculations, motor current starting calculation, electrical system calculations (i.e. load, voltage, and fault), pressure calculations and structural calculations. Fan housing shall be design to withstand winds and seismic forces per Natural Phenomena Hazard without loss of integrity. Calculations shall be

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submitted to the Buyer in accordance with the Technical Data Sheet, 145579-V-DS-004.1. The Seller shall provide all design drawings necessary for the Exhaust Fans which includes, but is not limited to, drawing outlines, interface drawings, electrical wiring diagrams, control elementary diagrams, electrical equipment layout, duct/pipe support drawings, dimensional drawings, structural framework drawings, rigging sketches, and as-built drawings.

Design drawings shall be provided as per the attached bidder drawings and documentation form. Drawings shall show all details of construction, accessories, and loading including but not limited to the following:

- Empty weight, static and dynamic loads
- Location of name plate and data to be stamped on it (see Section 3.3.8)
- Necessary structural details and dimensions
- Location of any necessary ductwork and electrical connections.

Seller shall provide following information:

- Equipment schedules
- Fan performance Curves showing CFM
- Static pressure
- Fan RPM
- BHP
- Efficiencies.

### **3.3.1 Parts/Materials/Processes**

The Exhaust fans shall be designed to fit on the concrete pad as detailed in attached drawings F-145579-V-007 and H-14-106796 (see section 3.2.2).

#### **3.3.1.1 Casing**

The casing material shall be in conformance with the ASME or ASTM materials listed in AG-1 Table BA-3100 and the structural requirements of AA-4000.

A quick-release cleanout/inspection door shall be provided at mid-scroll height.

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### 3.3.1.2 Drive Guard

The drive guard shall be fabricated of steel frame and steel sheet or expanded metal, of closed top and bottom design meeting appropriate safety standards, and shall have an access port for the measurement of fan RPM.

### 3.3.1.3 Electrical

Design and installation of electrical equipment shall be in accordance with the NFPA 70 "*National Electric Code (NEC)*" and IEEE "*Institute of Electrical and Electronics Engineers*" standards listed in Table 2-2. The motors shall meet the requirements of NEMA MG-1 The Exhaust Fans shall be labeled by a nationally recognized testing laboratory, AMCA rated, or inspected and passed by the CH2M Hill Hanford Inspector.

#### 3.3.1.3.1 Conduit

Rigid galvanized steel (RGS) or electrical metallic tubing (EMT) conduit shall be used. RGS or EMT shall be UL approved, standard weight, electro-galvanized steel, ½ inch minimum size for control wiring and ¾ inch minimum for power wiring.

- (a) Liquid tight flexible metallic conduit shall be installed where flexible conduit is required such as when connecting to vibrating equipment. Liquid-tight flexible conduit shall be grounded type with a Polyvinyl Chloride (PVC) jacket.
- (b) Conduit fittings shall be standard steel threaded, liquid-tight, type RGS fittings.
- (c) EMT fittings shall comply with provisions in NFPA 70.

#### 3.3.1.3.2 Wire and Cable

- (a) Conductors shall be stranded copper for all sizes of wire and cable.
- (b) Wire insulation shall be Type THHN (heat resistant thermoplastic) / THWN (moisture and heat resistant thermoplastic) for all 600V conductors.

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- (c) Minimum size of power conductors, 600V and below, shall be No. 12 AWG. Conductors shall be de-rated as required by NFPA 70 for proximity to heated equipment and summer outdoor ambient conditions specified in Section 3.2.5.
- (d) Conductors for control circuits shall be No. 14 AWG minimum, except that remote control circuits, signaling circuits, instrumentation, and power limited circuits may be sized smaller in accordance with the National Electric Code (NEC).
- (e) Power wiring for single-phase systems (120/240 V) shall have color-coded insulation as follows: Hot = Black, Brown; Neutral = White or Gray; Ground = Green or Bare.
- (f) Power wiring for 3-phase systems (480 / 277 V A, B, C) shall have color-coded insulation as follows: Red, Yellow, Blue; Ground = Green or Bare, Neutral = White or Gray.
- (g) Instrumentation cable shall be 600V, multi-conductor for discrete signals, flame retardant, jacketed cable suitable for installation in wet or dry locations. Conductors shall be #18 AWG stranded, copper, in twisted pairs/triads with ethylene propylene insulation. Each pair/triad shall be shielded with a drain wire and metallic tape. Multi-pair cables shall have an individual shield and an overall shield of metallic tape and drain wire. Conductor color-coding shall be black, white (and red if triad). Temperature rating shall be 194°F. Each pair/triad shall be numbered for simplified termination.
- (h) Control and power multi-conductor cable shall be 600V, flame resistant, radiation resistant, jacketed cable suitable for wet or dry locations. Conductors shall be stranded copper with cross-linked polyethylene ethylene propylene insulation with a temperature rating of 194°F.

### 3.3.1.3.3 Wire / Cable Markers

Conductors shall be identified with white heat shrink tubing with indelible black typed on letters. Hand lettered labels shall not be used.

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#### 3.3.1.3.4 Junction Boxes

Junction boxes shall be NEMA 4 rated.

#### 3.3.1.4 Instrumentation and Installation

In general, all instrument transmitters shall provide an isolated 4-20 mA signal to the MCS. Instruments, tubing, piping, and wiring shall be installed in accordance with the instrument manufacturers recommendations and the best practice for the industry. Purchasing and installation of the MCS input/output modules are not included in this contract. Local indicating instruments/sensors shall be installed so they are easily readable by an operator standing on the ground. The Buyer shall provide guidance with positioning based on best available knowledge of the configuration.

Certificates of calibration shall be provided with all instruments in the final data package and shall include the instrument accuracy and drift. When purchasing instrumentation, the instrumentation shall be in accordance with the data sheets provided by Buyer, or Buyer will provide the necessary instrumentation. The Seller shall provide the data sheets to the component Manufacturer. Recommended field re-calibration procedures shall also be provided in the final data package along with a list of special tools required for recalibration.

#### 3.3.1.5 Mechanical Assembly Requirements

All equipment shall be assembled to the structural frame observing the equipment Manufacturer's recommended assembly instructions. During fabrication, the Seller shall submit all fabrication redline changes to the Buyer for review and approval before implementation of the change with the exception of any minor red-line changes that do not affect form, fit, or function of the equipment. The Seller shall submit as-built drawings as well as final redlined fabrication drawings to the Buyer with delivery. The Seller shall denote mounting configuration and details on the redlined fabrication drawings.

The Seller shall provide Owner's Maintenance and Operation Manuals in "hard copy" and in electronic format.

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The technical documentation shall also be bound in 3-Ring Binders, complete with Indexed Tabs, Table of Contents, drawings, illustrations, catalog cuts, etc.

OM manuals shall include recommended Spare Parts with catalog identifications and points of contact/addresses & telephone numbers, detailed operating and maintenance instructions.

### 3.3.1.6 Materials

The Seller shall select materials based upon acceptable performance of materials subjected to the chemical exposures. All parts and materials shall be new. All parts shall be made of corrosion-resistant materials that are suitable for this environment. Material selection shall be identified in the Seller documents to the Buyer.

Material type and grade shall be clearly identified on the bill of materials. Certificates of Conformance (COCs) are required for all materials coming in contact with the air stream. Structural steel shall be ASTM A36 "Standard specification for Structural Steel" or better.

Exhaust Fans materials in contact with the air stream shall be compatible with the conditions identified on Technical Data Sheet, 145579-V-DS-004.1. No aluminum or "yellow" metals are to be used. No beryllium shall be present. Exposed polymer materials shall be constructed of anti-static materials.

### 3.3.1.7 Fasteners

No fasteners shall be capable of vibrating loose under operating conditions. All such joints should be tack welded or have some equivalent means of assurance of remaining intact. Double-nutting is not an acceptable method of securing fasteners. Loctite<sup>®1</sup> threadlock may be used where applicable.

Stainless steel bolts, cap screws, and washers shall be per ASTM A193 "Standard specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service" Grade B8, and nuts shall be heavy hex nuts per ASTM A194 "Standard specification for Carbon and Alloy Nuts for Bolts for High-Pressure and High-Temperature Service" Grade 8. Bolts and cap screws shall be

<sup>1</sup> Loctite<sup>®</sup> is a registered trademark of Henkel Corporation

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grade marked. Carbon-steel bolts shall be per ASTM A307 "Standard specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength" or better, nuts per ASTM A563 "Standard specification for Carbon and Alloy Steel Nuts," Grade C Heavy Hex, and washers per ASTM F436 "Standard Specification for Hardened Steel Washers."

All graded fasteners shall conform to ASME B18.2.1 "Square and Hex Bolts and Screws, Inch Series," Society of Automotive Engineers (SAE) J429 "Mechanical and Material Requirements for Externally Threaded Fasteners", and ASTM A354 "Standard specification for Quenched and Tempered Alloy Steel Bolts, Studs and other Externally Threaded Fasteners."

The Seller shall select fasteners where they are not specifically called out in this specification using the following guidance:

- (a) Anti-galling compound (e.g., Loctite® 8013 or 8009) shall be applied where stainless-steel bolts are used.
- (b) Stainless-steel bolts, nuts, and washers shall be used when the mating parts are stainless steel.
- (c) Carbon-steel bolts, nuts, and washers shall be used where mating parts are not stainless steel.
- (d) The Seller shall ensure that suspect/counterfeit fasteners and components are not used for the construction of the Exhaust Fans assembly and its components. Suspect fasteners can be identified by the following inspection methods:
  - (i) Head markings are marred, missing, or appear to have been altered,
  - (ii) Threads show evidence of dressing or wear (threads should be of uniform color and finish),
  - (iii) Head markings are inconsistent with a heat lot, and
  - (iv) Head markings matching one of those identified on the United States Customs Service, "Suspect Headmark List", in Appendix A.

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### 3.3.1.8 Gaskets

Flanged connections shall be appropriate for the temperature and sealing application of the system to which they will be sealing. The Seller shall provide manufacture-cut-sheets and application data for gaskets during the design for Buyer approval.

### 3.3.1.9 Welding

Certified welders shall perform welding of all structural steel in accordance with American Welding Society (AWS) D1.1 "*Structural Welding Code – Steel*" or AWS D1.6 "*Structural Welding Code – Stainless Steel*" (depending on material). Welding Procedures, Procedure Qualification Records, and Welder Procedure Qualification Records shall be submitted for review and approval to the Buyer before welding is performed.

#### 3.3.1.9.1 Allowable Welding Methods

Welding of all stainless steel, including but not limited to structural shapes, rectangular tubing, plate, and sheet shall be performed in accordance with AWS D1.6 nontubular, statically loaded conditions.

Welding of all carbon steel, including but not limited to structural shapes, rectangular tubing, plate, and sheet shall be performed in accordance with AWS D1.1 nontubular, statically- loaded conditions.

#### 3.3.1.9.2 Welding Procedure Requirements

All welding shall be performed in accordance with the Seller's approved Welding Procedure specification. Each Welding Procedure specification shall be qualified with a Procedure Qualification Record as required in ASME Section IX, AWS D1.1, and AWS D1.6 as applicable.

#### 3.3.1.9.3 Welder Qualification

Welder Performance Qualification Records shall be submitted for all personnel performing welding, including tacking. Welders shall be qualified in accordance with ASME Section IX, AWS D1.1, and AWS D1.6, as applicable.

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#### 3.3.1.9.4 Weld Repair

Weld defects shall be removed and repaired as allowed by the referenced standards. The original Welding Procedure specification shall be used for weld repair. Welds that fail inspection shall not be ground out and repaired more than twice before the section is abandoned and replaced.

#### 3.3.1.9.5 Inspection

Inspection shall be done in accordance with the Seller's standard practice. A certified dimensional drawing and weldmap shall be produced from this inspection.

Prior to fabrication, a weld map shall be produced and delivered to the Buyer for review and approval. Welds shall be inspected per AWS D1.1 or D1.6 (depending on material) for structural steel. An AWS Certified Weld Inspector (CWI) shall perform visual inspections and inspectors certified to ASNT-TC-1A "American Society for Nondestructive Testing - Recommended Practice" shall perform NDEs. Visual and NDE weld inspection procedures shall be submitted along with the personnel certifications to the Buyer for review and approval, before performance of the inspections and examinations. Welded connections on the lifting components shall be 100% visual and 100% Dye-Penetrant Test or Magnetic Particle Test inspected.

### 3.3.2 Industry and Government Standards

#### 3.3.2.1 Design Loads - Hoisting and Rigging

The lifting apparatus (eyebolts, hoist rings, and lifting bails) shall be designed in accordance with the ASME B30.20 "Below-The-Hook Lifting Devices" and DOE-RL-92-36 "Hanford Site Hoisting and Rigging Manual." Equipment lift points designed and fabricated by Seller shall have a factor of safety of 3 based on yield strength. Equipment purchased by Seller shall have a factor of safety of 3 based on yield strength. Documents shall be provided to the Buyer demonstrating incorporation of these safety factors. The Seller shall identify the total weight, the center of gravity, and the lift points and rigging methods necessary for lifting each Fan/motor/base assembly. Lift points shall be identified with yellow paint. Any

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special tooling, spreader bars or other recommended fabricated devices for lifting to be provided by Seller.

### 3.3.3 Radiation

#### 3.3.3.1 Electromagnetic

The Exhaust Fans shall comply with the limits set forth in HNF-2962, "*List of EMI/EMC Requirements, Numetec Hanford Corporation for Fluor Daniel Corporation Hanford, Inc, Richland, WA,*" as summarized in the following subsections.

##### 3.3.3.1.1 Unintentional Radiators

Applicable equipment shall comply with the emission limits specified in 47 CFR 15 "*Code of Federal Regulations, Telecommunication, Federal Communications Commission, Radio Frequency Devices,*" Subpart B. The Seller must provide certification that the emissions from equipment or the device are within the limits specified in 47 CFR 15 or a Federal Communications Commission accepted international standard.

##### 3.3.3.1.2 Radio Frequency Interference Susceptibility

Applicable equipment shall be tested and evaluated for the immunity to radio frequency interference from portable communications equipment. The testing method and procedure for testing process instrumentation are found in IEEE Std C37.90.2 "*Standard for Withstand Capability of relay Systems to Radiated Electromagnetic Interference from Transceivers.*"

Since the frequencies of interest are in the bands of 120 to 190 MHz and 420 to 480 MHz, the equipment shall be evaluated from 20 MHz to 1,000 MHz. The electric field intensity of 30V/m shall be used for testing.

##### 3.3.3.1.3 Equipment Alternating Current Mains Surge Protection

Applicable equipment shall be designed to withstand the surge waves specified in IEEE C62.41 "*IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits,*" Category B. The equipment shall be type tested by the

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manufacturer in accordance with this standard, and certification provided by the Seller.

#### 3.3.3.1.4 Electrostatic Discharge Protection

The system or individual parts of the system shall not be damaged and shall continue to function after being subject to electrostatic discharge on operating panels and other controls normally available to operating personnel. The manufacturer shall provide certification that Electrostatic Discharge testing was performed according to the methodologies found in ANSI C63.16 "*American National Standard Guide for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment.*" The test voltage should be at least 4 kV. ANSI C63.16 provides additional references to selecting the proper voltage ranges to be used.

#### 3.3.3.2 Nuclear

The Exhaust Fans shall be ASME AG-1-2003, "Code on Nuclear Air and Gas Treatment" as indicated in Appendix B.

#### 3.3.4 Cleanliness

Before assembly, and before preparing for shipment, all components shall be cleaned by flushing clean water and/or blown clean and dry with compressed air to the extent that extraneous materials, such as those listed below, are not present:

- (a) Metallic or other dusts (shop dust), chips, turnings, and weld splatter;
- (b) Abrasive particles;
- (c) Rust and other loose corrosion particles;
- (d) Magnetic/liquid penetrant<sub>[h2]</sub> residues, dye check, etc.;
- (e) Foreign material, such as paper, tape, plastic, sand, and wood;
- (f) Cutting oils;
- (g) Excess lubrication, grease, and oil; and
- (h) Marking dyes.

The fabrication procedure shall describe the cleaning and packaging steps taken.

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Solvents and cleaning solutions used on stainless steel shall be chloride-free. Stainless-steel components do not require painting except as required for identification or other markings. Paint used on stainless steel shall be epoxy-phenolic.

The Exhaust Fan ports and pipe openings shall be temporarily capped following cleaning and drying for shipment. Packaging requirements following cleaning are documented in Section 5.3.

### **3.3.5 Corrosion of Parts**

The Exhaust Fans design shall include requirements for corrosion protection, especially restrictions on dissimilar metal couples.

### **3.3.6 Protective Coatings**

All components shall be corrosion protected. Surfaces shall be cleaned, primed and painted such that corrosion shall not be a factor for the design life of the equipment. The protective coatings shall resist physical wear and the primer shall be of the zinc-rich variety to ensure corrosion protection in the event of coating penetration. Hot dipped galvanization of the mounting frame is also an acceptable option.

### **3.3.7 Interchangeability**

The Exhaust Fan Unit design shall ensure interchangeability of components, to minimize consumable parts storage.

### **3.3.8 Identification and Marking**

The Exhaust Fans shall have a Manufacturer's nameplate using the Seller's standard practice. The nameplate shall include: the equipment number (provided by the Buyer, per the requirements of Section 3.3.9); assembly weight (dry and wet); purchase order number; lifting bail working load limits; Manufacturer data for swivel hoist rings (as applicable); and this specification number, 145579-V-SP-004, latest revision. Clearly mark and identify any components required for removal before equipment installation (e.g., shipping blocks).

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The markings on all motors shall be in accordance with the NEC and NEMA MG-1 "Motors and Generators." Frame size shall be selected according to NEMA MG-13 "Frame Assignments for Alternating Current Integral Horsepower Induction Motors" Care should be taken when painting such that the motor nameplates, lifting eyes, or lifting swivel Manufacture nameplates are not painted.

Manufacturer's nameplate shall be stainless steel, permanently engraved and permanently attached to the equipment and major accessories (i.e. fans, motors, drives, etc.) and shall include the following information:

- Fan capacity \_\_\_\_\_ CFM
- Fan operating static pressure \_\_\_\_\_ in. W.G.
- Fan RPM
- Break Horse Power
- Centrifugal wheel size \_\_\_\_\_ in.
- Fan bearings: size, identification number, lubricant used, etc.
- Fan weight
- Motor: type, RPM, HP, frame, bearings, insulation class, NEMA characteristics, weight, etc
- Drive
- Manufacturer's Model identifications and serial numbers
- Year of manufacture

Motor power terminals shall come pre-labeled by phase to ensure correct motor rotation the first time.

### 3.3.9 Nameplate

Seller shall supply a nameplate conforming to relevant sections of TFC-ENG-STD-12 "Tank Farm Equipment Identification Numbering and Labeling Standard," which will be provided upon award of the fabrication contract.

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**3.3.10 Human Engineering**

Any sensor indication must be easily visible to an operator standing on the ground.

**3.3.11 Qualification**

Equipment supplied by the Seller shall be subject to Factory Acceptance Testing. The Seller will be expected to provide a shop simulation of the inlet conditions of their equipment under normal and transient operating conditions to demonstrate the operational efficiency of the equipment. The Seller shall provide a FAT plan for operational testing and leak testing of their equipment in their proposal in accordance with the verification, inspection and test requirements specified in sections 4.2 and 4.3.

**3.3.12 Document Submittal**

Each document submittal shall be identified with this specification number, item number, purchase order number, and Seller's identification number. Submittals shall be transmitted to the Buyer in accordance with the directions found in the Drawing and Data Commitment sheet in the Technical Data Sheet 145579-V-DS-004.1

Data shall be sufficiently clear to allow legible copies to be made on standard reproduction equipment after microfilming.

The items shown in the Drawing and Data Commitment sheets shall be included along with the bid submittal. The schedule shall show equipment fabrication, testing, and delivery as noted on the inquiry. The drawings shall show full compliance with this specification (and the associated drawings/documents) or note any exceptions. The Seller shall allow 10 working days for the Buyer to review and state the disposition of each submittal.

Approval by the Buyer does not relieve the Seller from the responsibility for accuracy or adequacy of design under this specification.

Submittals are divided into two types: (1) Those requiring "approval before proceeding" (i.e., weld procedures or pre-purchase evaluation data); and (2) Those requiring "approval before shipment" (i.e., vendor information data).

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Submittals requiring approval before shipment will be reviewed to verify completeness and adequacy for their intended purposes.

Unacceptable items that require approval before proceeding will be handled as specified below.

A submittal requiring approval that is not approved by the Buyer, will be dispositional as:

1. "Not Approved, Revise and Resubmit." The submittal is considered technically deficient, or incomplete, and is therefore unacceptable. Re-submittal is required; hence fabrication, procurement, or performance of procedures shall not proceed.
2. "Approved with Exception." Fabrication, procurement, and performance of procedures may proceed, and re-submittal is required to verify incorporation of the exception. Final acceptance of the item is contingent upon the Buyer's receipt and approval of the corrected submittal.

Submittals requiring approval before shipment that are determined to be incomplete or inadequate will be marked "Resubmit" and will be returned. An explanation of the deficiencies will be included for corrective action by the Seller.

The Seller shall provide fabrication traveler(s) for the fabrication and testing of the above-described Exhaust Fans. The fabrication traveler(s) shall include detailed procurement, fabrication, assembly, testing, shipping, and handling steps required to properly fabricate, assemble, and test the equipment in accordance with the drawings and specifications.

A proposed schedule of fabrication, inspection, and testing of all Exhaust Fans equipment shall be submitted for review with the bid and approval with the submittal of the fabrication traveler(s).

The Seller shall provide Owner's Maintenance and Operation Manuals in "hard copy" and in electronic format.

The technical documentation shall also be bound in 3-Ring Binders, complete with Indexed Tabs, Table of Contents, drawings, illustrations, catalog cuts, etc.

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The Owner's Maintenance and Operation Manuals shall include recommended Spare Parts with catalog identifications and points of contact/addresses & telephone numbers, detailed operating and maintenance instructions.

The Buyer will insert witness/hold points in the fabrication traveler during their review and approval of the fabrication traveler. Witness points can be waived by the Buyer but must be document in writing. Hold points require the Buyer personnel to be present during the fabrication, inspection, or test step.

**3.3.13 Personnel and Training**

The Seller's equipment and systems shall be designed so that it is operable and maintainable by the Buyer's operations and maintenance personnel. If specialized technical education or training is required by the Buyer's personnel the Seller shall advise in their proposal.



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## **4.0 QUALITY ASSURANCE REQUIREMENTS**

### **4.1 GENERAL**

#### **4.1.1 Quality Assurance Program**

The Subcontractor/Supplier shall have a documented, implemented and maintained Quality Assurance Program that is based on ASME NQA-1-1994, *Quality Assurance Requirements for Nuclear Facility Applications*, or other consensus standards that provide an equivalent level of quality assurance requirements. The Quality Assurance Program shall national standard and identifies the activities and items to which it applies. Instructions and procedures must include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities have been satisfactorily accomplished.

The Quality Assurance Program must address each of the areas discussed within this QA Requirements Flow-down. The Subcontractor/Supplier must submit the Quality Assurance Program to the Buyer for review prior to award of contract.

The Subcontractor/Supplier shall assess its Quality Assurance Program regularly to assure its effective implementation.

The Quality Assurance Program shall provide for indoctrination and training, as necessary, of personnel performing activities affecting quality to assure that suitable proficiency is achieved and maintained. Personnel who conduct inspection and test activities shall be qualified to conduct those activities and certification of the qualification must be submitted to the Buyer upon request.

#### **4.1.2 Design**

The Subcontractor/Supplier must define, control, and verify designs developed for this contract. Design inputs must be specified on a timely basis and correctly translated into design documents. Design interfaces must be identified and controlled. Persons who did not design the item must be used to verify design adequacy. Design changes, including field changes, must be reviewed and approved by the same personnel who reviewed and approved the initial designs.

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#### 4.1.3 Computer Software Important to Safety

When applicable, software applications important to safety shall meet the requirements of ASME NQA-1-1994 subpart 2.7, *Quality Assurance Requirements for Nuclear Facility Applications*.

*Safety software* includes safety system software, safety and hazard analysis software and design software, and safety management and administrative control software.

Software documentation shall include identification of any computer calculation, including computer type, computer program (e.g., name), revision identification, inputs, outputs, evidence of or reference to computer program verification, and the bases (or reference thereto) supporting application of the computer program to the specific physical problem.

#### 4.1.4 Procurement Document Control

Procurement documents must include or reference sufficient quality and technical requirements in order to describe the items and services requested. Procurement documents must be reviewed and approved by the authorized personnel within the Subcontractor's/Supplier's organization, and changes must be reviewed and approved by the same individuals who reviewed and approved the original procurement documents.

The Subcontractor/Supplier must have a process for accepting procured items. This process must include one or a combination of the following: Certificate of Conformance, source verification, receiving inspection, and post-installation testing.

The Subcontractor/Supplier shall provide a legible and reproducible Certificate of Conformance. The Certificate of Conformance shall be signed by the Subcontractor's/Supplier's authorized representative responsible for quality assurance.

The Certificate of Conformance shall contain, as a minimum, the following information:

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- Identification of the Buyer's contract or purchase order number under which the materials, equipment, component, or service is being purchased;
- Provide traceability by means of positive identification from the material, equipment, component, or service to the Certificate of Conformance;
- Identify the specific procurement requirements met by the material, equipment, component, or service supplied (i.e., codes, standards, or other applicable specification). The procurement requirements shall include any approved changes, waivers, or deviations applicable to the subject materials, equipment, component, or service;
- Identify any procurement requirements that have not been met, together with an explanation and the means for resolving the nonconformance.

The Subcontractor's/Supplier's certification system, including the procedures to be followed in filling out a certificate and the administrative procedures for review and approval of the certificates, shall be described in the Subcontractor's/Supplier's QA Program.

The certification system shall provide a means to verify the validity of Subcontractor/Supplier certificates and the effectiveness of the certification system, such as during the performance of audits of the Subcontractor/Supplier or independent inspection or test of the items. The Buyer shall conduct this verification at intervals commensurate with the Subcontractor's/Supplier's past quality performance.

The Seller is required to flowdown applicable QA requirements based upon a graded approach from this contract to any subtier subcontractor/suppliers.

Any access to the sub-tier suppliers'/Subcontractor/Suppliers' facilities for verification activities will be requested through the Subcontractor/Supplier prior to access, and verification activities may be performed jointly.

The Subcontractor/Supplier shall warrant that all items furnished under the contract are genuine (i.e., new, not refurbished, not counterfeit) and match the quality, test reports, markings, and/or fitness for intended use as required by the contract. Any materials furnished as part of the contract that the government or

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other duly recognized agency had been previously found to be suspect/counterfeit shall not be used.

All items are subject to inspection at the Subcontractor's/Supplier's facility or lower-tier subcontractor's facility. The Subcontractor/Supplier shall notify the Buyer at least 7 working days in advance of the time when such items or activities will reach the Buyer's identified inspection hold points. As a minimum, final inspection prior to packaging for shipment shall be considered such a hold point, unless specifically waived by the Buyer.

The Subcontractor/Supplier shall obtain all materials to be delivered under the contract directly from the original manufacturer or an authorized manufacturer's representative. The Subcontractor/Supplier shall provide legible and reproducible documentation, with the materials, that provides objective evidence that the items were provided by the original manufacturer. Such documentation may include a copy of the purchase order to the manufacturer, shipping documentation or manufacturer invoice; each of which would identify that the materials were obtained from the original manufacturer.

The Subcontractor/Supplier shall submit, with or prior to item shipment, a recommended spare parts list. The list shall provide the name and address of the original supplier of the replacement part, and the part's drawings, specification, or catalog identity including applicable change or revision information.

All items and/or services procured under this specification shall be subject to inspection by the Buyer or Buyer's representative throughout the contract. Additionally, procured items and/or services shall be subject to inspection for acceptance.

The Subcontractor/Supplier shall grant access to the Subcontractor's/Supplier's plant facilities and records for inspection or audit by the Buyer, his designated representative, and/or other parties authorized by the Buyer.

#### **4.1.5 Identification and Control of Items**

The Subcontractor/Supplier shall establish controls to assure that only correct and accepted items are used or installed.

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All items shall be identified with the applicable part number, model number, or other identifier prescribed in the specification. Identification shall be on the item or the package containing the item. When the identification is on the item, such marking shall not impair the service of the item or violate dimensional, chemical, or physical requirements.

The Subcontractor/Supplier shall submit a legible and reproducible copy of the product data sheet (e.g., drawing, catalog cut sheet, brochure, etc.) that provides adequate information to enable the Buyer to verify the form and function of the articles procured. One copy of such documentation, unless otherwise specified, shall accompany the item.

The Subcontractor/Supplier shall identify each item, assembly, package, container, or material, having limited shelf life, with the cure date or date of manufacture and the expiration date. The Subcontractor/Supplier shall specify any storage temperatures, humidity and environmental conditions that should be maintained. Material shall not be furnished having less than 75 percent of total shelf life available at time of shipment.

#### **4.1.6 Control of Processes**

The Subcontractor/Supplier shall have processes to control processes, including special processes that control or verify quality (e.g., welding, heat treating, and nondestructive examination). Special processes must be performed by qualified personnel using qualified procedures in accordance with specified requirements.

Subcontractor/Supplier personnel performing weld inspections shall be certified as a CWI in accordance with the requirements of the American Welding Society (AWS), QC-1. The following documentation shall be submitted for Buyer approval prior to the start of fabrication:

- Current AWS CWI certification;
- Current/valid visual acuity examination (must be given every 3 years); and
- Visual weld inspection procedure(s).

Welding procedures and personnel shall be qualified in accordance with applicable AWS or ASME requirements specified in the contract. The

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Subcontractor/Supplier shall submit copies of all welding procedures, procedure qualification records, and welder qualification records to be employed. Buyer review and approval of these documents is required prior to start of fabrication.

Nondestructive Examination (NDE) personnel shall be qualified and certified in accordance with the recommended guidelines of the American Society of Nondestructive Testing (ASNT) SNT-TC-1A. The Supplier is not authorized to begin fabrication until the following documentation has been approved by the Buyer:

- NDE personnel qualification and certification procedure;
- Level I, II, and/or III personnel qualification and certification records, including objective evidence of NDE training, formal education, examination, experience, date of hire and current visual acuity exam;
- NDE method procedure(s) compliant with the applicable requirements of the Buyer's contract.

NDE reports and radiographs shall be traceable to the item examined, shall include all essential examination parameters, and shall be signed and dated by a qualified/certified NDE examiner. All NDE reports and radiographs shall accompany or precede shipment of the item or component. Radiographs and radiographic technique and examination reports shall be subject to approval by the Buyer prior to shipment.

These requirements shall be passed to lower-tier subcontractors.

#### **4.1.7 Inspection**

The Subcontractor/Supplier shall have a process to plan and execute inspections to verify conformance of an item or activity to specified requirements. The process shall document the characteristics to be inspected and inspection methods to be employed. The Subcontractor/Supplier shall document the results of inspections. Inspections for acceptance shall be performed by persons other than those who performed or directly supervised the work being inspected.



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The Subcontractor/Supplier shall submit, as required by the contract, legible, reproducible copies of inspection and/or test reports. The reports shall include, as a minimum, the following information:

- Identification of applicable inspection and/or test procedure;
- Resulting data for all characteristics evaluated, as required by inspection or test procedures, including reference to information on action taken in connection with nonconformances;
- Traceability to the item inspected/tested (e.g., serial number, part number, lot number, etc.), date of inspection, name of inspector, type of observation; and
- Signature of the Subcontractor/Supplier's authorized representative or agency performing the inspection or test.

#### **4.1.8 Test Control**

The Subcontractor/Supplier shall have a process to plan and execute tests to verify conformance of an item or activity to specified requirements. The process shall document the characteristics to be tested and test methods to be employed.

The Subcontractor/Supplier shall prepare a detailed test plan. Prior to starting work, the plan shall be submitted to the Buyer for approval and insertion of Buyer's designated source inspection/witness notification points. The test plan shall provide the following at a minimum:

- Traceability to Buyer's purchase/contract order document number;
- Name or description of the item to be tested (e.g., components, assemblies, subassemblies); and
- Method/procedure to be used during test.

Subsequent revisions/modifications to the test plan require review and approval by the Buyer prior to implementation of the changes.

The Subcontractor/Supplier shall provide test reports that include, as a minimum:

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- Item tested,
- Date of test,
- Tester or data recorder,
- Type of observation,
- Results and acceptability,
- Action taken in connection with any deviations noted, and
- Person evaluating test results.

Test plans and test reports must be submitted to the Buyer for the project records.

#### **4.1.9 Control of Measuring and Test Equipment**

The Subcontractor/Supplier shall control tools, gages, instruments, and other measuring and test equipment used for activities affecting quality, and shall calibrate at specified periods and adjust to maintain accuracy within necessary limits.

The Subcontractor/Supplier shall maintain legible, reproducible copies of the Certificates of Calibration, traceable to the National Institute of Standards and Technology (NIST), for each article contracted. Each Certificate of Calibration shall be signed by the Supplier's representative responsible for calibration, attesting to its authenticity, and shall be identified with the following information:

- Buyer's contract number;
- Identification of the article to which the Certificate of Calibration applies; and
- Standards used for calibration.

In addition, the Subcontractor/Supplier shall submit a report of actual calibration results. The report shall be identifiable to the acceptance criteria of the items submitted and shall meet the contract requirements. The report shall contain the signature of the authorized representative of the agency verifying compliance.

One copy of the documentation, unless otherwise specified, shall accompany the applicable item(s) shipped.

The Certification of Calibration will be held on file by AMEC as objective evidence to support the actual test results and attest to the fact that the calibrated item(s) met requirements.



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#### 4.1.10 Handling, Storage, and Shipping

The Subcontractor/Supplier shall prepare and submit for Buyer review and approval, prior to use, procedure(s) or plan(s) for the packaging and shipping of materials, equipment, or components to be furnished under the contract. The procedure(s) or plan(s) shall include, as appropriate, cleanliness inspection prior to packaging, use of preservatives and coatings, descriptions of specially designed shipping containers, handling and rigging data, final inspections and the type of transfer and shipping vehicles.

#### 4.1.11 Control of Nonconforming Items

The Subcontractor/Supplier must have a process to control items that do not conform to specified requirements to prevent inadvertent installation or use.

These controls must provide for identification, documentation, evaluation, segregation (when practical), and disposition of nonconforming items, and for notification to affected organizations.

All nonconforming conditions identified at the Subcontractor/Supplier's facility, with a proposed disposition of "Accept-as-Is" or "Repair," as defined below, shall be approved by the Buyer before Supplier implementation of the Nonconformance Report (NCR) disposition:

- **Accept-as-Is:** Nonconforming materials will perform its intended function.
- **Repair:** Nonconforming item can be corrected so that its characteristics meet requirements of the contract.

Nonconforming items identified as "Repair" or "Rework" shall be re-examined in accordance with applicable procedures and with the original acceptance criteria, unless the nonconforming item disposition has established alternate acceptance criteria.

Nonconformances shall be documented by the Subcontractor/Supplier on their own nonconformance form or one provided by the Buyer. After documenting the nonconformance and providing a proposed disposition and technical justification, the report shall be submitted to the Buyer.



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After the proposed disposition has been evaluated, and approved or rejected by the Buyer, the form shall be returned to the Subcontractor/Supplier. Corrective action may only take place after Buyer approval. Copies of completed, Buyer approved, NCRs shall be shipped to the Buyer with the affected item.

## 4.2 QUALIFICATION VERIFICATION

Items to be verified:

- (a) Minimum noise and vibration requirements of Exhaust Fan assembly under loaded conditions
- (b) Pressure and flow requirements of Exhaust Fans
- (c) Power consumption (full load and no-load)
- (d) Instrumentation Function/Calibration test

## 4.3 INSPECTIONS AND TESTS

Seller shall provide all necessary reviews, inspections, tests, analyses, demonstrations, and documentation required to verify that all qualifications have been satisfied, including:

- (a) Testing to ensure satisfaction of the specified functional characteristics, as specified in Appendix B, including leak and pressure testing.
- (b) Measurement of the specified physical characteristics and comparison with previous tests on similar equipment.
- (c) Examination for workmanship.

The Hanford Site CH2M Hill NEC Electrical Inspector shall inspect equipment fabricated under this contract that is not NRTL listed or labeled. All deficiencies found shall be corrected or dispositioned before shipment. The Seller shall prepare certification and documentation for the electrical inspector and inspection report.

### 4.3.1 Vibration Testing

Shall be in accordance with ASME AG-1, Section BA-4160.



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#### **4.4 TRAINING OF INSPECTION AND TEST PERSONNEL**

The Seller shall qualify Inspection and Test Personnel performing acceptance inspections and testing. In addition, the Seller shall document all qualifications.

Review of the qualifications may be subject to a surveillance or source inspection by the Buyer.

#### **4.5 QUALITY ASSURANCE RECORDS**

Records that furnish documentary evidence of quality shall be specified, prepared, and maintained. Records shall be legible, identifiable, and retrievable. Records shall be protected against damage, deterioration, or loss. Requirements and responsibilities for record transmittal, distribution, retention, maintenance, and disposition shall be established and documented.

When requested, record copies are to be transmitted with native electronic files and provided as either hardcopy or in PDF format.

The Subcontractor/Supplier shall implement a document control system to ensure that approved and correct documents are being employed. This system shall describe the process for the preparation, issue, approval and changes of documents that specify quality requirements or prescribe activities affecting quality. Such documents, including changes thereto, shall be reviewed for adequacy and approved for release by authorized personnel.

#### **5.0 PREPARATION FOR DELIVERY**

##### **5.1 GENERAL**

The equipment shall be shipped via covered truck, and disassembled only as necessary to meet truck dimensional requirements. All parts shall be match marked and shown on the general assembly drawings.

##### **5.2 PRESERVATION AND PACKAGING**

Seller shall provide all necessary packaging, supports, cushioning, and wrapping to protect the Exhaust Fans and all internal components from damage during shipping.

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### 5.3 PACKING

The Exhaust Fans shall be packed appropriately to protect the exterior surfaces during shipping and handling.

### 5.4 MARKING

All shipping containers shall be marked and labeled for safety, protection, and identification. If the unit must be disassembled for shipping, containers shall be identified as to their contents.

### 5.5 HANDLING

The seller shall identify any special handling requirements for the Exhaust Fans, such as loading and unloading limitations, and restrictions regarding hooks, bails, forklifts, etc.

### 5.6 SHIPPING

Seller shall specify limitations or special instructions on shipping.

### 6.0 NOTES

There are no notes for this specification.

### 7.0 APPENDICES

<b>Appendix</b>	<b>Description</b>
A	Control of Suspect/ Counterfeit Items (TFC-ESHQ-Q_C-C-03)
B	Exhaust Fan requirement schedule per AG-1, Section BA, Fans and Blowers

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## 8.0 ATTACHMENTS

<b>Document No.</b>	<b>Description</b>	<b>Rev.</b>
145579-V-DS-004.1	Exhaust Fan Data Sheet	2
36-VIT-515	Vibration Transmitter	B
36-TE-516	Resistance Temperature Detector	B
36-VIT-518	Vibration Transmitter	B
36-TE-519	Resistance Temperature Detector	B
F-145579-36-V-0007	Off Gas Area – Scrub & Stack Area Plan	D
H-14-106796	Off Gas Area – FDNS Plans & Sections	0

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## Appendix A

Control of Suspect/ Counterfeit Items (TFC-ESHQ-Q\_C-C-03)

<b>CH2M HILL Hanford Group, Inc.</b>	<b>Manual</b>	<b>ESHQ</b>
<b>CONTROL OF SUSPECT/ COUNTERFEIT ITEMS</b>	<b>Document</b>	<b>TFC-ESHQ-Q_C-C-03, REV B</b>
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<b>APPROVAL AUTHORITY:</b>		<b>R. L. Higgins</b>
<b>DOCUMENT OWNER:</b>		<b>J. L. Logston</b>

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## 1.0 PURPOSE AND SCOPE

(7.1.1, 7.1.2, 7.1.3, 7.1.4)

This procedure describes the process for the identification, prevention, evaluation, notification, and disposition of suspect/counterfeit items (S/CIs) at CH2M HILL. This procedure applies to items that are:

- In the procurement cycle
- In source or receiving inspection
- In inventory at warehouses and staging areas
- Installed
- In operation.

This procedure applies to:

- Company ordered material
- Material supplied by subcontractors
- Material and test equipment supplied by test sponsors
- Construction
- Fabrication shops
- Laboratory work and experiments
- Surplus/excess property
- Government property
- Material obtained from U.S. Department of Energy (DOE) sources.

## 2.0 IMPLEMENTATION

This procedure is effective on the date shown in the header.

## 3.0 RESPONSIBILITIES

### 3.1 Procurement Personnel

Maintain awareness of S/CI and support S/CI program implementation.

### 3.2 Inspection Personnel

Perform inspections for conformance or acceptance of material including verifications that the item(s) being inspected do not exhibit indications attributed to potential suspect/counterfeit items.

### 3.3 Quality Assurance Engineer

1. Ensures appropriate procurement controls are implemented to preclude entry of S/CI to the site through review of procurement documents.
2. Notifies the S/CI coordinator of nonconformance reports (NCRs) associated with S/CI.

### 3.4 S/CI Coordinator

Apprises company, DOE, and DOE local Office of the Inspector General personnel of S/CI status and final disposition.

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### 3.5 Assigned Engineering Personnel

1. Evaluate S/CI information for applicability to design and procurement specifications, system configuration, and operating conditions.
2. Provide technical specifications, critical characteristics, and acceptance methods in support of procurement and inspection activities to prevent introduction of S/CI.

### 3.6 Responsible Managers and Supervisors

1. Maintain awareness of S/CI.
2. Control potential S/CI.
3. Evaluate training needs based on job classification and ensure individuals receive training in S/CI awareness, prevention, detection, and reporting, as appropriate, to respective assignments.

## 4.0 PROCEDURE

### 4.1 Introduction

The two most common S/CIs found at DOE facilities have been threaded fasteners fraudulently marked as high-strength bolts, and refurbished electrical circuit breakers sold and distributed under false certifications. Purchasers have also been misled into accepting S/CIs that do not conform to specified requirements by falsified documentation.

NOTE: Questions about a specific item should be referred to the S/CI coordinator. Attachment A provides a historical listing of suspect components. Equipment/material types or classes have been established to identify those specific items which are classified as potentially misrepresented or S/CI. Attachment B provides a listing of those classifications and items subject to S/CI control at tank farm facilities.

### 4.2 Procurement

CH2M HILL  
Personnel

1. Ensure material requirements are specified in subcontracts to preclude the purchase or introduction of S/CI. Use the information in Attachments A, B, C, D, E, F, G, H, and I to identify specific components, characteristics, precautions, and other considerations that are to be addressed during the procurement process to prevent introduction of S/CI.
2. Ensure material requests for quality level 1, 2, and 3 items and services include appropriate technical specifications, procurement quality clauses, documentation, and inspection requirements to prevent introduction of S/CI.
3. In maintenance and construction/fabrication subcontracts, specify appropriate requirements to preclude the purchase or introduction of S/CI.

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- |                            |  |
|----------------------------|--|
| Quality Assurance Engineer | 4. Review procurement documents to ensure they contain the appropriate procurement controls to preclude entry of S/CI to the site.   |
| Procurement Personnel      | 5. Ensure vendor selection complies with qualification requirements for the quality level of the items and services and is based on the vendor's ability to demonstrate the capability of delivering acceptable items. |

#### 4.3 Inspection for Potential S/CI

- |                               |   |
|-------------------------------|---|
| Bill of Material Preparers    | 1. For quality level 0 and P-Card items listed in Attachment B, designate an S/CI inspection in the special instruction of the Bill of Material (BOM) in accordance with the requirements of <u>TFC-BSM-FPM_MC-C-01</u> . |
|                               | 2. Ensure quality level 0 and P-Card items are inspected prior to material issuance.  |
| First Line Manager            | 3. Obtain on-site S/CI inspection for quality level 0 and P-Card items prior to material issue and use.   |
| Engineering Personnel         | 4. Provide technical specifications, critical characteristics, and acceptance methods to facilitate inspection planning for S/CI prevention and detection.  |
| Quality Assurance Engineer    | 5. Ensure S/CI detection criteria is incorporated into QA inspection planning activities.   |
| Assigned Inspection Personnel | 6. Use Attachments G, H, and I as resources for detecting S/CIs during walkdowns and inspections. Specific items are subject to inspection.   |
|                               | 7. Verify and document that the items being inspected do not exhibit indications attributed to potential S/CIs as described in Attachments G through J.   |
|                               | 8. If an S/CI is detected during inspection activities, document and control the S/CI in accordance with <u>TFC-ESHQ-Q_ADM-C-02</u> .   |

#### 4.4 Control of Material Identified as S/CI

- |                                 |  |
|---------------------------------|--|
| Responsible Manager or Delegate | 1. Ensure items identified as potential S/CI are documented as nonconforming and controlled in accordance with <u>TFC-ESHQ-Q_ADM-C-02</u> . Non conformances identified as S/CI shall be reviewed and processed within four working days to determine whether or not the items are S/CI. |
|                                 | 2. Transfer tagged S/CIs to 2101-HV for storage.   |
| Cognizant Quality Engineer      | 3. Notify the S/CI coordinator of all NCRs associated with the S/CI.   |

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#### 4.5 Reporting of S/CI

- |                               |  |
|-------------------------------|--|
| Assigned Company<br>Personnel | 1. Report all items identified as potential S/CI in accordance with <u>TFC-OPS-OPER-C-24</u> . (7.1.1)   |
|                               | NOTE: Reporting of S/CIs is required regardless of safety class, where the S/CIs are located (receiving inspection, inventory/storage areas, fabrication and maintenance areas, installed, etc.), or their operating status.   |
| S/CI Coordinator              | 2. Notify the DOE S/CI coordinator of all occurrence reports associated with S/CIs. As appropriate, transmit copies of NCRs and applicable documentation.  |
|                               | 3. Notify the DOE local Office of Inspector General of all S/CIs. Notification should be e-mailed to the DOE local Office of Inspector General points of contact providing information in the following format:  |
|                               | <ul style="list-style-type: none"> <li>• NCR number</li> <li>• Date NCR was written</li> <li>• Purchase order/job control number (if known)</li> <li>• End use of product</li> <li>• Name of manufacturer, distributor, supplier</li> <li>• Safety class (if known)</li> <li>• Occurrence report number</li> <li>• Value of item(s)</li> <li>• Point(s) of contact</li> <li>• Description of item(s)</li> <li>• Quantity</li> <li>• Description of nonconformance</li> <li>• Any other pertinent information that would help the DOE local Office of Inspector General.</li> </ul> |

#### 4.6 Acceptance, Removal, and Disposition of S/CI

- |                  |  |
|------------------|--|
| S/CI Coordinator | 1. Notify responsible company personnel that S/CI may not be destroyed or disposed of without written release from the DOE local Office of Inspector General.  |
|                  | 2. Prior to destroying or disposing of S/CIs, consult the Inspector General to determine if there is a need to retain the items as evidence for potential litigation. Based on the Office of Inspector General's decision, either: |
|                  | a. Retain S/CI material as evidence for potential litigation, or   |
|                  | b. Release S/CI material for final disposition and/or disposal as directed by the S/CI coordinator.  |

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- |                               |   |
|-------------------------------|---|
| Engineering<br>Personnel      | 3. Evaluate S/CI to determine if its use could create a safety hazard in its current/proposed application.  |
| Assigned Company<br>Personnel | <p>4. If the engineering evaluation of the S/CI has determined that its use could not create a safety hazard in its current/proposed application:</p> <p>a. Disposition the S/CI to remain in place.</p> <p>NOTE: Criteria for dispositioning S/CI is by acceptance, removal, or replacement after an engineering evaluation. This should be based on the deficient characteristic of the particular item.</p> <p>b. Identify the accepted S/CI by marking with orange paint or other appropriate methods and note its location.</p> <p>c. In areas where operating temperatures are 500°F and above or are subject to cyclic loading where fatigue failure is likely to occur, replace all grades 8 and 8.2 S/CI fasteners prior to further use of the equipment.</p> <p>d. Engineering must also identify a way to prevent its reuse in an application it may not be suitable for.</p> <p>e. If removed, prepare the S/CI for disposal.</p> <p>5. If the engineering evaluation of the S/CI has determined that its use could create a safety hazard in its current/ proposed application:</p> <p>a. Contact Waste Feed Operations (WFO) Shift Operations to secure the equipment.</p> <p>b. Remove the S/CI as soon as practical.</p> <p>c. Tag, segregate, or otherwise control the S/CI to prevent inadvertent use.</p> <p>d. Prepare the S/CI for disposal.</p> |
| S/CI Coordinator              | <p>6. Ensure that all S/CI material dispositioned for disposal is properly controlled and arranged for the material to be permanently and irrevocably altered so that it cannot be used. Examples of alterations include:</p> <ul style="list-style-type: none"> <li>• Melting</li> <li>• Shredding</li> <li>• Destroying the threads on fasteners.</li> </ul>  |

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7. If the DOE/Office of Inspector General has approved disposal, arrange for pick-up and disposal of the altered S/CI material on a yearly basis. Burying S/CIs may be acceptable if they do not contain hazardous material or material prohibited by federal, state, or local regulations.

#### 4.7 Surplus/Excess Material

- |                          |   |
|--------------------------|---|
| Responsible<br>Personnel | <ol style="list-style-type: none"> <li>1. Remove S/CI from surplus/excess material before they are released for sale or transfer of accountability.</li> <li>2. Ensure surplus items received from DOE or other facilities are inspected for S/CI prior to installation.</li> </ol> |
|--------------------------|---|

#### 4.8 Assessments

- |                   |  |
|-------------------|--|
| Quality Assurance | <ol style="list-style-type: none"> <li>1. Conduct assessments of the effectiveness of the S/CI program.<br/><br/>NOTE: The assessment should be performance based and designed to determine if company activities are conducted in accordance with this procedure, DOE 414.1A, DOE O 440.1A, DOE G 440.1-6, and 10 CFR 830, Subpart A.</li> <li>2. Lines of inquiry will be used as appropriate during assessments in areas that interface with the S/CI process. See Attachment J.</li> </ol> |
|-------------------|--|

#### 4.9 Training

- |                             |   |
|-----------------------------|---|
| Managers and<br>Supervisors | <ol style="list-style-type: none"> <li>1. Evaluate individual training needs of assigned personnel to ensure they are proficient in S/CI identification and control procedures within their areas of responsibility.</li> <li>2. All personnel involved in the following specific areas will receive S/CI process and hands-on training, whether it be formal, continuing training, or required reading. The formal training course that is available is Module #1, Course 170720, "Suspect/Counterfeit Items." <ul style="list-style-type: none"> <li>• Quality Assurance/technicians</li> <li>• Engineers (design, systems, etc.) who procure materials/equipment</li> <li>• Maintenance personnel (electricians, pipefitters, millwrights, instrument technicians)</li> <li>• Warehouse personnel who handle and process materials/equipment</li> <li>• Tool Crib attendants.</li> </ul> </li> </ol> |
|-----------------------------|---|

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## 5.0 DEFINITIONS

Counterfeit part. A part made or altered so as to imitate or resemble an “approved part” without authority or right, and with the intent to mislead or defraud by passing the imitation as original or genuine. (Source: U. S. Department of Transportation Federal Aviation Administration Advisory Circular 21-29B, Detecting and Reporting Suspected Unapproved Parts).

Fastener (regardless of the safety classification). (Source: Fastener Quality Act, Public Law 101-592 as amended by Public Law 104-113).

- A screw, nut, bolt, or stud with internal or external threads or a load-indicating washer with a nominal diameter of 5 millimeters or greater in the case of such items described in metric terms; or 1/4 inch or greater in the case of such items in terms of the English system of measurement which contains any quantity of metal and held out as meeting a standard or specification which requires through-hardening; or
- A screw, nut, bolt, or stud having internal or external threads which bears a grade identification marking required by a standard or specification; or
- A washer to the extent that it is subject to a standard or specification applicable to a screw, nut, bolt, or studs described above, except that such term does not include any screw, nut, bolt, or stud that is produced and marked as American Society for Testing and Materials (ASTM) A 307 Grade A or produced in accordance with ASTM F432.

Grade identification. Any symbol appearing on a fastener purporting to indicate that the fastener’s base material, strength properties, or performance capabilities conform to a specific standard of a consensus standards organization or government agency.

Graded classifications. System used to determine minimum requirements for structures, systems and components (e.g., design, operation, procurement, and maintenance requirements). The graded classifications in order of precedence are safety class, safety significant, and enhanced quality general services.

High strength graded fastener. Fasteners having a minimum tensile strength of 75 ksi, including those produced and procured in accordance with the Society of Automotive Engineers Standard J429, Grades 5, 5.2, 8, and 8.2; ASTM Standard A325, Types 1, 2, and 3; ASTM A490, ASTM A354, ASTM A449 (I&II), and some ASTM F468.

Item. An all-inclusive term used in place of any of the following: appurtenance, assembly, component, equipment, material, module, part, structure, subassembly, subsystem, system, or unit. (Source: ASME-NQA-1-1989, Quality Assurance Requirements for Nuclear Facilities).

An all-inclusive term used in place of any of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, structure, subassembly, subsystem, system, unit, documented concept, or data. (Source: DOE G 440.1-6, Implementation Guide for use with Suspect/Counterfeit Items Requirements of DOE O 440.1, Worker Protection Management; 10 CFR 830.120; and DOE 5700.6C, Quality Assurance).

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Substantial safety hazard. A loss of safety function to the extent that there is a major reduction in the degree of protection to the public or employee health and safety. (Source: U.S. Department of Energy (DOE) M 232.1-1A, "Occurrence Reporting and Processing of Operations Information").

Suspect/counterfeit items. A suspect item is one in which there is an indication by visual inspection, testing, or other information that it may not conform to established Government or industry-accepted specifications or national consensus standards. A counterfeit item is a suspect item that is a copy or substitute without legal right or authority to do so or one whose material, performance, or characteristics are knowingly misrepresented by the vendor, supplier, distributor, or manufacturer. An item that does not conform to established requirements is not normally considered S/CI if the nonconformity results from one or more of the following conditions, which should be controlled by site procedures as nonconforming items:

- Defects resulting from inadequate design or production quality control
- Damage during shipping, handling, or storage
- Improper installation
- Deterioration during service
- Degradation during removal
- Failure resulting from aging or misapplication, or
- Other controllable causes.

(Source: DOE G 440.1-6, Implementation Guide for use with Suspect/Counterfeit Items Requirements of DOE O 440.1, "Worker Protection Management," 10 CFR 830.120; and DOE 700.6C, "Quality Assurance").

## 6.0 RECORDS

No records are generated during the performance of this procedure.

## 7.0 SOURCES

### 7.1 Requirements

1. DOE-O-232.1A Part 4.f. (1), "Occurrence Reporting and Processing of Operations Information." (S/RID)
2. DOE O 414.1A, "Quality Assurance."
3. 10 CFR 830, Subpart A, "Quality Assurance Requirements."
4. DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees."

### 7.2 References

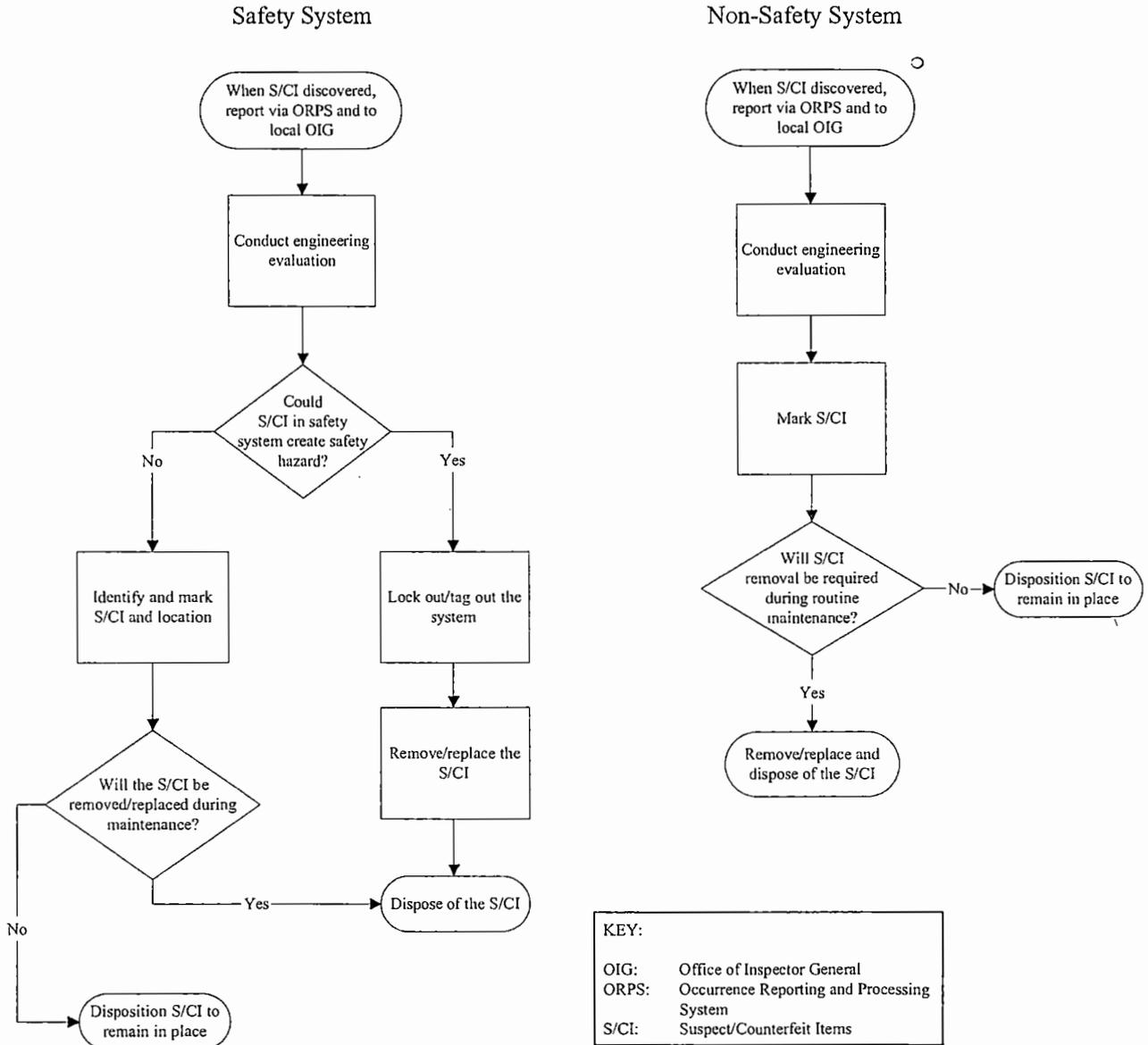
1. HNF-SD-MP-SRID-001, "Standards/Requirements Identification Document for the Tank Farm Contractor."

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2. DOE G 440.1-6, "Implementation Guide for use with Suspect/Counterfeit Items Requirements of DOE O 440.1, Worker Protection Management; 10CFR830.120; and DOE5700.6C, Quality Assurance."
3. NRC Information Notice 89-70: "Possible Indications of Misrepresented Vendor Products."
4. NRC Information Notice 89-70, Supplement 1: "Possible Indications of Misrepresented Vendor Products."
5. TFC-BSM-CP CPR-C-01, "Purchasing Card (P-Card)."
6. TFC-BSM-CP CPR-C-03, "Buyer's Technical Representative Process."
7. TFC-BSM-CP CPR-C-06, "Procurement of Items (Materials)."
8. TFC-BSM-CP CPR-C-09, "Supply Chain Process."
9. TFC-BSM-CP CPR-C-11, "Acquisition Planning."
10. TFC-BSM-FPM MC-C-01, "Material Receipt, Storage, Issuance, Return, and Excess Control."
11. TFC-ESHQ-Q ADM-C-02, "Nonconforming Item Reporting and Control."
12. TFC-OPS-OPER-C-24, "Occurrence Reporting and Processing of Operations Information."
13. TFC-PLN-03, "Engineering Program Management Plan."

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Figure 1. Management of Suspect/Counterfeit Items.



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**ATTACHMENT A - SUSPECT COMPONENTS LIST**

This list was extracted from the U.S. Department of Energy Quarterly Reports on the "Analysis and Trending of Suspect/Counterfeit Items at Department of Energy Facilities," July 1997.

NOTE: It is not necessarily a negative reflection on a supplier or manufacturer if S/CIs are reported regarding its particular product. Reputable manufacturers and suppliers have a vital interest in preventing the manufacture or distribution of S/CI associated with themselves. It may be that the supplier or manufacturer was victimized and is pursuing S/CI associated with its products in an aggressive, prudent, and professional manner in order to get such items off the market. Therefore, each particular case regarding the manufacture or supply of S/CI must be examined on its own merit without making premature conclusions regarding fault or culpability of the manufacturer or supplier whose name is associated with the S/CI. In short, what follows is a "suspect components list" and not a "suspect manufacturer or supplier list." The manufacturer or supplier identified in the following table should not be considered to have engaged in any wrongdoing without additional information.



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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Westinghouse (Component Examples)			
	<ul style="list-style-type: none"> <li>• TF136090</li> <li>• TF361050WL</li> <li>• TED1130020</li> </ul>	Commercial Grade	Westinghouse Electric Supply Co. (WESCO)	NRC I.N. 91-48
	<ul style="list-style-type: none"> <li>• Not Provided</li> </ul>			
	<ul style="list-style-type: none"> <li>• DB-25 &amp; DS-416</li> </ul>	Low Voltage	Satin America & Circuit Breaker Systems, Inc.	NRC I.N. 89-45 & Supplement #2
	<ul style="list-style-type: none"> <li>• FSN-5925-628-0641</li> </ul>	Trip units; Navy Trip units; 1, 2, & 3 pole various amp. ratings	General Circuit Breaker & Electrical Supply	NRC I.N. 88-46, Supplements and Attachments
	<ul style="list-style-type: none"> <li>• DB-25</li> </ul>			
	<ul style="list-style-type: none"> <li>• DB-50</li> </ul>			
	<ul style="list-style-type: none"> <li>• HKB3150T</li> </ul>			
	<ul style="list-style-type: none"> <li>• FB3020</li> </ul>			
	<ul style="list-style-type: none"> <li>• FB3070</li> </ul>			
	<ul style="list-style-type: none"> <li>• FB3050</li> </ul>			
	<ul style="list-style-type: none"> <li>• EHB3025</li> </ul>			
	<ul style="list-style-type: none"> <li>• LBB3125</li> </ul>			
<ul style="list-style-type: none"> <li>• HKA31250</li> </ul>				
<ul style="list-style-type: none"> <li>• JA3200</li> </ul>				
<ul style="list-style-type: none"> <li>• EHB2100</li> </ul>				
<ul style="list-style-type: none"> <li>• 225N</li> </ul>				
<ul style="list-style-type: none"> <li>• EB 1020</li> </ul>	HLC Electrical Supply	Office Of Nuclear Safety 93-9		
<ul style="list-style-type: none"> <li>• HDEA 2030</li> </ul>	California Breakers, Inc.			
<ul style="list-style-type: none"> <li>• MCP331100R</li> </ul>	PENCON International (DBA) General Magnetics/Electric Wholesale			
<ul style="list-style-type: none"> <li>• MCP431550CR</li> </ul>	ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply			
<ul style="list-style-type: none"> <li>• BAB3060H</li> </ul>				
<ul style="list-style-type: none"> <li>• 656D14 8G03</li> </ul>	Molded Case Circuit Breakers			
<ul style="list-style-type: none"> <li>• FA-2100</li> </ul>				
<ul style="list-style-type: none"> <li>• EH-2050</li> </ul>	NSSS, Inc.			
<ul style="list-style-type: none"> <li>• HFB-3050</li> </ul>				
<ul style="list-style-type: none"> <li>• HFD(B)-3020</li> </ul>	Spectrum, Tech.			
<ul style="list-style-type: none"> <li>• MA3600</li> </ul>				
<ul style="list-style-type: none"> <li>• F2020</li> </ul>				
<ul style="list-style-type: none"> <li>• EH2100</li> </ul>				
<ul style="list-style-type: none"> <li>• EB3050</li> </ul>				
<ul style="list-style-type: none"> <li>• HMC3800F</li> </ul>				
<ul style="list-style-type: none"> <li>• EA2090</li> </ul>	Rosen Electric			
<ul style="list-style-type: none"> <li>• FA3125</li> </ul>				
<ul style="list-style-type: none"> <li>• HMCP 150</li> </ul>	Luckow Circuit Breaker			

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Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Westinghouse (cont.) (Component Examples)	Shunt Trips Aux. Contacts 2 & 3 pole circuit breakers of various amperages	General Circuit Breaker & Electrical Supply  HLC Electrical Supply  PENCON International (DBA) General Magnetics/ Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply  Molded Case Circuit Breakers Co. (MCCB)	NRC I.N. 88-46 Supplements and Attachments
	<ul style="list-style-type: none"> <li>• HFD</li> <li>• EH2070</li> <li>• FA2050</li> <li>• JA2225</li> <li>• JL3B125</li> <li>• JL3B070</li> <li>• JL3B150</li> <li>• JL3B200</li> <li>• JL3B090</li> <li>• JL3B100</li> <li>• HLM3800T</li> <li>• F3100N</li> <li>• MA3500</li> <li>• EH2015</li> <li>• FA3035</li> <li>• FA2100</li> <li>• HLA2125OTM</li> <li>• EH2070</li> <li>• JB3100</li> <li>• EB2030</li> <li>• 8MC800</li> <li>• CAH3200</li> <li>• EHB3040</li> <li>• JL3-B150</li> <li>• JL3-B200</li> <li>• JL3-B090</li> <li>• JL3-B1000</li> <li>• HFA, HFB, FA</li> <li>• JL3-(B)8070</li> <li>• JL3-B125</li> <li>• EH-2020</li> <li>• FA-3035</li> <li>• EH-2050</li> <li>• FA-2100</li> <li>• FA-2050</li> <li>• HFB-3050</li> <li>• JA-2225</li> <li>• HLM3800T</li> <li>• F3100N</li> <li>• MA3500</li> <li>• EH2015</li> <li>• LA3200WL</li> <li>• HLA3200T</li> <li>• 2602D58U9</li> </ul>			



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Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	ITE (cont.) (Component Examples) <ul style="list-style-type: none"> <li>• HE9B040</li> <li>• EE3B050</li> <li>• BQ2B030</li> <li>• EE3B070</li> <li>• EE2B100</li> <li>• EE2B050</li> <li>• EE2B030</li> <li>• FJ3B225</li> <li>• ET</li> <li>• KA</li> <li>• EH-313015</li> <li>• JL-3B070</li> <li>• JL-3B150</li> <li>• E43B015</li> <li>• EF2-B030</li> <li>• EH3B100</li> <li>• QP1B020</li> <li>• QJ3B200</li> <li>• EF3B100</li> <li>• 1193</li> </ul>		California Breakers, Inc.  PENCON International (DBA) General Magnetics/ Electric Wholesale  ATS Circuit Breakers, Inc.  Panel Board Specialties  Rosen Electric Equipment	
Circuit Breakers	ITE, Gould & ITE Imperial  Brown Boveri Elect. (BBE) ASEA Brown Boveri (Component Examples) <ul style="list-style-type: none"> <li>• Type HK</li> <li>• 5 HK</li> <li>• 7.5 HK</li> <li>• 15 HK</li> <li>• 38 HK</li> <li>• ITE 62-6</li> </ul>	Not Provided ID-4KV Not Provided Not Provided Not Provided	Brown Boveri ASEA Brown Boveri	NRC I.N. 89-86  NRC I.N. 87-41  Office of Nuclear Safety, 92-25
Circuit Breakers	Square "D" Co. Component Examples <ul style="list-style-type: none"> <li>• KHL 36125                (Any Type)</li> </ul>	Molded Case	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale	NRC I.N. 88-46 Supp. & Attach.  NRCB 88-10  NRC I.N. 90-46

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Circuit Breakers	Square "D" Co. Component Examples (cont.)		ANTI THEFT Systems Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	
	• QOB220	1 pole, 15 amp	Not Provided	SENS ID #10 3-17-89
	• QO220 • LO-3	2 & 3 pole 20 & 50 amp breakers	General Circuit Breaker & Electrical Supply	NRC I.N. 89-45 & Supplement #2
	• SBW-12 • 989316 • FAL3650-16M or • FAL36050-16M • KA36200	3 pole - 200 amp breaker 30A/600V	HLC Electric Supply California Breakers, Inc.	
	• 999330	Not Provided	PENCON International (DBA) General Magnetics/Electric Wholesale	
	Manufacturer not Provided	Not Provided	Stokely Enterprises	DOE Letter 8-26-91 Reprinted NuVEP: Bulletin 7-26-91
	• EHB3025		Molded Case Circuit Breakers	
Circuit Breakers	Fed. Pacific (Component Examples)		General Circuit Breaker & Electrical Supply	
	• NEF431020R • NE111020 • NE	3 pole, 20 amp 1 pole, 20 amp 1 pole, 15 amp	HLC Electric Supply	
			California Breakers, Inc.	
			PENCON International (DBA) General Magnetics/Electric Wholesale	SENS ID. #10 3-17-89

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Circuit Breakers	Fed. Pacific (Component Examples) (cont.)	1, & 3 pole - 30, 60 & 100 amp breakers	ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	SENS ID. #11 3-3-89
	<ul style="list-style-type: none"> <li>• NF63-1100</li> <li>• NE22-4060</li> <li>• NE22-4100</li> <li>• NEF-433030</li> <li>• 2P125</li> </ul>		General Circuit Breaker & Electrical Supply	
Circuit Breakers	Jefferson (Component Examples)	Not Provided	HLC Electric Supply	NRC I.N. 88-46, Supp. & Attach.
			California Breakers, Inc.	
Circuit Breakers	Superior (Component Examples)	Not Provided	ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46 Supp. & Attach.
			Mid West Co.	
Circuit Breakers	<ul style="list-style-type: none"> <li>• 246U-3</li> </ul>	Not Provided	Rosen Electric	NRC I.N. 88-46 Supp. & Attach.
			HLC Electric Supply	
Circuit Breakers		Not Provided	PENCON International (DBA) General Magnetics/Electric Wholesale	NRC I.N. 88-46 Supp. & Attach.
			ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	

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Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Manufacturer Not Provided (Component Examples)  50DHP250	2 pole - 50 amp	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46, Supp. & Attach.
Circuit Breakers  Heaters	Cutler Hammer (Component Examples)  • 10177H13  • 10177H21 • 10177H32 • 10177H036 • 10177H1049	Not Provided	AAKER  General Circuit Breaker & Electrical Supply  HLC Electrical Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46, Supp. & Attach.

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Component	Manufacturer/Type	Description	Supplier	References
Switches	(Component Examples)  Crouse Hinds #EDSC2129  Sq. D Type G. Class 9012, 9025, 9016	Tumbler, ft. op	Platt Electric Supply Co.  Gen. Motors, Electro-Motive Design	SENS ID #16 1-27-92  Office of Nuclear Safety 93-24 & 93-27
Transmitters	Rosemount	(Component Examples)  • Model 1151 GP • Model 1151 DP	Venetech	E.L. Wilmot letter dated 8-1-91  H. Richardson letter HR-81-91 dated 8-15-91
Motors	Siemen & Allis (Component Examples)  INP 143 T 215 T	10 H.P.	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply  Rosen Electric Equipment	NRC I.N. 88-46, Supplements and Attachments

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Relays	Potter & Brumfield (Component Examples)  MDR-138, 173-1 134-1, 142-1	Not-latching rotary	Stokely Enterprises  Spectronics, Inc.  Nutherm International  The Martin Co.	NRC I.N. 90-57 & Attach.
	Teledyne	All qualified to MIL-R-28776 and MIL-R-39016	Not Provided	DOE-ID Wilmot letter, 7-16-91
	G.E. & Exide (Component Examples)  • 12HGA-11S52 • NX 400	Overload & Aux.	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46, Supp. & Attach.
	Manufacturer not provided  • FSC-5945	Not Provided	Stokely Enterprises	DOE Letter 8-26-91 Reprinted NuVEP: Bulletin 7-26-91
	Amerace (or Agastat) (Component Examples)  Models: E7024 E7022	Electro Pneumatic Timing Relays	Amerace  Control Components Supply	SENS ID #1 11-1-91  NRC I.N. 92-24
	A through L Series Model 7032	PRB		

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Fuses	Bussman Co. (Component Examples)  REN 15 & NOS-30          Class 1E	15A-250V & 30A-600V          All Supplied by PMS	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply  Preventive Maintenance Systems (PMS)	NRC I.N. 88-46, Supp. & Attach.          NRC I.N. 88-19
Controllers	Manufacturer Not Listed (Component Examples)	Motor Controllers	Stokely Distributors & Stokely Enterprises, Inc.	DOE letter 8-26-91 & NUVEP Bulletin 7-26-91
Starters	Westinghouse (Component Examples)  626B187G17 626B187G13	Not Provided	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-45 Supp. & Attach.
Resistors	Unknown	All	Impala Electronics	NRC I.N. 91-01

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**ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)**

Component	Manufacturer/Type	Description	Supplier	References
Semiconductors	Solid State Devices Inc. (SSDI) SFF 9140	P-Channel MOSFET	SSDI	DOE Albuquerque Letter, 06-25-96 to DOD Inspector General
	SPD 1511-1-11	Pin Diode (SA3059)		
	2A14/18 or 2A14/52	Ion Implanted Diode		
	SSR4045CTTXV	SCHOTTKY Diodes		
	SFF9140TWX	Power Transistors		
	SPMF106ANH	Special Pack MOSFET Switch		
	SPD 5818 or IN5858JTXV	Axial Leaded SCHOTTKY Diode		
	2N797	Transistor		
	Unknown	Diode (SA 3436)		
Starter Controls	Westinghouse (Component Examples)	Not Provided	General Circuit Breaker & Electrical Supply	NRC I.N. 88-48
	• A200MICAC		HLC Electric Supply	
	• A20IKICA		California Breakers, Inc.	
	• A201L2CA			
	• AN13A		PENCON International (DBA) General Magnetics/Electric Wholesale	
			ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Gauge Glasses	Siemen & Allis (Component Examples)  #00-737-637-118 215 T	Not Provided	Rosen Electric Co.	NRC I.N. 88-46 Supp. & Attach.
Mercury Lamps	Spectro Inc. (Component Examples)  V00014	Not Provided	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46
Electrical Frames	Westinghouse (Component Examples)  LA2600F LA3600F MA2800F	Not Provided	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46
Push button station	Crouse Hinds (Component Examples)  #00-737-637-118	Single gang, pushbutton	Platt Electric Supply Co.	SENS Report ID #16 1-27-92

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Overload Relay Thermal Unit	Square D (Component Examples) B19.5, B22	Not Provided	Not Provided	NRC I.N. 88-46
Piping, Fittings, Flanges, and Components	Tube-line Corp. Ray Miller, Inc.	Subassemblies, fittings, flanges, & other components  (Carbon and Stainless Steel components)	Tube-line Ray Miller, Inc.	NRC IEB 83-06 NRC I.N. 89-18 NRC IEB 83-07 NRC I.N. 83-01
Piping, Fittings, Flanges, and Components	Piping Supplies, Inc. & West Jersey Mfg. & Chews Landing Metal Mfg.	Carbon and Stainless Steel Fittings and Flanges	Piping Supplies, Inc. & West Jersey Mfg. & Chews Landing Metal Mfg.	NRC Bulletin 88-05 & Supplements
Valves	VOGT	Full port design 2-inch Model SW-13111 & 1023	CMA International IMA Valve Refurbisher	NRC I.N. 88-48 & Supplements
	Crane	4"-1500psi, pressure sealed	Southern Cal. Valve Maintenance co., Amesse Welding Service & CMA Int.	NRC I.N. 91-09
	ITT Grinnell Valve Co., Inc	Diaphragm valves	ITT Grinnell Valve Co. Inc. Div. of Diaflo & ITT Engineered Valves	NRC Comp. Bulletin 87-02
	Crane, Pacific, Powell, Walworth & Lunkenheimer	Gate Valves	Coffeyville Valve Inc.	NRC I.N. 92-56
	Pacific	8" & 3" Globe Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48, Supp. & Attach.
	Crane Chapman	24" Check Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48, Supp. & Attach.
	Pacific	Check Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48, Supp. & Attach.

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**ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)**

Component	Manufacturer/Type	Description	Supplier	References
Valves	Kerotest	8" Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48 Supp. & Attach.
	Pacific	4" Gate Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48 Supp. & Attach.
	Lukenheimer	6" Model 1542 20" Model 3013	CMA & IMA Valve Refurbisher	NRC I.N. 88-48 Supp. & Attach.
	Crane	All	CMA & IMA Valve Refurbisher	NRC I.N. 88-48 Supp. & Attach.
Flanges	China Ding Zinang Nan Xi Li Flange Co. Shou Gang Mach. Eng. Co.	Flanges, ASTM A105, ASME SA105	Billiongold Co. LTD. Tain Gong Co. Sanxi Province Overseas Trading Corp	NRC I.N. 92-68 and Attachments  Office of Nuclear Safety 92-25, 93-23, and 92-35  National Board of Boiler and Pressure Vessel Inspectors (NBBI) Bulletin: Special Report, 1992, Volume 48, Number 2, The Chinese Flange Investigation
Valve Replacement Parts	Masonellian-Dresser Industries	Plug stem, stem to plug anti-rotation pin, seat ring, valve plugs, bushings, cages & packing box components	Cor-Val, Control Valve Specialists, H.H. Barnum & M.D. Norwood, Sample Webtrol Controls, Inc.	NRC I.N. 88-97 Supp. & Attach.
Pumps & Replacement Parts	Hayward Tyler Pump Co.	HTPC ASME Nuclear Code	Hayward Tyler Pump Co.	IEB 83-05 & Attachments
Channel Members	Unistrut Corporation	Continuously slotted channels, structural framing members, fasteners, nuts, fittings, pipe clamps	Unistrut Corporation	NRC I.N. 91-25
Fire Barriers	Thermal Science Inc.	Thermo-Log 330	None Listed	ES&Q Update #8 NRC I.N. 92-55
Valve Actuator	Limitorque	Eyebolts on housing cover	None Listed	Office of Nuclear Safety 93-25  NRC I.N. 93-37

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Steel	Alloy & Carbon Steel Co. Inc., Atlantic Steel Co., Livingston Steel Co., & Copperweld Steel co.	Plate Angle Flat Bar Bar	Meredith Corporation Pressure Vessel Nuclear Alloy & Carbon Steel Co., Inc.	NRC I.N. 89-56, Attachments and Supplements
Fasteners (Bolts, Screws, Nuts, and Washers)	(parentheses designated headmark)  Asahi (A) Daiichi (D) Daiei (E) Fastener Co. of Japan (FM) Hinomoto Metal (H) Jin Her (J) Kyowa (K) Kosaka Kogyo (KS) Kyoei Minamida Seiybo (M) Mnato Kogyo (MS) Nippon (NF) Takai (RT) Tsukimori (S) Unytte (UNY) Yamadai (Y) Ivaco, Infasco (hollow triangled)	<ul style="list-style-type: none"> <li>• Those with suppliers or manufacturers</li> <li>• Those that are improperly marked</li> <li>• Those of foreign manufacture that do not meet Public Law 101-592. Fastener Quality Act</li> </ul>	<p>Note: Listed suppliers may also be manufacturers</p> <p>Lawrence Engineering &amp; Supply Co. Metal Building Bolts Nichimin Corporation UNICO Ace Corporation E. K. Fasteners, Inc. H. Y. Port Fasteners Co. Kobayashi Metals, LTD. Takai Screw Mfg. Co. LTD. Yamaguchi Sesakusho Co. LTD. Highland Bolt &amp; Nut Porteous Fastener Co. Northwest Fasteners Ziegler Bolts &amp; Parts Co. Edgewater Fasteners, Inc. Reynolds Fasteners A &amp; G Engineering</p>	<p>Commercial Carrier Journal Articles for: 6/88, 1/90, 2/90, 3/90, 4/90, 6/90, 7/90, 12/90</p> <p>INEL Suspect Headmark List</p> <p>SENS Report #5 2/6/91</p> <p>SENS Report #13 2/6/91</p> <p>HR 3000, U.S. House of Representatives, July 1988</p> <p>J. A. Jones, Ltr, 9/23/92</p> <p>Memo from L. Kubicek, 3/28/91</p> <p>Memo from D. Sanow, 3/8/91</p> <p>"Fastener Technology International," Feb., April, and June 1993</p> <p>Rep. J. Dingell Ltr to Comm. Dept. &amp; NRC June 18, 1993</p> <p>Office of Nuclear Safety 93-26, 93-22, 93-11</p> <p>DOE Quality Alert, Bulletin, Issue No. 92-4, August 1992</p> <p>FDH Hanford Suspect Headmark List</p>

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Fasteners (Bolts, Screws, Nuts, and Washers)	NUCOR	1-1/4" x 2" Zinc Chromate plated surface Hexhead cap screws	Cordova Bolt, Inc.	SENS ID #13 11-6/91
	Any	Any	Aircom Barnett Bolt Works Bolts & Nuts, Inc. Glasser & Assoc. Knoxville Bolt & Screw Metal Fastener Supply Phoell Mfg. Co. Service Supply Co. Southeastern Bolt & Screw Sure Loc Victory Bolt	NRC Compliance Bulletin 87-02 NRC I.N. 89-59

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**ATTACHMENT B - CLASSIFICATION OF POTENTIALLY SUSPECT/COUNTERFEIT  
ITEMS****A. ELECTRICAL ITEMS**

- Molded Case Circuit Breakers
- Motor Control Centers
  - Complete Units
  - Components
  - Starters
  - Starting coils
  - Contactors
  - Overload relays
  - Starter control relays
  - Overload heaters
- Protective/control relays
- DC power supplies/chargers
- AC inverters
- Current/potential transformers
- Exciters/regulators
- Bus transfers/auto bus transfers
- Motor generator sets
- Generators
- Rewindable motors
- Printed circuit boards
- Bulk commodity items
  - Fuses
  - Splices
  - Electrical connectors
- Indicators/controllers
- Panel lights/switches
- Transmitters/instrument switches
- Isolation devices.

The following items are excluded unless required by the applicable program/project: 600V or less: motors; outlets, switches, and plugs; boxes, conduit (i.e., bodies and covers, nipples, fittings, EMT, flex, liquid tight, rigid); wire; miscellaneous wire connections #10 and below; fixtures; lights.

**B. MECHANICAL ITEMS**

- Welding materials
  - Rod
  - Wire
  - Flux
- Structural members (pipe supports)
- Channel members

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**ATTACHMENT B - CLASSIFICATION OF POTENTIALLY SUSPECT/COUNTERFEIT  
ITEMS (cont.)**

- Sheet
- Plate
- Bars
- Round stock
- Other raw material which requires an ASTM or national standard
- All lifting/rigging gear (wire rope shall be made in the United States by a member of the Wire Rope Technical Board (WRTB) or the Associated Wire Rope Fabricators (AWRF) (except stainless steel, and unless recommended otherwise by a crane or hoist manufacturer); stainless steel wire rope shall be made in the United States and shall be 302 or 304 grade stainless steel unless otherwise recommended by a crane or hoist manufacturer)
- Ratchet tie-downs/strapping devices and come-a-longs, with fasteners.

The following materials are excluded unless required by the applicable program/project:  
ASTM-A36, brass, copper, sheet metal 7 GA or less, and aluminum.

- C. PIPING - which requires an ASTM or ASME standard
- Fittings
  - Flanges
  - Valves
  - Pipe
  - Components.

The following materials are excluded unless required by the applicable program/project:  
ASTM-A-53, Swagelock; cast iron, galvanized, copper, bronze, and brass; PVC; and gaskets.

- D. FASTENERS - All fasteners 1/4" and above in diameter
- Bolts
  - Studs
  - Cap screws
  - High-strength washers
  - Nuts
  - Anchors.

NOTE: Attachment I identifies headmarkings for stainless steel and carbon steel high strength fasteners that are considered counterfeit. Fasteners exhibiting these headmarks are counterfeit and no further testing is required.

The following items are excluded, unless required by the applicable program/project: sheetmetal screws, wood screws, stove bolts, pan heads, machine screws, lag bolts, threaded rod, rivets, and carriage bolts.

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### **ATTACHMENT C - SUSPECT/COUNTERFEIT ITEMS INFORMATION SOURCE LIST**

A wide variety of industry and Government sources publish information relative to suspect/counterfeit products. The following sources provide information which is available on a continuing basis:

#### Industrial Fasteners Institute (IFI)

The following information is available from IFI via subscription:

- "Fastener Application Advisory" (Published Monthly)
- "North American Manufacturers Identification Markings for Fasteners"
- Fastener-related video cassettes.

#### The National Board of Pressure Vessel Inspectors (NBBI)

The NBBI publishes "National Board Bulletins" to alert manufacturers and users of misrepresented products as they are discovered.

#### National Highway Traffic Safety Administration (NHTSA)

The NHTSA's Office of Defects Investigation issued a "Suspect Bolt List" in late 1990 identifying numerous fasteners, which they determined to be misrepresented.

#### Trade Journals and Magazines

There are numerous trade-oriented magazines which have carried articles identifying incidents of failure of substandard parts in industry applications which have caused personal injury and death, as well as serious property damage.

#### Newspaper and Television Reports

Another good source of information are news reports, which provide current accounts of problems encountered as a result of misrepresented products.

#### U.S. Nuclear Regulatory Commission (NRC)

The NRC issues bulletins, notices, and regulatory guidance on a continuing basis to alert nuclear power utilities of potential intrusion of misrepresented products into the operations environment of operating nuclear power plants.

U.S. Department of Defense (DOD) and U.S. Department of Commerce publications are also monitored by the DOE to assure that the deficiencies identified do not contaminate DOE facilities.

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**ATTACHMENT C - SUSPECT/COUNTERFEIT ITEMS INFORMATION SOURCE LIST (cont.)**

## Government Industry Data Exchange Program (GIDEP)

The mission of this program, established by the Office of Management and Budget, is to support government systems readiness, logistics effectiveness, productivity, and cost reduction through timely retrieval, storage, and distribution of data among government and industry organizations.

## U.S. Department of Energy

The following documents are issued by the DOE to provide information and guidance relative to the suspect/counterfeit parts issue:

- DOE Orders
- Letters of Direction
- Bulletins and Quality Alerts

(In addition, the DOE periodically sponsors seminars/workshops relative to the detection and control of suspect/counterfeit parts).

## U.S. Customs Service

The U.S. Customs Service has published the Suspect Headmark List (Figure 1) identifying graded fasteners determined to be of indeterminate quality, which has been adopted by DOE and, ultimately, Project Hanford, as a formal guide for use when evaluating currently installed and newly procured graded fasteners to assure their fitness for use on the Hanford Site.

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**ATTACHMENT D - CHARACTERISTICS THAT MAY MAKE PRODUCTS VULNERABLE TO MISREPRESENTATION, FRAUDULENT PRACTICES, AND COUNTERFEITING**

The following information has been extracted from the NRC Information Notice 89-70, Supplement 1, Attachment 3:

- High-turnover usage rate.
- No easy or practical way to uniquely mark the component itself.
- Critical characteristics, including environmental qualification not easily discernable in external visual inspection, or characteristics that are difficult to verify through receipt testing.
- May be widely used in non-critical and critical applications.
- Use may not result in used appearance.
- Often marketed through a supplier and dropped shipped from locations other than that of the original supplier.
- Special processes for ASME materials may be subcontracted (heat treating, testing, and inspections).
- Easily copied by secondary market suppliers.
- Viable salvage market.
- Reduced number of original equipment manufacturers.
- Obsolete or hard-to-get components.
- Components manufactured by a company that is no longer in business.
- Items with documentation from a plant where construction has been suspended, canceled, or deferred.
- Moderate or low cost.
- High potential for profit (rejected heats of material are purchased and decertified).

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### ATTACHMENT E - WHERE TO LOOK FOR SUSPECT/COUNTERFEIT ITEMS

The following areas should receive increased scrutiny to assure that suspect/counterfeit items are not evident:

#### Items in Supply

- Company supply stock
- Wagon stock
- Other sources of supply contamination.

#### Items in Use

- Plant facilities, components, and systems
- Equipment
- Operations and maintenance.

#### Items Being Procured

- "Known" critical items
- Critical equipment and assemblies
- Non-critical "known" purchases.

#### Operations Decisions

- Major disaster risks
- Personnel safety risks
- Program/mission risks (cost and schedule).

#### Cost of Implementation

- Potential consequential costs
- Management risk assessment
- Cost of focusing established controls
- Impact on schedule and program mission.

#### Cost of Focus on Known Suspect/Counterfeit Parts

- Uses existing procurement program
- Focuses on "known parts first"
- Reduction in major disaster potential
- Program costs low/benefits high.

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### ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION

It is very important to remember that just because an item is identified as being "suspect/counterfeit" it may not be appropriate to simply reject it. A review should be performed prior to formal disposition of the item to assure that it is indeed unfit for the intended application.

#### DETECTION METHODS

##### Visual Inspection

Items may be substandard or fraudulent when:

- Nameplates, labels, or tags have been altered, photocopied, painted over, are not secured well, show incomplete data, or are missing (e.g., preprinted labels normally show typed entries).
- Obvious attempts at beautification have been made, e.g., excess painting or wire brushing, evidence of hand painting (touch-up), or stainless steel is painted.
- Handmade parts are evident, gaskets are rough cut, shims and thin metal part edges show evidence of cutting or dressing by hand tools (filing, hacksaw marking, use of tin snips or nippers).
- Hand tool marks on fasteners or other assembly parts (upset metal exists on screw or bolt heads) or dissimilar parts are evident (e.g., seven or eight bolts are of the same material and one is a different material).
- Poor fit between assembled items.
- Configuration is not consistent with other items from the same supplier or varies from that indicated in supplier literature or drawings.
- Unusual box or packing of component or item.
- The supplier is not a factory-authorized distributor.
- Dimensions of the item are inconsistent with the specifications requested on the purchase order and/or those provided by the supplier at the time of shipment.
- The item or component matches the description of one that is on a suspect items list (e.g., U.S. Customs Service "Suspect Headmark List," National Board of Boiler and Pressure Vessel Inspectors (NBBI) "Special Bulletin," etc.).

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION (cont.)**

## Documentation

Documents may be suspect/counterfeit when:

- The use of correction fluid or correction tape is evident. Type or pitch change is evident.
- The document is not signed or initialed when required, is excessively faded or unclear (indicating multiple, sequential copying), or data are missing.
- The name or title of the document approved cannot be determined.
- Technical data is inconsistent (e.g., chemical analysis indicates one material and physical tests indicate another).
- Certification or test results are identical between items when normal variations should be expected.
- Document traceability is not clear. The document should be traceable to the item(s).
- Technical data are not consistent with code or standard requirements (e.g., no impact test results provided when impact testing is required or CMTRS physical test data indicate no heat treatment and heat treatment is required).
- Documentation is not delivered as required on the purchase order or is in an unusual format.
- Lines on forms are bent, broken, or interrupted indicating data has been deleted or exchanged (cut and paste).
- Handwritten entries of data are on the same document where typed or preprinted data exists.
- Data on a single line located at different heights indicate the possibility of retyping.

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION (cont.)**

## Fasteners

- Headmarkings are marred, missing, or appear to have been altered.
- Threads show evidence of dressing or wear (threads should be of uniform color and finish).
- Headmarkings are inconsistent with a heat lot.
- Headmarkings matching one of those identified on the U.S. Customs Service, "Suspect Headmark List" (Figure QP 3.2-1).
  - Headmarkings which depict both raised and hand-stamped markings, such as those described in WHC Quality Assurance Bulletin # 94-01, "Discrepant Dual Head Stamped Stainless Steel Bolts." This bulletin documents the results of internal inspections and independent testing of stainless steel bolts purchased to ASTM A193, Grade B8, which were found to be substandard.
  - Only manufacturers listed on the "Suspect Fastener Headmark List" (Figure QP 3.2-1) are known to produce substandard graded fasteners. If graded fasteners are discovered which exhibit headmarks matching those on the Suspect/Fastener Headmark List, they shall be considered to be defective without further testing, unless traceable manufacturer's certifications are received which provide documented evidence that the fasteners were not produced by the manufacturer listed on the Suspect Fastener Headmark List.
  - Interpretation of headmark/manufacturers listed on the "Suspect Fastener Headmark List," including newly discovered variations thereto, shall only be provided by the designated S/CI coordinator based on guidance received from the DOE.

## Electrical Devices

- Connections show evidence of previous attachment (metal upset or marring).
- Connections show arcing or discoloration.
- Fasteners are loose, missing, or show metal upset.
- Molded case circuit breakers are not consistent with manufacturer-provided checklists for detecting substandard/fraudulent breakers.
- Missing or photocopied Underwriters Laboratories (UL) labels on products requiring such.

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION (cont.)**

## Rotating Machinery and Valve Internal Parts

- Shows marring, tool impressions, wear marks, traces of Prussian blue or lapping compound, or other evidence of previous attempts at fit up or assembly.
- Heat discoloration is evident.
- Evidence of erosion, corrosion, wire-drawing or “dimples” (inverted cone-shaped impressions) on valve discs, seats, or pump impellers.

## Valves

- Paint
  - Valve appears to be freshly painted and valve stem has paint on it
  - Wear marks on any painted surface
  - Valve stem is protected, but protection has paint on it
  - Paint does not match standard Original Equipment Manufacturer (OEM) color.
- Valve Tags
  - Tags attached with screws instead of rivets
  - Tags attached in a different location than normal
  - Tags appear to be worn or old
  - Tags with paint on them
  - Tags that look newer than the valve
  - Tags with no part numbers
  - Tags with irregular stamping.
- Hand Wheels
  - Old looking hand wheels on new looking valves
  - Hand wheels that look sand blasted or newer than the valve
  - Different types of hand wheels on valves of the same manufacturer.
- Bolts and Nuts
  - Bolts and nuts have a used appearance (excessive wrench marks on flats)
  - Improper bolt/nut material (e.g., a bronze nut on a stainless stem).

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION (cont.)**

- Valve Body
  - Ground off casting marks with other markings stamped in the area (OEM markings are nearly always raised, not stamped)
  - Signs of weld repairs
  - Incorrect dimensions
  - Freshly sand-blasted appearance, including eye bolts, grease fittings, stem, etc.
  - Evidence of previous bolt head scoring on backsides of flanges, or evidence that this area has been ground to remove such marks
  - On a stainless valve, a finish that is unusually shiny indicates bead-blasting. A finish that is unusually dull indicates sand-blasting. The finish on a new valve is in-between.

## Manufacturer's Logo

- Missing.
- Logo plate looks newer than the valve.
- Logo plate shows signs of discoloration from previous use.

## Other

- Foreign material inside the valve (e.g., metal shavings).
- Valve stem packing that shows all the adjustments have been run out.
- In gate valves, a gate that is off-center when checked through the open end of the valve.
- Obvious differences between valves in the same shipment.

## Price

- Price is significantly less than that of the competition.

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## ATTACHMENT G - FASTENERS

### 1.0 Counterfeit/Substandard High-Strength Bolts

#### 1.1 General Background

Counterfeit bolts have been found in military and commercial aircraft, surface ships, submarines, nuclear weapon production facilities, bridges, buildings, and the space shuttle. These bolts often do not possess the capabilities of the genuine bolts they counterfeit and can threaten the reliability of industrial and consumer products, National Security, or lives. At Congressional hearings in 1987, the Army testified that they had purchased bolts that bore the headmarks of Grade 8 high-strength bolts, but that were actually inferior Grade 8.2 bolts.

The International Fasteners Institute (IFI) reported finding substandard, mis-marked, and/or counterfeit high-strength Grade 8 bolts in the United States commercial marketplace. In 1988, IFI reported that counterfeit medium-strength Grade 5 bolts had also been found.

Foreign bolts dominate the American marketplace due to their price advantage, and the majority of suspect/counterfeit bolts are imported. Identifying, testing, and replacing these bolts has proven expensive and difficult, both mechanically and technically. Not finding and replacing these bolts, however, has proven fatal in some instances.

#### 1.2 Headmarks

Attachment I may be removed and photocopied, as needed, for use as a poster and reference to known suspect fastener headmarks. Bolts with the headmarkings shown have a significant likelihood of being found to be inferior to standards. Generally, the cost of replacement of these bolts is less than the cost of chemical, hardness, and tensile strength testing. Note also that counterfeit bolts can be delivered with counterfeit certificates. Documentation alone is insufficient to demonstrate compliance with standards.

#### 1.3 Consensus Standards

There are several consensus organizations that have published standards for the properties of fasteners. One of these is the Society of Automotive Engineers (SAE). The SAE grade (or alleged grade on a suspect item) of a bolt is indicated by raised or indented radial lines on the bolt's head, as shown in Attachment I. These markings are called headmarks. DOE is currently concerned with two different grades of fasteners: one has three equally spaced radial lines on the head of a bolt which indicate that it should meet the specifications for a Grade 5 bolt; the other has six equally spaced radial lines which indicate a Grade 8 bolt. Letters or symbols on the head of a bolt indicate the manufacturer.

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**ATTACHMENT G - FASTENERS (cont.)**

Attachment I is a Suspect/Counterfeit Headmark List that was prepared by the United States Customs Service after extensive testing of many samples of bolts from around the nation. Any bolts anywhere in the DOE community that are currently in stock, in bins, or installed that are on the Customs Headmark List should be considered suspect/counterfeit. The headmarks on this list are those of manufacturers that have often been found to have sold bolts that did not meet the indicated consensus standards. Sufficient testing has been done on the bolts on this list to presume them defective without further testing.

## 1.4 Precautions: Selective Testing

Some facilities (manufacturers, distributors, etc.) perform selective testing of sample bolts rather than have an independent testing laboratory run all the tests required by consensus standards. In many cases, a new counterfeit bolt has roughly the same physical strength as the graded bolt it mimics, but does not have either the chemical composition or the heat treatment specified by the consensus standards. As a result, it will stretch, exhibit metal fatigue, or corrode under less harsh service than the genuine bolt. Simple tensile strength tests cannot be used to identify substandard high-strength fasteners and should not be solely relied upon in performing acceptance test.

## 1.5 Using Suspect/Counterfeit Grade 5 Bolts in Grade 2 Applications

Some sites use suspect/counterfeit Grade 5 bolts in applications that only call for Grade 2 bolts. Eventually, the suspect/counterfeit Grade 5 bolts may find its way into an application that requires a genuine Grade 5 bolt and that application may fail. In some cases, cheap imported graded bolts have been purchased in place of upgraded bolts because the small price differential made the extra quality seem to be a bargain. Given the expense of removing suspect bolts from DOE facilities, the practice of using suspect bolts for any application should be discontinued.

## 1.6 Keep Bolts in Original Packages

All bolts purchased should be kept in the original packages, not emptied into bins. The packages should have labels or other markings that would permit them to be associated with a particular procurement action and a specific vendor. Approved supplier lists should be checked to assure that fastener suppliers on that list have been recently qualified/audited for adequacy of their quality programs.

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**Effective Date****December 31, 2003****ATTACHMENT G - FASTENERS (cont.)**

## 2.0 Stainless Steel fasteners

## 2.1 Purpose

To provide follow-up information to the previous notification sent to the DOE field and contractor organizations in late 1996.

## 2.2 Background

In November 1993, the Industrial Fastener Institute (IFI) issued a Fastener Advisory regarding 18-8 stainless steel bolts. The advisory warned about a "bait and switch" tactic in which a distributor takes an 18-8 bolt (indicated by two radial lines 90 degrees apart), but no manufacturer's marking, and sells them as ASTM A320 Grade B8 bolts after hand-stamping B8 on to the heads.

As a result of this IFI Advisory, DOE sites conducted a search of facility stores for stainless steel fasteners with hand-stamped B8 grade marks. Hundreds of stainless steel bolts with hand-stamped B8 grade markings, along with a variety of other raised and depressed head and manufacturer's markings were identified in facility stores throughout the DOE complex.

For example, an inspection of shop stock at a Hanford Site facility revealed bolts with three different raised grade markings, 18-8, 304, and F593C, along with raised manufacturer's identifications of CK, H, HP, C, SO, CS, PMC, TH, THE, and a STAR. The majority of the remaining samples found at Hanford exhibited raised grade markings of 18-8 and 304, with a B8 grade marking and manufacturer's identification hand-stamped into the head of the bolt.

Finally, a few samples did not display any manufacturer's markings. Most of the bolts discovered were purchased with the specification to meet a national consensus standard, American Society for Testing and Materials (ASTM) A193, B8 Class 1 rather than the ASTM A320 standard discussed in the IFI warning.

The Savannah River Site also conducted a site-wide search of facility stores with similar results. A total of 159 stainless steel fasteners with hand-stamped B8 grade marks and raised or hand-stamped manufacturer's symbols were found. Fifteen stainless steel fasteners that had no manufacturer's symbol were also found.

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**ATTACHMENT G - FASTENERS (cont.)**

## 2.3 Issue

The requirements of the ASTM A193 standard regarding fastener marking and certification are very similar those required by the ASTM A320 standard discussed in the IFI advisory. The ASTM A193 standard requires that grade and manufacturer's identification symbols be applied to the heads of bolts that are larger than 1/4" in diameter. The standard, however, does not specifically differentiate between raised and depressed headmarkings, but states only that "for the purposes of identification marking, the manufacturer is considered the organization that certifies the fastener was manufactured, sampled, tested, inspected in accordance with this specification." In other words, the standard allows for some of the required markings to be formed into the head of the bolt (either raised or lowered) during manufacturing, and the rest to be applied later on via hand-stamping.

Since ASTM A193 does not differentiate between raised and depressed markings, these fasteners can be counterfeited in the same way as the ASTM A320 fasteners discussed in the November 1993 IFI warning. For example, distributors can procure 18-8 stainless steel bolts that were manufactured by an anonymous party, and without conducting the necessary upgrading process or certification testing, a second party could hand-stamp B8 and a manufacturer's marking into the heads to indicate that the fasteners exhibit the mechanical and chemical properties required of ASTM A193 Grade B8 Class 1.

Unless the certification documentation is specifically requested, and in most cases it is not, there is no way to determine by visual inspection whether these fasteners were properly certified and tested to meet the requirements of the ASTM standard.

ATTACHMENT H - DOE HEADMARK LIST



# Help Stamp Out Suspects/Counterfeits

## Suspect Stainless Steel Fastener Headmark List

Examples of stainless steel fasteners that have been upgraded from 18-8 to ASTM A320 or ASTM A193 Grade B8 after hand stamping. The last three examples show samples of fasteners to indicate conformance to two non-compatible standards, ASTM A193 and ASTM F593C.

Any bolt on this list should be treated as defective without further testing and process in accordance with HNF-PRO-301. Note: This list was originally Published by DOE /EH-0196, Issue No. 97-6

If any of these fasteners are located, contact your facility S/C Point of Contact (POC) for instructions. The POC list is on the Hanford Intranet at: <http://docs.rl.gov/han.info/hlansci/hlansci.doc>. Scroll to the end of the document for the list.

	Surrounding White Color Illustrates Head Markings Before Hand Stamping
	Surrounding Black Color Illustrates Head Markings After Hand Stamping

**Suspect**


ATTACHMENT H - DOE HEADMARK LIST (cont.)

*Help Stamp Out Suspects/Counterfeits*



**Suspect Fastener Headmark List**

All Grade 5 and Grade 8 fasteners of foreign origin which do not bear any manufacturers' headmarks:



Grade 5



Grade 8

Grade 5 fasteners with the following Manufacturers' headmarks:

Mark	Manufacturer	Mark	Manufacturer
 J	Jinn Her (TW)	 KS	Kosaka Kogyo (JP)

Grade 8 fasteners with the following Manufacturers' headmarks:

Mark	Manufacturer	Mark	Manufacturer
 A	Asahi Mfg (JP)	 KS	Kosaka Kogyo (JP)
 NF	Nippon Fasteners (JP)	 RT	Takai Ltd (JP)
 H	Hinomoto Metal (JP)	 FM	Fastener Co. of Japan (JP)
 M	Minamida Sieybo (JP)	 KY	Kyoei Mfg (JP)
 MS	Minato Kogyo (JP)	 J	Jinn Her (TW)
 Hollow Triangle	Infasco (CA, TW, JP, YU)	(Greater than 1/2-inch diameter Grade 8 Hollow Triangle only)	
 E	Daiei (JP)	 UNY	Unytite (JP)

Grade 8.2 fasteners with the following headmarks:



Mark	Manufacturer
KS	Kosaka Kogyo (JP)

Grade A325 fasteners (Bennett Denver target only) with the following headmarks:

Type	Mark	Manufacturer
Type 1	 A325 KS	Kosaka Kogyo (JP)
Type 2	 A325 KS	
Type 3	 A325 KS	

Key: CA-Canada, JP-Japan, TW-Taiwan, YU-Yugoslavia  
Any bolt on this list should be treated as defective without further testing.

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COUNTERFEIT ITEMS****ATTACHMENT I - REFURBISHED MOLDED CASE CIRCUIT BREAKERS**

Investigations thus far of electrical components at DOE facilities uncovered over 700 suspect/ counterfeit molded-case circuit breakers that were previously used, refurbished and sold to DOE contractors.

1. Recognition Factors

The following factors should be recognized regarding suspect or refurbished circuit breakers:

- A. The quality and safety of refurbished molded-case circuit breakers is questionable since they are not designed to be taken apart and serviced or refurbished. There are no electrical standards established by Underwriters Laboratory (UL) for the refurbishing of molded-case electrical circuit breakers, nor are there any "authorized" refurbishes of molded case circuit breakers. Therefore, "refurbished" molded-case circuit breakers should not be accepted for use in any DOE facility.
- B. One source of refurbished molded-case circuit breakers is from the demolition of old buildings. Some refurbishes are junk dealers who may change the amperage labels on the circuit breakers to conform to the amperage ordered and then merely clean and shine the breakers.

This situation was brought to DOE's attention by the Nuclear Regulatory Commission (NRC), which, in turn, had been informed of the practice by the company that manufactures circuit breakers. In early 1988, a sales representative identified "refurbished" circuit breakers at Diablo Canyon Nuclear Power Plant. A subsequent investigation confirmed that circuit breakers sold to the power plant as new equipment were actually refurbished. The managers of the two firms that refurbished and sold these breakers have been convicted of fraud and have paid a substantial fine.

- C. NRC published information Notice No. 88-46 dated July 8, 1988, on the investigation findings and circulated it to all applicable government agencies, including DOE. On July 20, 1988, DOE notified all field offices that refurbished circuit breakers may have been installed in critical systems. Shortly thereafter, DOE established the Suspect Equipment Notification System (SENS), a sub-module of ES&H Events and News on the Safety Performance Measurement System (SPMS). SENS has since been replaced by the Supplier Evaluation and Suspect Equipment (SESE) sub-module which includes Suspect Equipment Reports.
- D. Some of DOE's older sites have circuit breakers in use that are no longer manufactured. According to the Nuclear Management and Resources Council (NUMARC), examples of such breakers are Westinghouse breakers with frames E, EA, F, and FA. If a DOE contractor has an electrical box that requires a breaker with one of these frame sizes, that contractor would not have been able to purchase it from Westinghouse for several years. If the contractor were to order a replacement breaker from an authorized Westinghouse dealer, the dealer could not get a new replacement breaker from the manufacturer. To fill the order, the dealer had to turn to the secondary or refurbished market.

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**ATTACHMENT I - REFURBISHED MOLDED CASE CIRCUIT BREAKERS (cont.)**

Dealing with an authorized distributor does not preclude ending up with refurbished circuit breakers. Westinghouse has announced that it is considering satisfying this market by manufacturing circuit breakers that will fit in these applications.

The solution, as recommended by NUMARC, is not to focus on the credentials of the distributor but on the traceability of the circuit breaker itself. A purchaser can be assured of having a new circuit breaker only if the breaker can be traced back to the original manufacturer.

**2. Indicators of Refurbished Breakers**

Typically, refurbished circuit breakers sold as new equipment have one or more of the following characteristics:

- The style of breaker is no longer manufactured.
- The breakers may have come in cheap, generic-type packaging instead of in the manufacturer's original boxes.
- Refurbished circuit breakers are often bulk-packaged in plastic bags, brown paper bags, or cardboard boxes with handwritten labels. New circuit breakers are packed individually in boxes that are labeled with the manufacturer's name, which is usually in two or more colors, and are often date stamped.
- The original manufacturer's labels and/or the Underwriter's Laboratory (UL) or Factory Mutual (FM) labels may have been counterfeited or removed from the breaker. Refurbishing operations have been known to use copying machines to produce poor quality copies of the original manufacturer's and the certifying body's labels.
- Breakers may be labeled with the refurbisher's name rather than the label of a known manufacturer.
- The manufacturer's seal (often multicolored) across the two halves of the case of the breaker is broken or missing.
- Wire lugs (connectors) show evidence of tampering.
- The surface of the circuit breaker may be nicked or scratched yet have a high gloss. Refurbishers often coat breakers with clear plastic to produce a high gloss that gives the casual observer the impression that the breaker is new. The plastic case of new circuit breakers often have a dull appearance.
- Some rivets may have been removed and the case may be held together by wood screws, metal screws, or nuts and bolts.

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**ATTACHMENT I - REFURBISHED MOLDED CASE CIRCUIT BREAKERS (cont.)**

- Contradictory amperage ratings may appear on different parts of the same refurbished breaker. On a new breaker, the amperage rating is stamped into, raised from, or machine-painted on the handle of the circuit breaker. In order to supply a breaker with a hard-to-find rating, refurbishers have been known to file down the surface of the handle to remove the original rating and hand-paint the desired amperage rating.

**3. Testing**

In a news release dated February 6, 1989, the National Electrical Manufacturers Association (NEMA) announced the cancellation of its Publication AB-2-1984 entitled, "Procedures for Field Inspection and Performance Verification of Molded-Case Circuit Breakers used in Commercial and Industrial Applications," and stated the following:

"These procedures were intended for use with breakers that had been originally tested and calibrated in accordance with NEMA Standards Publication AB 1 or Underwriters Laboratories Standard UL 489, and not subsequently opened, cleaned or modified...Therefore, the Standards Publication contained none of the destructive test procedures...necessary to verify the product's ability to withstand such conditions as full voltage overload or short circuit. Without such tests, even if a rebuilt breaker had passed the tests specified in AB-2, there would be no assurance that it would not fail under overload or short circuit conditions. It is NEMA's position that regardless of the results of electrical testing, refurbished electrical circuit breakers are not reliable and should not be used."

**4. Precautions**

Follow these precautions regarding suspect or refurbished circuit breakers.

- A. Require that molded-case breakers be new and unaltered. Proof that they are new and unaltered requires the vendor to show traceability back to the original manufacturer.
- B. Do not rely completely on dealing with authorized dealers for protection from purchasing refurbished molded-case circuit breakers.
- C. Approve formal procedures for inspecting circuit breakers that are received and installed according to the indicators of refurbished breakers listed above.
- D. Contact the original manufacturer if any indication of misrepresentation is encountered. There are many original manufacturers of molded-case circuit breakers whose products are being refurbished and sold as new. These manufacturers have the most specific information about how to ensure that their products have not been refurbished.

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**ATTACHMENT I - REFURBISHED MOLDED CASE CIRCUIT BREAKERS (cont.)**

5. Disposition
- A. Segregate and retain all circuit breakers found with indications that they may be refurbished. These will be retained as potential evidence until specifically released by the Office of Inspector General and the Office of Nuclear Safety for Price Anderson Enforcement. Circuit breakers that may be refurbished may only be disposed of when the above organizations no longer need them as evidence.
  - B. Report suspect electrical components to Occurrence Reporting and Processing System (ORPS). The ORPS categorization group should be identified as "Cross-Category items, Potential Concerns or issues." The description of cause section in the ORPS report should include the text "suspect counterfeit parts."
  - C. Witness and document the destruction of all suspect/counterfeit circuit breakers when approval is given for disposal.

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#### ATTACHMENT J - ASSESSMENT/SURVEILLANCE LINES OF INQUIRY

1. S/CI processes and other S/CI related processes are effective in addressing the safety-related aspects of S/CI.
2. Formal supplier qualification and re-qualification processes are established and implemented, including routine collection of evaluations of feedback on vendor performance.
3. Controls are established on a graded basis that considers the risks involved and historical experience with S/CIs.
4. Controls are implemented for segregation and separate storage of material identified as suspect/counterfeit
5. Subcontractors have established and implemented sufficient controls to preclude an introduction or use of S/CIs. These controls address construction materials, maintenance or modification equipment and components, and the use subcontractor owned or rented equipment (cranes, hoists, etc.) on site.
6. S/CI processes, requirements, and controls are fully integrated into Integrated Safety Management (ISM) and quality assurance programs and procedures, e.g, training, procurement, maintenance, and assessment) to ensure adequate linkage to S/CI elements.
7. Expectations are established for timeliness in determining whether nonconforming items are S/CI.
8. Protocols are established for clearly identifying S/CIs that are determined to be acceptable for use
9. Inspections for S/CI materials are incorporated into routine maintenance activities, and clear guidance is provided for the disposition of installed S/CI materials identified during routine inspections and maintenance activities.
10. Expectations for S/CI controls are integrated within existing processes, such as routine and special inspections for S/CIs in site procedures, and guidance is provided for performing such inspections.
11. Roles and responsibilities and interfaces for management of S/CIs are clearly assigned, including provisions for the handling of sensitive information and interfacing with the local Office of the Inspector General (IG), to ensure effective, consistent, and timely communication of S/CI information.
12. S/CI reporting requirements are effectively integrated into the site contractors' processes for disposition of non-conforming items, such as NCR processes, as required by appropriate DOE directives.
13. Lessons learned processes are evaluated to determine whether all available and relevant information resources, such as the Government Industry Data Exchange Program (GIDEP), are being utilized for screening S/CI and other relevant information for potential applicability to site activities.

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**ATTACHMENT J – ASSESSMENT/SURVEILLANCE LINES OF INQUIRY (cont.)**

14. Lessons learned processes are evaluated to ensure that significant requirements and performance expectations have been established for the documentation of applicability reviews, needed actions, and actions taken for lessons learned that require line management attention and action.
15. Lessons learned requiring line management actions are integrated with the site's corrective action management processes to ensure formal tracking, feedback, and closure of actions taken.
16. Corrective actions and management procedures include formal linkage to S/CI reporting requirements for the site office, Occurrence Reporting System (ORPS), contractor General Counsel, and the IG.
17. Site mechanisms, such as a controlled product list, are established and used to maintain current and accurate information on S/CIs. Provisions are available for making this list readily available to site personnel who have S/CI responsibilities for procurement, inspection, and other areas associated with the implementation of S/CI controls.
18. S/CI training programs include the identification of positions and associated personnel required to receive training, the processes for designating those personnel who must receive initial and refresher training, and the required frequencies for refresher training.
19. All personnel involved in design, system engineering, procurement, inspection, maintenance, and other functions involving potential S/CI materials receive S/CI process and hands-on training.
20. Training programs place special emphasis on ensuring that system engineers involved in the design, procurement, and inspection of materials and components with the potential for S/CI receive such training.
21. Subcontractors involved in the procurement or handling of potential S/CI materials and components receive initial and refresher training and are knowledgeable of site S/CI processes, procedures, requirements, and controls.
22. S/CI training addresses site-specific processes and procedures for identifying, dispositioning, and reporting S/CIs, including reporting to the IG.
23. S/CI processes are subject to regular self-assessment, consistent with site self-assessment protocol.
24. Assessments are performed for S/CI processes to evaluate significant changes to the S/CI processes and to establish a baseline for implementation where appropriate. Based on that baseline review, further assessments are tailored to the maturity of the S/CI processes.
25. S/CI lines of inquiry are considered and evaluated, as appropriate, during assessments of areas that interface with S/CI processes (procurement process, NCR process, etc.).

**TECHNICAL SPECIFICATION**  
*AMEC Americas Limited*

<b>PROJECT:</b>	Final DBVS Design	145579-V-SP-004	REV. 4
<b>PROJECT NO.:</b>	145579	<b>EXHAUST FANS</b>	
<b>CLIENT:</b>	AMEC E&E – Richland, WA		

## Appendix B

Exhaust Fan requirement schedule per AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
	<b>ASME-AG-1</b>	<b>CODE ON NUCLEAR AIR AND GAS TREATMENT</b>		
	<b>BA</b>	<b>SECTION BA: Fans and Blowers</b>		
	BA-1100	Applicability: This Section provides minimum requirements for the performance, design, construction, acceptance testing, and quality assurance for fans, fan drivers, drives, and related fan accessories used as components in nuclear safety-related air or gas treatment systems in nuclear facilities.		
	<b>BA-3000</b>	<b>MATERIALS</b>		
1	BA-3100	General: Fan materials, components, and accessories shall be capable of meeting all requirements of BA-4133. As a minimum, materials shall be in conformance with the ASME or ASTM materials listed in Table BA-3100. Substitute materials shall be equivalent to or exceed the requirements in Table BA-3100.		
2	BA-3110	Material Stress Values: The ASME or ASTM numbers in Table BA-3100 designate a chemical composition and a material thickness limit. A grade designation is usually required to determine the minimum strength of the material. If the specific grade material has an assigned minimum yield and tensile strength, these values shall be used for design purposes. If values have not been established and assigned, then tests in accordance with the procedures outlined in ASTM A 370 and AA-5000 shall be performed to obtain these values. Results of mill certified tests performed as above designating these values may be used. Maximum allowable design stress values shall be calculated by the procedures in AA-4000. These procedures require the use of an allowable stress for normal structural requirements, and correction of allowable stress for conditions where buckling can take place and for the several service levels. When the minimum yield values have been established by test or by ASTM minimums, then the allowable stress $S$ or $S_u$ used in AA-4000 shall be 60% of yield.		
3	BA-3200	Special Limitations on Materials: All materials shall be compatible with operating environmental conditions.		
4	BA-3300	Designation of Materials: The ASME or ASTM material numbers and grade for the fan components selected from BA-3410 shall be identified.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
5 N/A	BA-3400 N/A	<del>Certification of Materials: The manufacturer shall make available, as a minimum, certified test reports of chemical and physical properties of material and hardware used for all stress components of fans and related accessories, including fan wheel components, fan shafts, and driver support plate, but excluding fan drivers, drives, and bearings. Fan components, listed in BA-3410 and BA-3420, shall be provided with a Manufacturer's Certificate of Compliance covering the ASME or ASTM material specification, grade, and class.</del>	N/A	N/A
6	BA-3410	Centrifugal Fans: A manufacturer's Certificate of Compliance shall be provided for scroll, housing side sheets, inlets, side plates, back (center) plate, weld filler materials, and support framing integral to the fan.		
7 N/A	BA-3420 N/A	<del>Axial Fans: A manufacturer's Certificate of Compliance shall be provided for fan casing, guide vanes, weld filler materials, and driver support components.</del>	N/A	N/A
8	BA-3500	Purchased Materials: All purchased items shall meet the requirements of BA-3100, BA-3200, BA-3300, and BA-3400 or CFC in lieu of CTR (Certified Test Report)		
9	BA-3600	Driver Materials: Driver materials shall be selected such that the drivers meet the electrical and mechanical requirements of NEMA MG-1, as required by the Design Specification.		
	<b>BA-4000</b>	<b>DESIGN</b>		
10	BA-4000	General: Design of fans shall be in accordance with the requirements of Section BA and of those portions of Section AA invoked in Section BA. Refer to Non-mandatory Appendix BA-A for fan system considerations.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/ Validation R- Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
11	BA-4110	<p>Performance:</p> <p>Fans shall be selected to provide the specified volume and pressure requirements while operating in the stable region of the fan curve. Fans shall not be selected to operate in the stall or unstable region of the fan curve. Details of fan inlet and discharge conditions shall be considered and documented in support of fan sizing and selection. Fans shall be sized with consideration of dynamic losses that may be encountered. System characteristics shall be considered using AMCA 201. The following fan data shall be established in support of the fan selection:</p> <ul style="list-style-type: none"> <li>(a) fan type and blade shape;</li> <li>(b) air flow, actual;</li> <li>(c) total pressure to be developed;</li> <li>(d) maximum allowable discharge velocity;</li> <li>(e) air density at which the fan is to be rated;</li> <li>(f) maximum air density expected;</li> <li>(g) operating temperatures;</li> <li>(h) details of intake and discharge transitions that affect fan performance;</li> <li>(i) parallel fan operation, if required;</li> <li>(j) peak design temperature;</li> <li>(k) fan operating range, if required.</li> </ul>		
12 N/A	BA-4121 N/A	<p><del>Environmental Conditions— General:</del></p> <p><del>Fans, including drivers, drives, bearings, and accessories, shall be designed to operate continuously for a period of at least 30 days, or for a period of time during which access for maintenance cannot be provided, while exposed to the environmental conditions caused by a postulated accident. This applies to fans used during normal plant operation and to fans on standby status intended for operation under accident conditions only. The 30 days of continuous operation is in addition to the projected life of the plant for fans used during normal plant operation and in addition to expected operation, including operation during periodic testing and maintenance for fans on standby status.</del></p>	N/A	N/A
13 N/A	BA-4122 N/A	<p><del>Aging:</del></p> <p><del>The aging mechanisms listed in BA-4123 shall be applied to the equipment and components. Design qualification shall be specified in accordance with ANSI/IEEE 627. A list of recommended spare parts and their expected life shall be provided for the equipment and components that are not expected to last for the life of the plant under specific environmental conditions.</del></p>	N/A	N/A

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
14 N/A	BA-4123 N/A	Environmental Considerations: The following aging mechanisms affecting life expectancy shall be considered as a minimum: (a) radiation (b) temperature variation range (c) pressure variation range (d) corrosive chemicals and moisture conditions (e) erosive particles in air streams (f) duty cycles	N/A	N/A
15	BA-4130 BA-4131	Loading: Loads applicable for fan design are described in AA-4211 and AA-4212. Specific conditions listed in BA-4131.1 through BA-4131.4 shall be considered.		
16	BA-4131.1	Normal Loads. The following normal loads shall be considered: (a) positive or negative pressure differential transients imposed on the fan housing by: (1) sudden closure of air dampers in the fan or system in which the fan is installed, or (2) maximum normal fan pressure differential; (b) dead weight of fan, driver, drive, and related fan accessories; (c) forces imposed on the fan in any of its modes of operation, including a single failure of any interacting component; (d) loads imposed on fan inlet and outlet by duct connections; (e) loads imposed on fan, driver, or both, by electrical conduit connections; and (f) loads imposed on the fan bearings.		
17	BA-4131.2	Loads Due to Constraint of Free End Displacement. Loads due to constraint of free end displacement may be caused by thermal expansion and contraction.		
18	BA-4131.3	Design Pressure Differential Loads. Design pressure differential loads may be caused by hurricane, tornado, and design basis accident or pipe break.		
19	BA-4131.4	Loads Imposed on Driver and Fan When Starting. Loads imposed on the driver and fan may be caused by fan pinwheeling (inadvertent reverse rotation) caused by backflow of air while on standby status.		
20	BA-4132	Missile Protection: Fans shall be designed to prevent any internally generated missiles from penetrating the fan housing unless other external protection is provided.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
21	BA-4133	Construction: As a minimum, the fan construction shall be capable of meeting the maximum conditions in which fan pressure and outlet velocity are specified. Fans shall be designed in accordance with the structural requirements given in AA-4000. Structural requirements, load definitions, and structural design verification specific to fans are given in BA-4131, BA-4431, BA-4432, and BA-4433. Construction shall comply with the stress and deflection criteria associated with the loads given by BA-4433.		
22	BA-4142	Fan Leakage: Fans are subject to the leakage criteria when the location of the fan and direction of leakage impose a contamination burden on the space housing the fan or the space supplied with air by the fan. Leakage testing shall be as given in BA-5142.		
23	BA-4142.1	Fan Housing Leakage: Housings subject to the leakage criteria, including penetrations such as cable connections of axial fans, shall be made air tight, according to the method outlined in BA-5142.1.		
24 N/A	BA-4142.2 N/A	Shaft Leakage: <del>Shafts subject to leakage criteria shall be limited to 0.01% of the normal air flow per inch of fan operating pressure, or 0.5 SCFM (0.0142 m<sup>3</sup>/min), whichever is greater.</del>	N/A	N/A
25	BA-4150	Support Boundary: The support boundary for the fan shall be the point of attachment of the fan housing or mount to its foundation.		
26	BA-4151	Centrifugal Fan Support Boundary: The support boundary for a centrifugal fan is the attachment point for the fan housing to the concrete foundation. The following data shall be specified: (a) size and type of anchorage attachment; (b) anchorage loads to be imposed on the attachment points.		
27 N/A	BA-4152 N/A	Axial Fan Support Boundary: <del>The support boundary for an axial fan is located at the inlet and outlet mounting flanges, unless the axial fan is base mounted. The following data shall be specified: (a) size and type of anchorage attachment; (b) anchorage loads to be imposed on the attachment points.</del>	N/A	N/A
28	BA-4160 BA-4161	Vibration – General: Fan wheels shall be dynamically balanced prior to fan assembly. Final balancing shall be performed after assembly. All test results shall be documented. After installation, fans shall be checked and re-balanced if necessary to correct changes due to handling, shipping, and final support structure conditions.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
29	BA-4162	Centrifugal Fans: The double amplitude radial displacement measured on the bearing caps at the designated fan speed shall not exceed the values listed in Table BA-4162-1, measured with a meter filtered to the fan rotational speed. AMCA 204 Balance Quality and Vibration Levels for Fans applies to this specification.		
30 N/A	BA-4163 N/A	Axial Fans: The double amplitude radial displacement measured on the fan housing at both the inlet and discharge locations at the designated speed shall not exceed 1.0 mil (0.025 mm), measured with a meter filtered to the fan rotational speed.	N/A	N/A
	BA-4200	Fan Selection		
31	BA-4211.1	General—Application: Each fan shall have a title and numbering system that uniquely identifies that fan.		
32	BA-4211.2	Duty: The duty of the fan shall be described by the operating and idle time periods, their frequency, and the corresponding fan load characteristics.		
33	BA-4211.3	Fan Location: The fan orientation, elevation above sea level, type of foundation, and means of support shall be included in the Design Specification. Fan orientation and means of support per DWG F-145579-V-0007 <i>Bulk Vitrification Off Gas Treatment, Scrub &amp; Stack Area Plan</i> .		
34	BA-4211.4	Fan Environment: The environmental conditions, including air stream and gas stream contaminants, of BA-4120 that can affect the operability service life, maintainability, or need for special features as to construction or materials of the fan shall be included on the Design Specification.		
35	BA-4211.5	Fan Drive Arrangement: The fan drive arrangement shall be included in the Design Specification.		
36	BA-4211.6	Special Limitations: Special limitations, such as space, weight, outlet velocity, fan speed, sound power level, and driver nameplate horsepower, that influence fan selection shall be considered and included in the Design Specification.		
37	BA-4212	Performance Rating: Fan performance rating shall consist of the following information for all fan operating points, as a minimum: (a) flow rate at fan inlet, actual; (b) fan total and fan static pressure; (c) fan air density; (d) fan air temperature; (e) fan operating speed; (f) fan power input.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/ Validation R- Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
38	BA-4213	Pressure Relationships: Fans shall be rated using both fan static pressure and fan total pressure. Fan pressure relationships are illustrated in AMCA 201.		
39 N/A	BA-4214 N/A	<del>Operation At Reduced Flow: Fans shall be selected to satisfy the maximum performance requirement. Operation at reduced flow shall be evaluated during the initial fan selection to ensure stable fan operation over the entire range of expected fan operation.</del>	N/A	N/A
40	BA-4215	Construction Information: The following design and construction information shall be identified in selecting the fan (see BA-4300): (a) fan arrangement and orientation (b) peak design and operating temperatures (c) special critical speeds or safe speeds (d) type of bearings (e) type of drive (f) accessories (g) leakage considerations (h) <del>seismic required response spectra (RRS)</del>		
41	BA-4216	Bases for Fan Rating Data: Fan performance shall be based on tests of a full size fan, or on test results of a smaller, geometrically similar fan, in accordance with BA-5111. Performance ratings shall not be based on calculations alone. Geometric similarity requires linear proportionality and angular similarity with no omission or addition of parts. Performance ratings from reduced size fans shall be obtained by tests complying with the requirements of AMCA 210.		
42	BA-4217.1	Sound Power Level: Fan sound shall be expressed as sound power level in dB (referenced to $10^{-12}$ watt) for eight octave bands. Data shall be obtained from tests of the actual fan or by calculation from test data from a similar fan. Data shall be provided in accordance with BA-4420.		
43	BA-4217.2	Test Data From Actual Fan: Fan sound power level data shall be provided in accordance with BA-5130.		
44 N/A	BA-4217.3 N/A	<del>Test Data From Fan Model: A fan model of the same Manufacturer's generic design shall be selected to obtain sound test data per BA-4217.2. Scaling of the test data shall be performed in accordance with AMCA 301.</del>	N/A	N/A

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
	BA-4220	Drivers		
45	BA-4221	Information Required for Driver Selection: Information required for driver selection shall consist of the following, as a minimum: (a) fan speed torque curve with operating brake horsepower point identified; (b) fan inertia applied to the driver shaft; (c) external forces acting on the driver shaft; (d) driver rated electrical power source; (e) environmental requirements; (f) driver and fan physical orientation; (g) applicable standards such as IEEE and NEMA requirements; (h) space heater requirements; (i) minimum air velocity over driver when required.		
46 N/A	BA-4222.1 N/A	<del>Special Limitations—Centrifugal Fans: Belt drives shall be permitted only in areas that are accessible for maintenance during normal or accident conditions. The number of belts selected shall allow for a single belt failure without loss of function. In use of either direct or belt drives, the equipment shall be capable of operating under the specified conditions while performing its intended safety-related function. Drives in which gear reducers are used shall not be allowed. Systems that are air balanced using variable pitch diameter sheaves shall be provided with fixed diameter sheaves for long-term operation.</del>	N/A	N/A
47 N/A	BA-4222.2 N/A	<del>Special Limitations—Axial Fans: Axial fans shall be selected for direct connected operation, similar to AMCA 99-2410 for tubular centrifugal fans, designated arrangement No. 4.</del>	N/A	N/A
	BA-4300	Fan Construction		
48	BA-4311.1	Centrifugal Fans—General: The housing materials and design shall meet the requirements of BA-4100 and BA-4200. Spark resistant construction, where specified shall meet the requirements of AMCA 99-401.		
49	BA-4311.2	Centrifugal Fans—Bearings: Bearings shall be self-aligning, anti-friction, and shall have an L-10 service rating life of at least 100,000 hr in accordance with the load and speed conditions. Bearing rating life shall be established in accordance with ANSI/AFBMA 9 or 11. When the driver bearings are also the fan bearings, an L-10 life less than 100,000 hr is permissible. This limitation shall be documented. Bearings shall be provided with grease fittings, useable in accessible areas without interrupting fan operation.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
50 N/A	BA-4312.1 N/A	<del>Axial Fans—General: The fan construction shall include adjustable-pitch bladed wheels mounted upon the driver's extended shaft and located inside the flanged fan casing. The shall meet the requirements of BA-4220 and BA-4320. When required by BA-4142, electric cables penetrating the fan housing shall meet the requirements of BA-4220 and BA-4320.</del>	N/A	N/A
51 N/A	BA-4312.2 N/A	<del>Axial Fans—Fan Housing: The fan housing materials and design shall meet the requirements of BA-4100 and BA-4200.</del>	N/A	N/A
52 N/A	BA-4312.3 N/A	<del>Axial Fans—Blade Angle: Adjustable-pitch blades shall have corresponding blade angles indicated on the fan performance curve. Blade position designations appearing on the fan curve shall bear a correspondence with a permanent index located at the blade-hub connection. After setting the blades, the locking device shall be torqued and secured in place.</del>	N/A	N/A
53 N/A	BA-4312.4 N/A	<del>Axial Fans—Bearings: Bearings shall be anti-friction type. Bearing L-10 life under actual operating conditions shall be at least 100,000 hr. Bearing life shall be established in accordance with ANSI/AFBMA 9 or 11. When the bearing size is limited by driver dimensional constraints and the driver bearings are also the fan bearings, an L-10 life less than 100,000 hr is permissible. This limitation shall be documented. Bearings shall be provided with grease fittings. For drivers within the fan casing, both supply and purge lines shall be extended to outside the fan casing to permit bearing lubrication without interrupting fan operation.</del>	N/A	N/A
	BA-4320	Drivers and Drives		
54 N/A	BA-4324 N/A	<del>Types of Drives: The drives shall be subject to the limitation of BA-4222.</del>	N/A	N/A
55	BA-4322	Drive Alignment and Adjustment: Direct drives shall make use of metal shims to provide final alignments.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R- Review A- Analysis T- Test I- Inspection	Document Reference (Where is this requirement incorporated)
56	BA-4323	<p>Mechanical Design Requirements for Drivers:</p> <p>(a) Bearings shall be anti-friction type. Bearing L-10 life under actual operating conditions shall be at least 100,000 hr. An L-10 life of less than 100,000 hr may be used when limited by driver constraints. Bearing life expectancy shall be documented. Bearings shall be provided with grease fittings. For drivers located within fan casing, both supply and purge grease lines shall be extended to outside the fan casing to permit bearing lubrication without interrupting fan operation.</p> <p>(b) Maximum sheave arrangement shall be limited per NEMA MG-1.</p> <p>(c) Drivers shall conform to NEMA MG-1.</p>		
57	BA-4324	<p>Electrical Design Requirements:</p> <p>(a) All drivers shall be designed for single voltage supply.</p> <p>(b) Drivers shall conform to NEMA MG-1.</p> <p>(c) Provision shall be made for solid grounding of the driver.</p>		
58	BA-4325	<p>Application:</p> <p>All fan drivers shall be designed to operate at maximum load brake horsepower without encroaching on the driver service factor. Drivers shall be selected to come to speed under reduced voltage conditions peculiar to the specific accident requirement, as detailed in the Design Specification.</p>		
	<b>BA-4330</b>	<b>Accessories</b>		
59	BA-4331	<p>Accessories Common to Centrifugal and Axial Fans:</p> <p>(a) Fan lifting lugs or eyebolts shall be provided on fans and drivers 50 lb and heavier.</p> <p><del>(b) Inspection panels shall be provided in fan housings having wheels 12 in. and larger in diameter. Panels shall be of a size that will allow maintenance on components located within the fan housing. Quick opening latches shall normally be used, except that when leakage criteria are required per BA-4142, bolted and gasketed seals shall be used. Latches shall be retainable on the panel or fan to prevent loss of latches in the fan housing.</del></p> <p>(c) Arrows clearly indicating the direction of fan rotation and air-flow shall be permanently displayed on each fan housing.</p> <p>(d) All gaskets used shall be of a material that is capable of withstanding the normal and accident aging mechanisms of BA-4123 without loss of function for a minimum predetermined qualified life, and capable of withstanding the environmental conditions of BA-4121.</p> <p>(e) Bearing lubricants shall be selected to withstand the accident aging mechanisms of BA-4123 for a minimum predetermined qualified life consistent with the term provided by provisions of accessibility and the environmental conditions of BA-4121.</p> <p><del>(f) Provisions shall be made for the installation of thermocouples on fan and driver bearings of fans that are inaccessible for unscheduled inspection.</del></p>		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
60 N/A	BA-4332.1 N/A	Centrifugal Fans—Variable Inlet Vanes: Variable inlet vanes, when used, shall be capable of reducing the rate flow to at least 30% of design, and shall be flanged and bolted to, or built as an integral part of the fan inlet. Manual actuation shall be with a locking quadrant. Electric, pneumatic, or noncombustible electro-hydraulic actuators for remote or automatic operation of variable inlet vanes shall be mounted on the fan housing or shall be provided with a common structural support base. When remote inaccessible actuation is required, the vane actuation position shall be displayed at an accessible location. Fan performance characteristics with inlet vanes shall be determined in accordance with BA-5000. Vane assemblies for double inlet fans shall be connected through a common control shaft for simultaneous operation.	N/A	N/A
61 N/A	BA-4332.2 N/A	Centrifugal Fans—Inlet Screen Guards: Guards for bolting to the fan inlet or outlet shall meet the material requirements of BA-3100.		
62 N/A	BA-4332.3 N/A	Centrifugal Fans—Vibration Isolators: Vibration isolators shall not be used and fans shall be mounted rigidly unless provisions are made to withstand the forces generated or amplified during a seismic event.		
63 N/A	BA-4332.4 N/A	Centrifugal Fans—Guards: Shaft and bearing guards and V-belt drive guards shall be of the quick-removal design type. V-belt guards shall permit checking the fan speed without guard removal.	N/A	N/A
64	BA-4332.5	Centrifugal Fans—Inlet Transitions: The inlet and outlet connections shall be flanged. The housing connected flange shall be drilled to match the fan inlet flange, the other flange shall be drilled using the same bolt spacing.		
65 N/A	BA-4332.6 N/A	Centrifugal Fans—Shaft Seals: Shaft seals, when required, shall meet the leakage criteria of BA-4142.2.	N/A	N/A
66 N/A	BA-4333.1 N/A	Axial Fans—Inlet/Outlet Cones: Flanged inlet/outlet cones shall be fabricated of the same material as the fan housing. The housing connected flange of the cone(s) shall be drilled to match the fan inlet/outlet flanges(s). The other cone flanges shall be drilled using a similar symmetrical bolt pattern.	N/A	N/A
67 N/A N/A	BA-4333.2 N/A	Axial Fans—Inlet Bells: Flanged inlet bells, drilled to match the fan housing inlet flange, shall meet the requirements of BA-3100. Inlet bells should always be provided for fans with non-ducted inlets.	N/A	N/A
68 N/A	BA-4333.3 N/A	Axial Fans—Inlet and Outlet Screen Guards: Guards for bolting to the fan inlet or outlet shall meet the material requirements of BA-3100.	N/A	N/A

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
69 N/A	BA-4333.4 N/A	<del>Axial Fans—Mounts: Fan mounts shall be welded to the casing and shall be designed to support the weight of the fan and drier in the specified mounting arrangement and in consideration of all internal and external dynamic forces.</del>	N/A	N/A
70 N/A	BA-4333.5 N/A	<del>Axial Fans—Vibration Isolators: Vibration isolators shall not be used and fans shall be mounted rigidly unless provisions are made to withstand a seismic event.</del>	N/A	N/A
71 N/A	BA-4333.6 N/A	<del>Axial Fans—Variable Inlet Vanes: Variable inlet vanes shall not be used for axial fans unless provisions are made to prevent overloading the driver.</del>	N/A	N/A
	<b>BA-4400</b>	<b>Reports and Calculations</b>		
72	BA-4411	Rating Calculations: (Calculations and tests used to obtain fan ratings shall include the effects on performance of all shafts and bearing blockages, accessories, and other means of control associated with the fan. Fan power requirements shall include the effects of bearing friction and any other losses due to the drives that are supplied as an integral part of the fan.)  ----- Manufacturer's standard rating calculations are acceptable.		
73	BA-4412	Documentation of Final Rating Data: As a minimum, the rating data and the bases identified in BA-4212 and BA-4216 shall be included. In addition, a constant speed performance curve shall be prepared, which contains complete identification information such as fan size, type, inlet and outlet area, system and fan duty, fan speed, and fan air density. The performance curve shall show fan total pressure, fan static pressure, and fan horsepower versus flow rate from free delivery to shutoff. The operation point of rating as well as the permissible operating range over which stable operation will occur shall be clearly identified. Unstable portions of the performance curve shall be clearly labeled.		
	<b>BA-4420</b>	<b>Equipment Sound Production</b>		
74	BA-4421	Sound Level Data Report: When required, a sound level data report shall be prepared. The sound level data in the report shall be expressed as sound power level in dB (referenced to $10^{-12}$ watt) for eight octave bands. The report shall state whether the data were obtained from tests of the actual fan or by calculation from test data of a similar fan (see BA-4217)		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R- Review A- Analysis T- Test I- Inspection	Document Reference (Where is this requirement incorporated)
	BA-4430	Structural Verification Considerations		
75	BA-4431	<p>Structural Verification by Analysis:</p> <p>When verification of design by analysis is selected, the results of the analysis shall be in the form of a Design Verification Report (DVR). The DVR shall comply with AA-4441. Equipment shall be deemed to be designed verified if the stress conditions and deflections identified in BA-4131 and AA-4341.2 are not exceeded under the applicable load combinations. The DVR shall address, as a minimum the stress and deflection of the following fan components in both the normal and accident conditions:</p> <p>(a) housings, including flanges and mounting supports</p> <hr/> <p>(b) wheel blades (c) wheel hub (d) shaft (e) bearing supports (f) driver supports (g) weld filler material (h) driver</p> <hr/> <p>Maximum shaft deflection shall not exceed 90% of the radial clearance between blade and housing. No deflection shall be allowed to exceed the limits of AA-4341.2.</p>		
76	BA-4432	<p>Structural Verification by Testing:</p> <p>When verification by testing is selected, a design verification test procedure (DVTP) shall be established. The test procedure, as a minimum, shall identify the specific components to be tested and the respective test methods and acceptance values. Upon completion of the tests, a DVR shall be prepared. The DVR shall comply with AA-4442. Equipment shall be deemed to have successfully passed the tests if the equipment meets the acceptance requirements identified in AA-4442 when subjected to the selected load combinations.</p>		
77	BA-4433	<p>Structural Special Considerations:</p> <p>(a) The maximum deflection that may be sustained without loss of equipment function during normal or accident conditions shall be determined by analysis or test. The allowable deflections in any plane for the load combinations of BA-4131 shall not exceed the limits expressed by and measured according to BA-4162 and BA-4163.</p> <p><del>(b) Fan supports shall be designed to withstand the loads described in BA-4131. Foundation and supports shall be designed so that the natural frequency of vibration of the overall supporting structure is at least 25% lower or 25% higher than the rotational frequency of the fan or driver.</del></p>		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
	<b>BA-5100</b>	<b>FAN INSPECTION AND TESTING</b>		
78	BA-5111	Fans Requiring Testing: Performance ratings may be based on test results of a fan that is identical as to type and size, of a small, geometrically similar fan, in accordance with BA-4216. Performance ratings established for a fan may be applied to several identical fans of the same type and size, with the same nominal dimensions, irrespective of fan orientation.		
79	BA-5112	Test Facilities: Equipment shall be tested in a facility that provides for testing in accordance with the requirements of AMCA Code.		
80	BA-5112.1	Facilities: The facility shall have the space, power, and instrumentation to conduct full-scale performance or mechanical operating tests without compromising the data or intent of the test.		
81	BA-5112.2	Instrument Calibration: An updated listing of all test instrumentation and equipment shall be maintained along with a description of methods used to calibrate each instrument, the calibration interval, and the date of the last calibration. Calibration intervals shall be a maximum of 1 year or the Manufacturer's minimum requirement, whichever is less. Calibration of instruments shall be traceable to the National Bureau of Standards.		
82	BA-5112.3	Qualification Records: Records shall be maintained in the test facility to verify that all test facility qualification requirements are met.		
83	BA-5113	Documentation: Documentation shall be required for all performance testing, including a report that details witness test procedures and test setups.		
84	BA-5120	Performance Acceptance Tests: Performance tests to determine a fan's flow rate, pressure, and power consumption shall be conducted.		
85	BA-5121	Test Codes: All performance tests shall be conducted in accordance with AMCA 210. These tests shall include the effects of the drive, fan, and accessories.		
86	BA-5122	Test Setups: Prior to testing, a test procedure containing details of all test setups and test methods shall be established based on AMCA 210 or an equivalent code. The buyer must approve use of the equivalent code.		
87	BA-5123	Measurements: Test measurements shall be in accordance with AMCA 210 and yield results within the limits set by AMCA 210, Appendix D. A fan performance test shall consist of the following measurements.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/ Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
88	BA-5123.1	Flow Rate: The fan flow rate shall be determined in accordance with AMCA 210 by either pitot tube traverse or AMCA nozzle method.		
89	BA-5123.2	Pressure: Pressure shall be measured by AMCA 210 pitot tube or by piezometer rings.		
90	BA-5123.3	Power: Measurements shall be made to determine shaft input power to the fan in accordance with AMCA 210 or an equivalent code. For the purposes of this Code, a driver with complete test results in accordance with IEEE 112A meets requirements of a calibrated driver. on AMCA. The buyer must approve use of the equivalent code.		
91	BA-5123.4	Fan Speed: The fan speed shall be measured in accordance with AMCA 210.		
92	BA-5123.5	Other: Measurements such as temperature and barometric pressure associated with intermediate calculations shall be made in accordance with AMCA 210 or an equivalent code. The buyer must approve use of the equivalent code.		
93	BA-5130 BA-5131 BA-5132	Sound tests: Sound test data shall be obtained in accordance with either of the following methods.  Semi-reverberant Room Method – Sound power level ratings shall be taken in accordance with AMCA 300 or an equivalent code. The buyer must approve use of the equivalent code. Induct Method – Sound Power level ratings shall be taken in accordance with ASHRAE 68.		
94	BA-5140	Mechanical Tests: Mechanical tests shall be conducted to verify the basic integrity and function of mechanical parts. These tests include the following.		
95	BA-5141	Overspeed Tests: The impeller of each fan shall be overspeed tested to a minimum of 15% above its maximum operating speed for a 10 minute duration without increased vibration. Visual inspection shall serve to further verify that no deformation or cracks have occurred.		
96	BA-5142.1	Leakage Tests—Housing: Housing leakage tests required by BA-4142 shall be conducted in the fan housing, pressurized to a level at least 1.25 times the fan operation pressure, using a soap solution at all welds and joints. The acceptance criteria shall call for the absence of any visible bubble formation.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
97 N/A	BA-5142.2 N/A	Leakage Tests—Shaft: Shaft leakage tests required by BA-4142 shall be conducted on the fan with the shaft and seal assembled, the shaft rotating at the normal fan operating speed, the fan openings sealed closed, and the fan subjected to the normal fan operating pressure. The fan wheel shall be removed prior to the shaft leakage test, or provision shall be made to account for the increase in air temperature if the fan wheel is left in place.	N/A	N/A
98	BA-5143	Fan Vibration Test: Fans shall be given a vibration test as required by BA-4160. Prior to taking the vibration measurements, the fans shall be operated at the normal operating speed for a run in period of time until the bearings reach a stable equilibrium temperature, at which point the temperature no longer rises. Vibration readings taken on the bearing caps on centrifugal fans, and on the fan housing on axial fans shall be no greater than those given in BA-4162 and BA-4163, respectively.		
99	BA-5144	Mechanical Running Test: All fans shall be given a mechanical running test for at least 1hr, after which all parts and accessories shall be inspected to determine any sign of excessive wear or mechanical defect.		
400 N/A	BA-5145 N/A	Seismic Test: Seismic testing, when required, shall be performed in accordance with AA-4350.	N/A	N/A
101	BA-5150	Test Results and Reports: All test results and reports shall be certified and documented.		
	<b>BA-5200</b>	<b>Driver Inspection and Testing</b>		
402 N/A	BA-5210 N/A	First Unit of a Design: First units of a design shall be given a complete test per IEEE 112A. For a totally enclosed, air over (TEAO) driver, the full load heat run shall be taken. Test data shall be documented.	N/A	N/A
403 N/A	BA-5220 N/A	Succeeding Units of a Design: Each subsequent driver shall be given a complete test per IEEE 112A. Test data shall be documented.	N/A	N/A
	<b>BA-6000</b>	<b>FABRICATION AND INSTALLATION</b>		
104	BA-6000	General: Fabrication shall be in accordance with the requirements of Section BA and of AA-6000.		
105	BA-6100	Fabrication: Written fabrication procedures shall be established and used during the fan manufacture. All heat-treating requirements shall be indicated on drawings or in the fabrication procedures.		
106	BA-6110	Selection of Materials: Materials shall conform to the requirements of BA-3000. The material designations shall be provided on the fabrication drawings.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
	<b>BA-7000</b>	<b>PACKAGING, SHIPPING, AND STORAGE</b>		
107	BA-7000	General: Packaging, shipping, and storage of fans shall be in accordance with the requirements of Section BA and of AA-7000. Packaging, shipping, and storage requirements shall comply with manufacturer's recommended practices and this specification.		
108	BA-7100	Fans: Fans shall be prepared for shipment in accordance with ASME NQA-2, Protection Level C, when shipped direct without the driver, or when shipped with the driver installed to a supplier who will assemble the fan with another piece of equipment. When the fan is to be shipped to the job site with the driver installed, preparation shall be in accordance with Protection Level B. Buyer will specify packaging requirements in specification.		
409 N/A	BA-7110 N/A	Storage: Fans shall be stored in accordance with ASME NQA-2. When the fans are packaged to Protection Level C, they shall be stored in accordance with Storage Level 3. When packaging is Protection Level B, the fans, drivers, and accessories shall be stored in accordance with Storage Level 2.		
110	BA-7120	Documentation: One copy of the storage procedure shall be attached to the equipment or crate at the time of shipment. The storage procedure shall cover both short term and long term (over 6 months) storage maintenance programs.		
111	BA-7210	Drivers Shipped Separately--Short Term: Any driver that is to be used within 6 months of shipment shall be packaged according to good commercial practice, shipped within an enclosed carrier.		
442 N/A	BA-7220 N/A	Drivers Shipped Separately--Long Term: Any driver that is to be stored for a period of 6 months or longer must be packaged per ASME NQA-2, Protection Level B. If the driver is equipped with space heaters, the space heaters may be energized in storage, in lieu of providing moisture barrier wrapping and internal desiccant.	N/A	N/A
	<b>BA-8000</b>	<b>QUALITY ASSURANCE</b>		
113	BA-8000	General: Quality Assurance of fans shall be in accordance with the requirements of Section BA and of AA-8000.		
114	BA-8110	Certified Fan Performance Curves: Documentation shall be established to verify that the certified fan performance curves were generated in accordance with AMCA 210. The certified fan performance data shall include a description of the test setup, instruments used, calibration data, and personnel qualifications.		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

Requirement No.	Source	Requirement Text	Verification/Validation R-Review A-Analysis T-Test I-Inspection	Document Reference (Where is this requirement incorporated)
115	BA-8120	<p><b>Material Certifications:</b></p> <p>Material test reports are required in accordance with BA-3400. Permanent documentation shall be established and shall include as a minimum: procurement records, receiving reports, manufacturing records, inspection reports, material control records, and Certified Material Test Reports for which certification is required. Permanent documentation shall be maintained for the life of the plant.</p> <hr/> <p>Certificates of Conformance are acceptable in lieu of MCR.</p>		
116	BA-8200	<p><b>Quality Assurance for Drivers:</b></p> <p>Each driver shall be manufactured under a quality assurance program that conforms to ASME NQA-1 as applied to fan drivers. Each driver shall be qualified in accordance with ANSI/IEEE 323 Class 1E qualification Standards.</p> <p>The manufacturer's quality assurance program shall meet the basic requirements of this specification.</p>		
	<b>BA-9000</b>	<b>NAMEPLATES AND OPERATING AND MAINTENANCE MANUALS</b>		
117	BA-9110	<p><b>Required Nameplate Data:</b></p> <p>Each fan assembly shall be provided with a legibly marked nameplate giving the identifying name, normal fan capacity, manufacturer, fan type, size, rotation, rating, maximum speed, and mark numbers, as applicable to Section BA and AA-9000.</p>		
118	BA-9120	<p><b>Drivers:</b></p> <p>Each driver shall have one or more engraved or embossed nameplates of stainless steel, which as a minimum, shall convey the data required by NEMA MG-1.</p>		
119	BA-9210	<p><b>Acceptable Marking Methods:</b></p> <p>Each accessory shall be marked with the Name of the Manufacturer or a distinctive marking, which may be in code, by which it is identified as the product of a particular manufacturer.</p>		
120	BA-9310	<p><b>Operating and Maintenance Manuals:</b></p> <p>The manufacturer shall provide an operating and maintenance manual for the equipment furnished. The manual shall include:</p> <ul style="list-style-type: none"> <li>(a) recommended spare parts list, including a description of each part and a drawing that identifies the location of each part; and</li> <li>(b) recommended maintenance procedure, including a periodic servicing schedule.</li> </ul>		

Strikethrough = Not Applicable (N/A)

ASME AG-1, Section BA, Fans and Blowers

TECHNICAL DATA SHEET  
AMEC Americas Limited



The document revision number is indicated below. Please replace all revised pages of this document and destroy the superseded copies.

PROJECT:	Final DBVS Design	145579-V-DS-004.1	REV. 2
PROJECT NO.:	145579	EXHAUST FANS	
CLIENT:	AMEC E&E - Richland, Washington	EQUIPMENT NO.: 36-N31-025, -026	

REV. NO.	ISSUED FOR	ORIGIN	DATE	INITIAL
A	Internal Review	DW	08-Oct-04	DW
B	Internal Approval	DW	22-Oct-04	DW
C	CH2M Hill Review	DW	04-Nov-04	DW
0	Bid Request	DW	21-Dec-04	DW
1	Bid Request	DW	06-Jan-05	DW
2	Bid Request	TM	19-Oct-05	TM

DOCUMENT APPROVAL

<p><b>CLIENT APPROVAL (AMEC RICHLAND)</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u>[Signature]</u></p> <p>Date: <u>9/22/05</u></p> <p>Q.A. Rep.: <u>Hank M. Chafin</u></p> <p>Date: <u>10-20-05</u></p>	<p><b>AMEC AMERICAS LIMITED (TRAIL)</b> <i>Original Approvals on File</i></p> <p>Project Manager: _____</p> <p>Date: _____</p> <p>Discipline Lead: _____</p> <p>Date: _____</p> <p>Originator: _____</p> <p>Date: _____</p> <p><i>bx 10/20/05</i></p>
<p><b>CLIENT APPROVAL (CH2M HILL)</b></p> <p>Project Manager: <u>[Signature]</u></p> <p>Date: <u>10/21/05</u></p>	



**TECHNICAL DATA SHEET**

<b>PROJECT:</b>	Final DBVS Design	145579-V-DS-004.1	REV. 2
<b>PROJECT NO.:</b>	145579	EXHAUST FANS EQUIPMENT NO.: 36-N31-025, -026	
<b>CLIENT:</b>	AMEC E&E - Richland, Washington		

**REFERENCE SPECIFICATION**

Document No.	Specification
145579-V-SP-004	EXHAUST FANS

**CONTENTS**

Data Sheet ..... 2 Page

Bidders Drawing & Data Commitments Sheet ..... 1 Page



TECHNICAL DATA SHEETS

<b>PROJECT:</b>		Final DBVS Design		145579-V-DS-004.1		REV. 2	
<b>PROJECT NO.:</b>		145579		EXHAUST FANS			
<b>CLIENT:</b>		AMEC E&E - Richland, Washington		EQUIPMENT NO.: 36-N31-025, -026			
<b>No. Required</b>		2		<b>Area</b>		36	
<b>PFD #</b>		F-145579-00-A-0023		<b>Stream No.</b>		45	
<b>Reference Specification:</b>		145579-V-SP-004		<b>Quality Assurance Level</b>		EQ	
<b>Operating Conditions</b>				<b>Rev</b>		<b>Rev</b>	
<b>Location (Indoors/Outdoors)</b>		Outdoors		<b>Environment</b>			
<b>Operation (Continuous / Intermittent)</b>		Continuous		-Radioactive		No B	
<b>Days per year</b>		365		-Toxic		Yes 1	
<b>Hours per day</b>		24		-Corrosive		No	
<b>Availability of each fan (%)</b>		95		-Flammable		No	
<b>Ambient temp - min (°F)</b>		-25		-Beryllium		No 2	
<b>Ambient temp - max (°F)</b>		115					
<b>Inlet Composition</b>				<b>Footprint</b>			
<b>Description</b>		Air		<b>Max base length</b>		(ft) * 2	
<b>Flow Rate (ACFM)</b>		11,400		<b>Max base width</b>		(ft) * 2	
<b>Temperature (°F)</b>		248					
<b>Fan Data</b>							
<b>Manufacturer</b>		*		<b>Hub (external/intenal)</b>		*	
<b>Model number</b>		*		<b>-Material</b>		*	
<b>Size</b>		*		<b>Fan Wheel</b>		*	
<b>Inlet Static Pressure (in wg)</b>		-120 B		<b>-Material</b>		*	
<b>Outlet Static Pressure (in wg)</b>		1 1		<b>-Type</b>		*	
<b>Total External Static Pressure (in wg)</b>		-121 1		<b>-Diameter (in)</b>		*	
<b>Max Speed (RPM)</b>		* 2		<b>-Blade Thickness (in)</b>		*	
<b>Operating Speed (RPM)</b>		* 2		<b>-Hardness (BHN)</b>		*	
<b>Air Displacement (SCFM)</b>		*		<b>-Tip Speed (fps)</b>		*	
<b>BHP, at Std Air (hp)</b>		*		<b>-Direction of curvature</b>		*	
<b>BHP, at Oper. Temp. (hp)</b>		*		<b>-Max. Allow tip speed (fps)</b>		*	
<b>Inlet</b>				<b>-Min. Allow. Flow (CFM)</b>		*	
<b>- Diameter (in)</b>		*		<b>Rotation (viewed from driver end)</b>		*	
<b>- Flange specification</b>		*					
<b>- Position</b>		*					
<b>Outlet</b>							
<b>- Diameter (in)</b>		*					
<b>- Flange specification</b>		*					
<b>- Position</b>		*					
<b>Additional Features:</b>				<b>Coupling</b>			
<b>Speed Sensor (Yes/No)</b>		Yes		<b>Manufacturer</b>		*	
<b>Anti-static Features (Yes/No)</b>		No		<b>Type</b>		*	
<b>Coupling Guard (Yes/No)</b>		Yes		<b>Gear Ratio</b>		*	
<b>Inlet Filter (Yes/No)</b>		No		<b>Material</b>		*	
<b>Case Drain (Yes/No)</b>		Yes		<b>Service factor (based on motor Hp)</b>		1.5	
				<b>Split taper-lock bushings</b>		yes	
				<b>Thermal Isolation reqd</b>		* B	
<b>Date</b>	08-Oct-04	22-Oct-04	01-Nov-04	21-Dec-04	06-Jan-05	19-Oct-05	
<b>By</b>	DW	DW	DW	DW	DW	TM	
<b>Chkd</b>	AP	AP	AP	AP	AP	TM	
<b>Rev.</b>	A	B	C	0	1	2	



TECHNICAL DATA SHEETS

Data sheet 2 of 2

Motor		Rev			Rev
Manufacturer	*		Pull-up torque % of locked rotor torque	*	
Power	(HP) *	B	Speed	(RPM) *	
Frame size	*		Efficiency	*	
NEMA Design	*		Torque	(ft-lbs) *	
Service Factor	*		Current	(A) *	
Duty	Continuous	B	Paint Finish	*	
Corrosion protection	*		Weight	(lb) *	
Enclosure Type and Rating	TEFC		Position	*	
Voltage	(V)	460	Soft Start capable	yes	
Frequency	(Hz)	60	Insulation Class (NEMA MG-1)	F	
Phases		3	RTD ( 3 phases )	(ohms)	100 B

Materials of Construction

Housing	*		Motor Enclosure	*	
Fan Shaft	*		Guards	*	
Fan Base	*		Bearing Pedestal	*	
Spacer Ring	*				

Bearings

Manufacturer	*		Bolting Material		
Size	*		Bolts		
Number	*		- size	(in) *	
Type	*		- number	*	
L <sub>10</sub> Life	(hrs)	100,000	Nuts		
Vibration Transducer/Switch	**		- size	(in) *	
			- number	*	

Surface Preparation and Finish

By VENDOR (Yes/No)		Yes	Weight		
Surface Preparation System	*		Total Shipping Weight	(lb) *	
Finish type	*	-			
Finish Dry Film Thickness	(in) *	-			

Comments:

1. Items marked with an \* shall be filled in by VENDOR

\*\* Vendor to recommend type

The fan is to meet applicable requirements of the ASME AG-1 Sections per appendix B of the Specification 145579-V-SP-004.

The fans shall be mirror image discharge as shown on drawing 36-V-0007

Date	08-Oct-04	22-Oct-04	01-Nov-04	21-Dec-04	06-Jan-05	19-Oct-05	
By	DW	DW	DW	DW	DW	TM	
Chkd	AP	AP	AP	AP	AP	TM	
Rev.	A	B	C	0	1	2	



**TECHNICAL DATA SHEETS**

<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-DS-004.1</b>	<b>REV. 2</b>
<b>PROJECT NO.:</b>	<b>145579</b>	<b>EXHAUST FANS</b>	
<b>CLIENT:</b>	<b>AMEC E&amp;E - Richland, Washington</b>	<b>EQUIPMENT NO.: 36-N31-025, -026</b>	

**BIDDERS DRAWING AND DATA COMMITMENTS**

Vendor shall supply all drawings, manuals and documentation in the quantities indicated. Approval drawings are due within the listed number of calendar days after issue of the Purchase Order or Letter of Intent. The dates set out for drawing and data submissions are governed by the engineering design schedule of the project. The Vendor shall supply one Autocad disk file and requested number of copies within the listed number of calendar days. Final drawings must be certified as correct and bear the Vendors name, equipment number and Purchase Order Number. Drawing Transmittals listing the document numbers, revision numbers, quantities, status and document types must be included with all submissions (including electronic submittals)

<p><b>SEND ALL DOCUMENTS TO:</b></p> <p>Submit all documents via courier service.</p> <p>Faxed documents must be followed by the originals. Electronic E-mail or FTP transmissions of drawings &amp; data must be copied to Document Control Always include a transmittal</p>	<p><b>AMEC E&amp;E</b> 1135 Jadwin Avenue Richland, WA 99352</p> <p>Attn: Vendor Document Control</p> <p>Phone: (509) 942-1114, Ext. 118 Fax: (509) 942-1122</p>	<p><b>AMEC Americas Limited</b> 1385 Cedar Avenue Trail, BC, Canada V1R 4C3</p> <p>Attn: Document Control</p> <p>Phone: (250) 368-2400 Fax: (250) 368-2401</p>
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**BIDDERS MUST PROVIDE ESTIMATED LEAD TIMES FOR APPROVAL DRAWINGS**

Proposal	Bidder shall include this data for each item			REVIEW ITEMS DUE WITHIN (DAYS)	VENDOR COMMITMENT (SEE NOTE 4) (DAYS)
	Review	Required before ordering or start of fabrication			
		Final	Required within 7 days prior to shipment and before final payment		
PROPOSAL	REVIEW	FINAL	DESCRIPTION		
1			QA Program that satisfies the requirements of NQA-1-1994	Bid	
1			Experience list and maintainability information	Bid	
E+3	E+3		Design, fabrication & delivery schedule	PO+7	
E+3	E+3	E+6	Outline drawings and layout drawings indicating weights and dimensions	PO+14	
E+3	E+3	E+6	Technical brochures on purchased components	PO+21	
	E+3	E+6	Calculations	PO+21	
	E+1	E+6	Spare parts list	Del-14	
	E+1	E+6	Set of installation and maintenance manuals c/w technical literature for all equipment and devices	Del-14	
		6	NEC inspection certificate & electromagnetic interference test results	Del-7	
		6	U/L and motor lists	Del-7	
		6	Site commissioning record & test results	COM+14	

Legend: E=Electronic Copy, PO+7=Due within 7 calendar days of P.O. issuance, Del-7=Due within 7 calendar days of delivery, COM+7=Due within 7 calendar days of commissioning

**THE TIMELY RECEIPT OF THE VENDOR DOCUMENTS IS CRITICAL TO THIS PROJECT  
BUYER COMMITS TO A 10 WORKING DAY TURNAROUND ON REVIEW ITEMS**

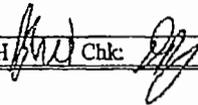
I agree to provide the listed documentation and data and the dates shown above.

\_\_\_\_\_

Vendor Signature Date

 <p>AMEC E&amp;C Services Limited Trail, BC Canada</p>	<h3>Instrumentation Data Sheet</h3>						
TAG NUMBER: 36-VIT-515							
SUBJECT:	VIBRATION TRANSMITTER						
SERVICE:	Off-Gas Exhaust Fan No.1						
SUPPLIER:	_____ P.I.C. No.: 209						
MAKE:	* _____ P.O. No.: _____						
MODEL:	* _____ P&ID No.: F-145579-36-A-0103						
<b>TRANSMITTER:</b>							
Type:	Axial Acceleration						
Housing Mat'l:	*						
Range:	*						
Output:	4 - 20mA Isolated						
Power:	10 - 28 VDC						
Enclosure Class:	*						
Sensitivity:	100 mV/g						
Loop Resistance:	*						
Certification:	UL						
<b>SENSING ELEMENT</b>							
Material:	*						
Mounting Type:	*						
Cable Type:	*						
Cable Length:	15ft (To be Confirmed)						
Output Connector:	*						
316ss Tags permanently affixed to instrument							
<b>SERVICE CONDITIONS:</b>							
Equip No.:	36-N31-025						
Temp Min.:	-25°F						
Temp Oper.:	Ambient						
Temp Max.:	115°F						
_____	_____						
_____	_____						
_____	_____						
NOTES: 1. All items with an * shall be filled in by the VENDOR.							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">By: RPH <i>AD</i></td> <td style="width: 15%;">Chk: <i>AG</i></td> <td style="width: 15%;">Appd. <i>JA</i></td> <td style="width: 15%;">Date: 07-Dec-04</td> <td style="width: 15%;">Project No.: 145579</td> <td style="width: 15%;">Rev: B</td> </tr> </table>		By: RPH <i>AD</i>	Chk: <i>AG</i>	Appd. <i>JA</i>	Date: 07-Dec-04	Project No.: 145579	Rev: B
By: RPH <i>AD</i>	Chk: <i>AG</i>	Appd. <i>JA</i>	Date: 07-Dec-04	Project No.: 145579	Rev: B		

 <p>AMEC E&amp;C Services Limited Trail, BC Canada</p>	<p>Instrumentation Data Sheet</p>
<p><b>TAG NUMBER: 36-TE-516</b></p>	
<p><b>SUBJECT:</b> RESISTANCE TEMPERATURE DETECTOR (RTD) - 100 OHM PLATINUM</p>	
<p><b>SERVICE:</b> Off-Gas Exhaust Fan No. 1 Drive End Bearing Temperature</p>	
<p><b>SUPPLIER:</b> *</p>	<p><b>PIC No.:</b> 209</p>
<p><b>MAKE:</b> *</p>	<p><b>P.O. No.:</b></p>
<p><b>MODEL:</b> *</p>	<p><b>P&amp;ID No.:</b> F-145579-36-A-0103</p>
<p><b>WEI.I.: N/R</b> <span style="float: right;"><b>ELEMENT: 36-TE-516</b></span></p>	
<p><b>Material:</b> N/A</p>	<p><b>Type:</b> Dual 100 ohm Platinum RTD</p>
<p><b>Construction:</b> N/A</p>	<p><b>Calibration:</b> Din 43760(0.00385 ohm/ohm/deg C)</p>
<p><b>Dim: Mfg. Std.:</b> N/A</p>	<p><b>Leads:</b> Hermetically Sealed</p>
<p><b>Tip O/D:</b> N/A</p>	<p><b>Mounting:</b> 1/4" Tube x 1/4" NPT T/C Connector</p>
<p><b>Bore I/D:</b> N/A</p>	<p><b>Connection:</b> 3 - Wire Terminal Lead Wires</p>
<p><b>Internal Thread:</b> N/A</p>	<p><b>Sheath Mat'l:</b> 316L SS</p>
<p><b>Process Connection:</b> N/A</p>	<p><b>Sheath O/D:</b> 1/4"</p>
<p><b>Length Overall:</b> N/A</p>	<p><b>Probe Length:</b> To Suit Bearing Shell Dimension</p>
<p><b>"U" Insertion Dim:</b> N/A</p>	<p><b>Other:</b> 1/2" NPT to Accept Head</p>
<p><b>"T" Lagging Extn:</b> N/A</p>	
<p><b>HEAD:</b></p>	
<p><b>Cover:</b> Aluminium</p>	<p><b>Connection:</b> 1/2" NPT</p>
<p><b>Enclosure Rating:</b> Nema 4X</p>	<p><b>Union:</b> N/R</p>
<p><b>Material:</b> Aluminium</p>	<p><b>Conduit Conn.:</b> 1/2" NPT</p>
<p><b>Termination:</b> Std. Terminal Block</p>	
<p><b>FEATURES:</b></p>	
<p>316SS Tag permanently affixed to RTD Head</p>	
<p><b>SERVICE CONDITIONS:</b></p>	
<p><b>Equip No.:</b> 36-N31-025</p>	<p><b>Max. Velocity:</b> N/A</p>
<p><b>Fluid:</b> N/A</p>	<p><b>Percent Solids:</b> N/A</p>
<p><b>Fluid pH:</b> N/A</p>	<p><b>Acidity:</b> N/A</p>
<p><b>Temp Oper:</b> Approx. 100°F (To Be Confirmed)</p>	<p><b>Specific Gravity:</b> N/A</p>
<p><b>Ambient Temp:</b> -25°F to 115°F</p>	<p><b>Dielectric:</b> N/A</p>
<p><b>Press Min:</b> N/A</p>	<p><b>Vibration:</b> Minimal</p>
<p><b>Press Oper:</b> N/A</p>	<p><b>Vessel Material:</b> N/A</p>
<p><b>Press Max:</b> N/A</p>	<p><b>Agitator:</b> N/A</p>
<p><b>NOTES:</b> 1. All items with an * shall be filled in by the VENDOR</p>	
<p>By: RPH <i>rod</i>   Chk: <i>ly</i>   Appd: <i>JA</i>   Date: 07-Dec-04   Project No. 145579   Rev: B</p>	

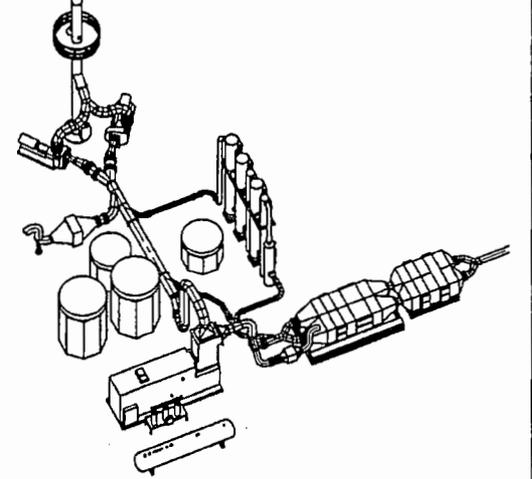
 <p>AMEC E&amp;C Services Limited Trail, BC Canada</p>	<p>Instrumentation Data Sheet</p>
TAG NUMBER: 36-VIT-518	
SUBJECT: <u>VIBRATION TRANSMITTER</u>	
SERVICE: <u>Off-Gas Exhaust Fan No.2</u>	
SUPPLIER: _____	P.I.C. No.: <u>209</u>
MAKE: <u>*</u>	P.O. No.: _____
MODEL: <u>*</u>	P&ID No.: <u>F-145579-36-A-0103</u>
TRANSMITTER:	
Type:	<u>Axial Acceleration</u>
Housing Mat'l:	<u>*</u>
Range:	<u>*</u>
Output:	<u>4 - 20mA Isolated</u>
Power:	<u>10 - 28 VDC</u>
Enclosure Class:	<u>*</u>
Sensitivity:	<u>100 mV/g</u>
Loop Resistance:	<u>*</u>
Certification:	<u>UL</u>
SENSING ELEMENT	
Material:	<u>*</u>
Mounting Type:	<u>*</u>
Cable Type:	<u>*</u>
Cable Length:	<u>15ft (To be Confirmed)</u>
Output Connector:	<u>*</u>
316ss Tags permanently affixed to instrument	
SERVICE CONDITIONS:	
Equip No.:	<u>36-N31-026</u>
Temp Min.	<u>-25°F</u>
Temp Oper.	<u>Ambient</u>
Temp Max.	<u>115°F</u>
NOTES: 1. All items with an * shall be filled in by the VENDOR.	
By: RPH  Chk:  Appd.  Date: 07-Dec-04   Project No.: 145579   Rev: B	

	AMEC E&C Services Limited Trail, BC Canada	Instrumentation Data Sheet
<b>TAG NUMBER: 36-TE-519</b>		
<b>SUBJECT: RESISTANCE TEMPERATURE DETECTOR (RTD) - 100 OHM PLATINUM</b>		
<b>SERVICE: Off-Gas Exhaust Fan No. 2 Drive End Bearing Temperature</b>		
<b>SUPPLIER:</b>	* _____	PIC No.: 209
<b>MAKE:</b>	* _____	P.O. No.: _____
<b>MODEL:</b>	* _____	P&ID No.: F-145579-36-A-0103
<b>WPII.: N/R</b>		<b>ELEMENT: 36-TE-519</b>
<b>Material:</b>	N/A	<b>Type:</b> Dual 100 ohm Platinum RTD
<b>Construction:</b>	N/A	<b>Calibration:</b> Din 43760(0.00385 ohm/ohm/deg C)
<b>Dim: Mfg. Std.:</b>	N/A	<b>Leads:</b> Hermetically Sealed
<b>Tip O/D:</b>	N/A	<b>Mounting:</b> 1/4" Tube x 1/4" NPT T/C Connector
<b>Bore I/D:</b>	N/A	<b>Connection:</b> 3 - Wire Terminal Lead Wires
<b>Internal Thread:</b>	N/A	<b>Sheath Mat'l:</b> 316L SS
<b>Process Connection:</b>	N/A	<b>Sheath O/D:</b> 1/4"
<b>Length Overall:</b>	N/A	<b>Probe Length:</b> To Suit Bearing Shell Dimension
<b>"U" Insertion Dim:</b>	N/A	<b>Other:</b> 1/2" NPT to Accept Head
<b>"T" Lagging Extn:</b>	N/A	
<b>HEAD:</b>		
<b>Cover:</b>	Aluminium	<b>Connection:</b> 1/2" NPT
<b>Enclosure Rating:</b>	Nema 4X	<b>Union:</b> N/R
<b>Material:</b>	Aluminium	<b>Conduit Conn.:</b> 1/2" NPT
<b>Termination:</b>	Std. Terminal Block	
<b>FEATURES:</b>		
316SS Tag permanently affixed to RTD Head		
<b>SERVICE CONDITIONS:</b>		
<b>Equip No.:</b>	36-N31-026	<b>Max. Velocity:</b> N/A
<b>Fluid:</b>	N/A	<b>Percent Solids:</b> N/A
<b>Fluid pH:</b>	N/A	<b>Acidity:</b> N/A
<b>Temp Oper:</b>	Approx. 100°F (To Be Confirmed)	<b>Specific Gravity:</b> N/A
<b>Ambient Temp:</b>	-25°F to 115°F	<b>Dielectric:</b> N/A
<b>Press Min:</b>	N/A	<b>Vibration:</b> Minimal
<b>Press Oper:</b>	N/A	<b>Vessel Material:</b> N/A
<b>Press Max:</b>	N/A	<b>Agitator:</b> N/A
<b>NOTES: 1. All items with an * shall be filled in by the VENDOR</b>		
<b>By:</b> RPH <i>[Signature]</i>	<b>Chk:</b> <i>[Signature]</i>	<b>Appd.:</b> <i>[Signature]</i>
<b>Date:</b> 07-Dec-04	<b>Project No.:</b> 145579	<b>Rev:</b> B

In making requests for transmittal of data by any electronic media, the Company hereby grants its license to the recipient to use the data for the project only. The recipient shall be responsible for the security of the data and shall indemnify the Company against all claims, damages, costs and expenses, including reasonable attorneys' fees, arising from the use of the data for any purpose other than that for which it was transmitted. The Company's liability shall be limited to the amount of the fee paid for the transmission of the data.

NO.	AME Dwg. No.	REFERENCE DRAWINGS
1	F-145579-00-D-0000	OFF-GAS & ELECT. TRAILERS G.A. - PLAN
2	F-145579-00-P-0007	OFF-GAS TREATMENT - PIPING LAYOUT
3	F-145579-00-P-0012	OFF-GAS TREATMENT - PIPING SECTIONS
4	F-145579-36-V-0033	OFF-GAS TREATMENT - SCRUB & STACK SECTIONS
5	F-145579-36-V-0034	OFF-GAS TREATMENT - SCRUB & STACK SECTIONS

- NOTES:**
- ONLY VENTILATION DUCTWORK PIPING AND SUPPORTING CABLE TRAYS SHOWN. ALL OTHER PIPING AND CABLE TRAYS OMITTED FOR CLARITY.
  - DIMENSIONS AND LOCATIONS OF JOINTS TO BE CONFIRMED BY SELECTED YENDOR.
  - VENTILATION DUCTWORK PIPING TO BE MINIMUM THICKNESS SCHEDULE TO EXCEPT AS NOTED.
  - DUCTWORK MATERIAL AND FABRICATION SHALL CONFORM TO ASME B31.1 POWER PIPING.
  - DUCTWORK FITTINGS AS PER AMEC DWG. NO. F-145579-36-V-0033 STANDARD DETAILS - SHT. 1.
  - I.D. DESIGNATED ISOLATION DAMPERS TO BE FLANGES ROUND BUBBLE-TIGHT (FLAT BLACK TYPE). FLANGES TO MATCH 150# DRILLING.
  - VENTILATION DUCTWORK SUPPORTS ARE REPRESENTED BY A HEXAGON.  
 EXAMPLES - VS- OR RC- CO- OS- A- H- OS-  
 FOR 'VS' TYPE SUPPORTS SEE DWG. F-145579-36-0024.  
 FOR ALL OTHER SUPPORTS SEE DRAWINGS F-145579-00-P-0001 TO -0004.  
 B. SEE BRANCH REINFORCEMENT DETAIL ON DWG. F-145579-36-V-0023 FOR FITTINGS SHOWN SHADDED.

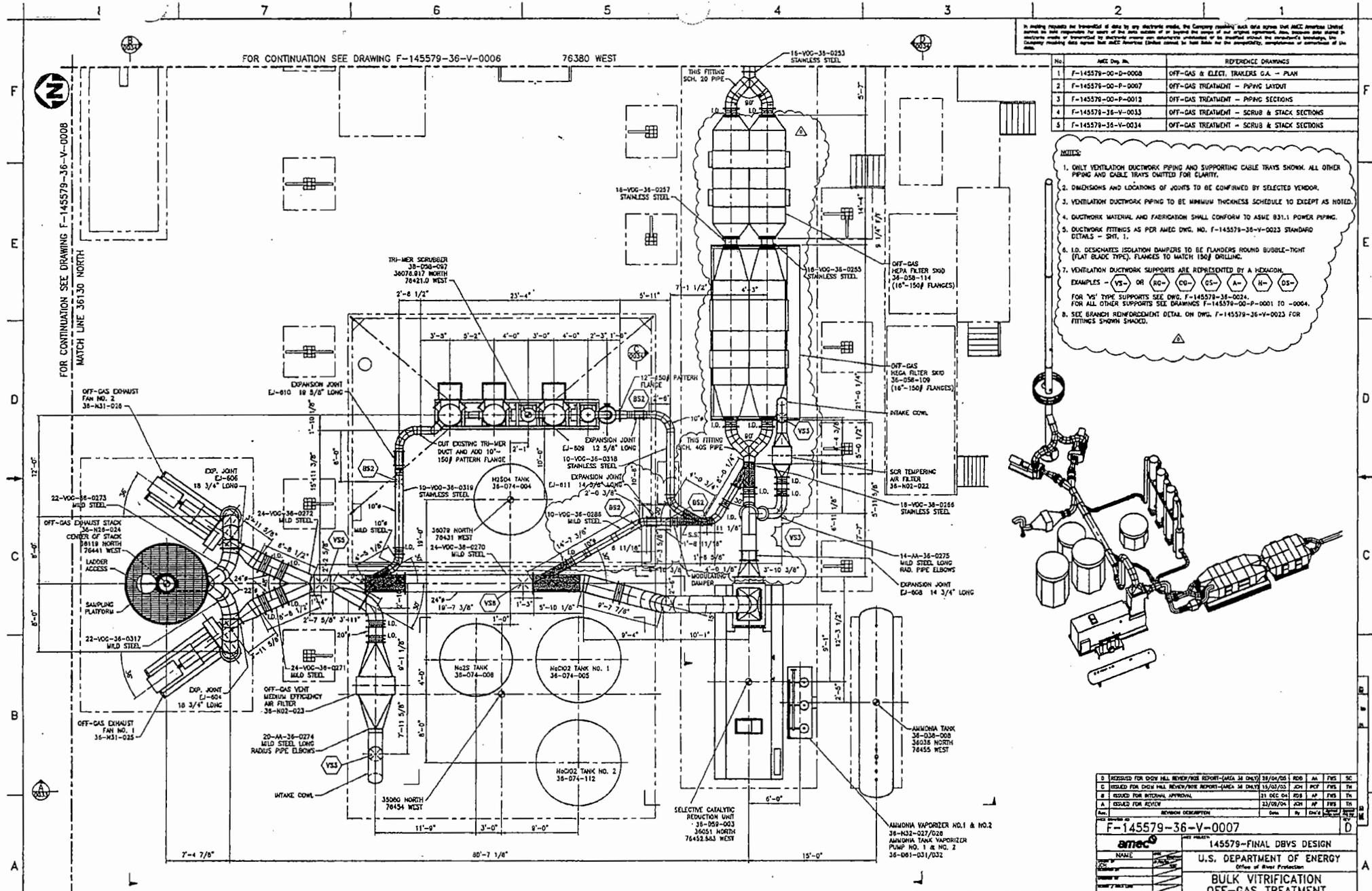


NO.	REVISION DESCRIPTION	DATE	BY	CHK'D	APP'D
1	ISSUED FOR DESIGN REVIEW/REVISE REPORT-(AMEC 34 ONLY)	33/04/02	ROD	AA	FWS
2	ISSUED FOR DESIGN REVIEW/REVISE REPORT-(AMEC 34 ONLY)	15/02/03	JON	PCF	PMS
3	ISSUED FOR NATIONAL APPROVAL	11/02/04	ROD	AF	FWS
4	ISSUED FOR REVIEW	22/06/04	JON	AF	FWS

F-145579-36-V-0007  
 145579-FINAL DBVS DESIGN  
 U.S. DEPARTMENT OF ENERGY  
 Office of River Protection  
**BULK VITRIFICATION  
 OFF-GAS TREATMENT  
 SCRUB & STACK PLAN**

DWG NO.	TITLE	REF NUMBER	TITLE	REFERENCES
	DRAWING TRACEABILITY LIST		NEXT USED ON	

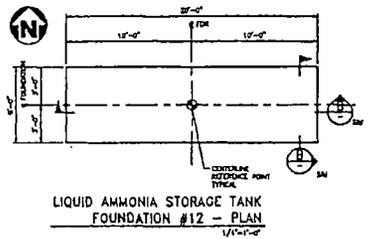
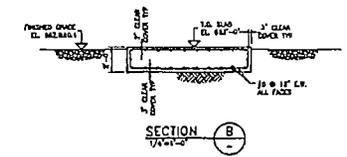
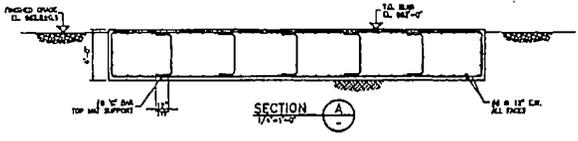
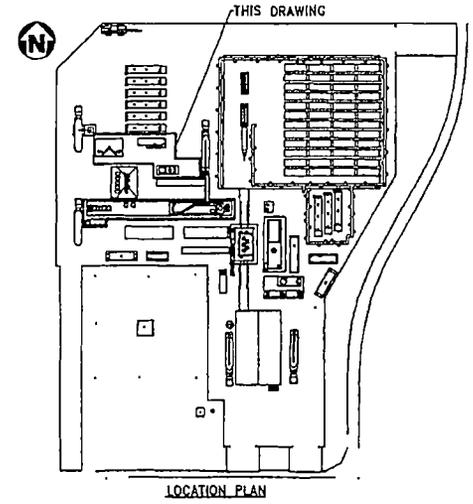
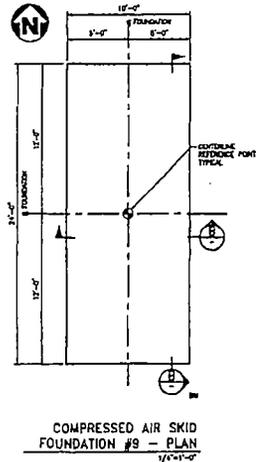
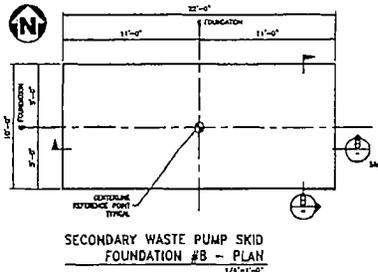
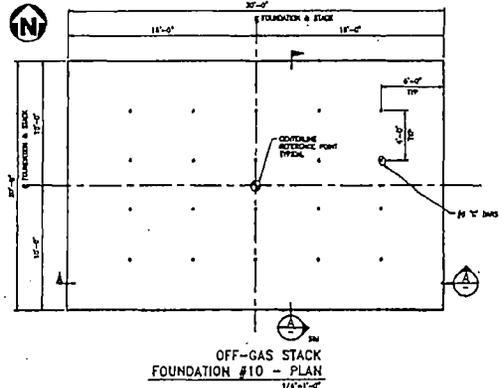
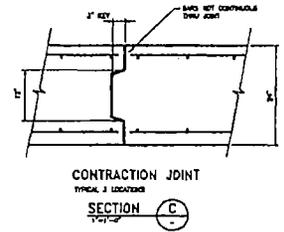
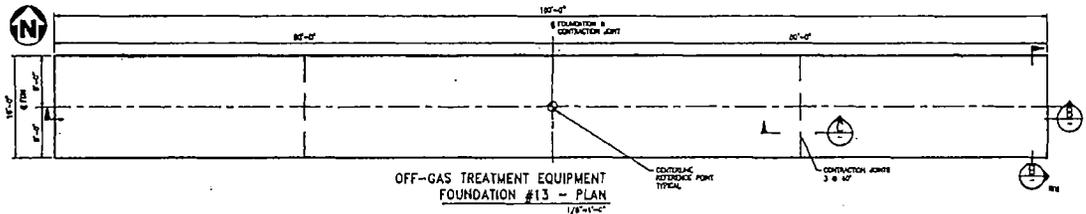
NO.	REVISIONS
1	
2	
3	
4	



GS-905

RP-24544 REV 1D

In making reference to drawings of this type, the contractor shall refer to the specifications and drawings for the Bulk Vitrification Plant, and shall be held responsible for any errors or omissions in the drawings or specifications. The contractor shall be held responsible for any errors or omissions in the drawings or specifications. The contractor shall be held responsible for any errors or omissions in the drawings or specifications.



NOTES:  
FOR GENERAL NOTES, DESIGN CRITERIA, MATERIAL SPECIFICATIONS, AND FOUNDATION LOCATIONS REFER TO DRAWING H-14-106789 "BULK VITRIFICATION - CML SITE IMPROVEMENTS"

THIS DRAWING FORMERLY ISSUED AS AMEC DRAWING F-143843-00-C-0011.

amec		145579-FINAL DBVS DESIGN	
NAME	DATE	U.S. DEPARTMENT OF ENERGY	
DESIGNER	DATE	Office of Area Protection	
CHECKED	DATE	BULK VITRIFICATION	
APPROVED	DATE	OFF-GAS AREA	
DATE	DATE	FDNS - PLANS & SECTIONS	
DATE	DATE	F 2410 0900 H-14-106796 0	
DATE	DATE	AS SHOWN 821143	

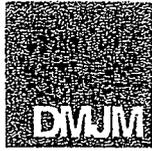
DWG NO	TITLE	REV NUMBER	TITLE	REVISIONS
	DRAWING TRACEABILITY LIST		NEXT USED ON H-14-106789	

GS-906

RPP-24544 REV 1d

145579-V-DS-005.1-CN-001

	<h2 style="margin:0;">CHANGE NOTICE</h2> <p style="text-align: right; margin:0;">Page 1 of 5</p>	CN No. <b>145579-V-SP-004-                  CN-001</b>							
Change Notice (CN) Category (Check One)  Supplemental <input checked="" type="checkbox"/> Direct Revision <input type="checkbox"/> Cancel <input type="checkbox"/>  Quality Program Procedure Change <input type="checkbox"/>  Affects Cost? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>  Affects Schedule? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>  Other Documents Affected by this CN: N/A	Originator's Name and Signature.  Jack McConwell <i>Jack McConwell</i>  Project Title/ Project No. Demonstration Bulk Vitrification System / 145579  Primary Document Changed by this CN (include sheet no. and rev) Exhaust Fans Specification 145579-V-SP-004, Rev 4	Date  02/13/2006  Safety Class (If Rq'd)  SS  Contract No.  N/A  Design Verification Required (Independent Review) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>  Affected Documents Superseded Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>							
Reason for Change: Incorporate changes due to bidder's questions and update to include a variable speed drive on each exhaust fan.									
Detailed Description of Change (Use Continuation Sheet as Applicable):  1. Change Section 1.2 Scope of supply as follows and add Variable Speed Drive to list:  The Seller's Scope of Supply shall include, but not be limited to, the design, analysis, fabrication, inspection, testing, documentation, packaging, and shipping of the following components associated with the Exhaust Fans. All equipment shall be mounted on a common mounting skid for operation, except for the variable speed drives which shall ship separately.  Fans – The Exhaust Fans or Blowers  Fan Motor – TEFC housing NEMA rated  <b>Variable Speed Drive - Specifically Matched to the fan motor</b>									
<b>Review/Approval Authorities: A = Approval, R = Review, I = Information (Check where applicable for change notice)</b>									
Printed Name/Signature	Date	R	A	I	Printed Name/Signature	Date	R	A	I
Program Director:		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Independent Review*:		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project Manager: Jim Frederickson <i>Jim Frederickson</i>	2/13/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	AMEC E&E PM or designee <i>Jeff [Signature]</i>	2/17/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Mechanical Engineering Manager: Ja-Kael Luey <i>Ja-Kael Luey</i>	2/13/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	AMEC E&E QA or designee HANK CHAPIN <i>Hank M. Chapin</i>	02/17/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Electrical Engineering Manager: Dave King <i>Dave King</i>	2/13/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CH2M HILL Environmental or designee <i>[Signature]</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Process Technology Manager:		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CH2M HILL PM or designee <i>[Signature]</i>	2/22/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Quality Assurance: <i>[Signature]</i>	2/14/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Other		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
* Design Verification per EP 3.9 required? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Assign Independent Reviewer									
CN Incorporated? PM or designee sign and date: _____									



**DMJM** technology

**CONTINUATION SHEET CHANGE NOTICE** CN No. 145579-V-SP-004-CN-001

Page 2 of 5

Detailed Description of Change (Continuation Sheet):

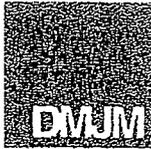
Work not included in the Seller Scope of Supply is as follows:

(a) Site installation of Exhaust Fans or Variable Speed Drives.

2. Add "VFD Variable Frequency Drive" to the Abbreviations and Acronyms list on page 6 of 42.
3. Add the following to Table 2-2 as shown.

**Table 2-2: Applicable Non-Government Documents**

Code/Standard	Title
AFBMA 9 or 11	Anti-friction Bearing Manufacturers Association
AMCA 201, 210, 300	Fans and Systems
AMCA 204	Balance Quality and Vibration Levels for Fans
ANSI C63.16	American National Standard Guide for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment
ASCE 7-98	<i>Minimum Design Loads for Buildings and Other Structures</i> , American Society of Civil Engineers, Reston, Virginia.
ASME AG-1	Code on Nuclear air and Gas Treatment
ASME B18.2.1	Square and Hex Bolts and Screws, Inch Series
ASME B30.20	Below-The-Hook Lifting Devices
ASME NQA-1-1994* (See Note at end of Table)	Quality Assurance Requirements for Nuclear Facility Applications
ASNT-TC-1A	American Society for Nondestructive Testing - Recommended Practice
ASTM A193	Standard specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A194	Standard specification for Carbon and Alloy Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A307	Standard specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A354	Standard specification for Quenched and Tempered Alloy Steel Bolts, Studs and other Externally Threaded Fasteners
ASTM A36	Standard specification for Structural Steel
ASTM A563	Standard specification for Carbon and Alloy Steel Nuts
ASTM F436	Standard Specification for Hardened Steel Washers



**CONTINUATION SHEET CHANGE NOTICE** CN No. 145579-V-SP-004-CN-001  
Page 3 of 5

**Table 2-2: Applicable Non-Government Documents**

Code/Standard	Title
AWS D1.1	Structural Welding Code – Steel
AWS D1.6	Structural Welding Code – Stainless Steel
HNF 2962	List of EM/EMC Requirements, Numetec Hanford Corporation for Fluor Daniel Corporation Hanford, Inc, Richland, WA
HNF-SD-GN-ER-501	Natural Phenomena Hazards, Hanford Site, Washington
IEEE C62.41	IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
IEEE Std C37.90.2	Standard for Withstand Capability of relay Systems to Radiated Electromagnetic Interference from Transceivers
IEEE 519	IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
ISA 5.1	Instrument Symbols and Identification
NEMA MG-1	Motors and Generators
NEMA ICS 7.1	Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems
NFPA 70	National Electric Code
TFC-ENG-STD-12	Tank Farm Equipment Identification Numbering and Labeling Standard
SAE J429	Mechanical and Material Requirements for Externally Threaded Fasteners
SAE J534	Lubrication Fittings
UBC 1997	Uniform Building Code
UL 508	Industrial Control Equipment

\*The relevant requirements of NQA-1 are included in Section 4.0

**4. Add the following sentence to 3.0 technical requirements.**

See Technical Data Sheet 145579-V-DS-004.2 for requirements specific to the fan motor Variable Frequency Drive.

**5. Change Paragraph 3.1 as follows:**

**3.1 Item Definition.**

The Exhaust Fans will provide the negative pressure to move the exhaust gas through the OGTS. Only one fan will be operating, the other fan will be in standby.



CONTINUATION SHEET CHANGE NOTICE CN No. 145579-V-SP-004-CN-001

Page 4 of 5

**6. Change Paragraph 3.2.1 and Table 3-1 as follows:**

**3.2.1 Functional Characteristics**

As specified in the Technical Data Sheet, 145579-V-DS-004.1. Table 3-2-3-1 lists air stream properties.

**Table 3-1: SCR Outlet Air Stream Properties**

Properties	Data
Design Air Flow Rate	11,400 acfm nominal[JSN1]
Estimated Temperature <sup>(a)</sup>	248 °F
Estimated inlet Pressure <sup>(a)</sup>	-120 in. w.g.
Relative Humidity-Moisture Content	100% < 5% by weight
Chemical Components	SO <sub>2</sub> = 1.1 ppmV NO <sub>x</sub> = 92 ppmV HCl = 0.1 ppmV
Specific Gravity (relative to water)	0.0006

ppmV = parts per million by volume.

w.g. = water gauge.

<sup>(a)</sup>The Seller shall verify design conditions based on performance criteria of selected equipment.

**7. Change paragraph 3.2.5 (b) as follows:**

(b) Ambient Relative humidity ranges from near 0 to 100%;

**8. Add subparagraph 3.2.5 (h) as follows:**

(h) Elevation: 663 ft above mean sea level.

**9. Change Paragraph 3.3.1.3 as follows:**

Design and installation of electrical equipment shall be in accordance with the NFPA 70 "National Electric Code" and IEEE "Institute of Electrical and Electronic Engineers" standards listed in Table 2-2. The motors shall meet the requirements of NEMA MG-1. **Motors shall operate outdoors under conditions described in Paragraph 3.2.5.** The exhaust Fans shall be listed by a nationally recognized testing laboratory, AMCA rated, or inspected and passed by the CH2M Hill Hanford



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**CONTINUATION SHEET CHANGE NOTICE** CN No. 145579-V-SP-004-CN-001

Page 5 of 5

Inspector. The variable frequency drives shall comply with the requirements of NEMA ICS 7.1 and shall be designed in accordance with UL 508. The VFDs shall be listed as suitable for the purpose specified by Underwriters Laboratory (UL), Electronic Testing Laboratories (ETL), or other nationally-recognized testing service certified for testing in accordance with UL standards.

**10. Change Section 8.0 Attachments table as follows:**

Document No.	Description	Rev.
145579-V-DS-004.1	Exhaust Fan Data Sheet	2 3
36-VIT-515	Vibration Transmitter	B
36-TE-516	Resistance Temperature Detector	B
36-VIT-518	Vibration Transmitter	B
36-TE-519	Resistance Temperature Detector	B
F-145579-36-V-0007	Off Gas Area – Scrub & Stack Area Plan	D
H-14-106796	Off Gas Area – FDNS Plans & Sections	0
145579-V-DS-004.2	Variable Speed Drive Data Sheet	A

**11. Replace Data Sheet 145579-V-DS-004.1 Rev 2 with Data Sheet 145579-V-DS-004.1 Rev 3.**

**12. Add Data Sheet 145579-V-DS-004.2 Rev A.**

145579-V-DS-004.1

**TECHNICAL DATA SHEET**  
AMEC Americas Limited



*The document revision number is indicated below. Please replace all revised pages of this document and destroy the superseded copies.*

<b>PROJECT:</b>	Final DBVS Design	145579-V-DS-004.1	REV. 3
<b>PROJECT NO.:</b>	145579	<b>EXHAUST FANS</b>	
<b>CLIENT:</b>	AMEC E&E - Richland, Washington		

REV. NO.	ISSUED FOR	ORIGIN	DATE	INITIAL
A	Internal Review	DW	8-Oct-04	DW
B	Internal Approval	DW	22-Oct-04	DW
C	CH2M Hill Review	DW	4-Nov-04	DW
0	Bid Request	DW	21-Dec-04	DW
1	Bid Request	DW	6-Jan-05	DW
2	Bid Request	TM	19-Oct-05	TM
3	Bid Request	JCMc	13-Feb-06	<i>JCMc</i>

**DOCUMENT APPROVAL**

<p><b>CLIENT APPROVAL (AMEC RICHLAND)</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u><i>Jeff Deffen</i></u></p> <p>Date: <u>2/17/06</u></p> <p>Q.A. Rep.: <u><i>Frank M. Chafin</i></u></p> <p>Date: <u>02-17-06</u></p>	<p><b>DMJM (RICHLAND)</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u><i>J. M. Frederic</i></u></p> <p>Date: <u>2/13/06</u></p> <p>Discipline Lead: <u><i>John E. Crisler</i></u></p> <p>Date: <u>2/13/06</u></p> <p>Originator: <u><i>John McCombs</i></u></p> <p>Date: <u>02/13/06</u></p>
<p><b>CLIENT APPROVAL (CH2M HILL)</b></p> <p>Project Manager: <u><i>John Beal</i></u></p> <p>Date: <u>2/23/06</u></p>	



**TECHNICAL DATA SHEET**

<b>PROJECT:</b>	Final DBVS Design	145579-V-DS-004.1	REV. 3
<b>PROJECT NO.:</b>	145579	<b>EXHAUST FANS</b>	
<b>CLIENT:</b>	AMEC E&E - Richland, Washington	EQUIPMENT NO.: 36-N31-025, -026	

**REFERENCE SPECIFICATION**

Document No.	Specification
145579-V-SP-004	EXHAUST FANS

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Bidders Drawing & Data Commitments Sheet ..... 1 Page



TECHNICAL DATA SHEETS

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<b>PROJECT NO.:</b>		145579		EXHAUST FANS			
<b>CLIENT:</b>		AMEC E&E - Richland, Washington		EQUIPMENT NO.: 36-N31-025, -026			
<b>No. Required</b>		2		<b>Area</b>		36	
<b>PFD #</b>		F-145579-00-A-0023		<b>Stream No.</b>		45	
<b>Reference Specification:</b>		145579-V-SP-004		<b>Quality Assurance Level</b>		EQ	
<b>Operating Conditions</b>				<b>Rev</b>		<b>Rev</b>	
<b>Location (Indoors/Outdoors)</b>		Outdoors		<b>Environment</b>			
<b>Operation (Continuous / Intermittent)</b>		Continuous		-Radioactive		No B	
<b>Days per year</b>		365		-Toxic		Yes 1	
<b>Hours per day</b>		24		-Corrosive		No	
<b>Availability of each fan (%)</b>		95		-Flammable		No	
<b>Ambient temp - min ("F)</b>		-25		-Beryllium		No 2	
<b>Ambient temp - max ("F)</b>		115					
<b>Elevation ft MSL</b>		663					
<b>Inlet Composition</b>				<b>Footprint</b>			
<b>Description</b>		Air		<b>Max base length (ft) *</b>		2	
<b>Flow Rate (ACFM)</b>		11,400		<b>Max base width (ft) *</b>		2	
<b>Temperature ("F)</b>		248					
<b>Fan Data</b>							
<b>Manufacturer *</b>				<b>Hub (external/intenal) *</b>			
<b>Model number *</b>				<b>-Material *</b>			
<b>Size *</b>				<b>Fan Wheel *</b>			
<b>Inlet Static Pressure (in wg) *</b>		-120 B		<b>-Material *</b>			
<b>Outlet Static Pressure (in wg) *</b>		1		<b>-Type *</b>			
<b>Total External Static Pressure (in wg) *</b>		-121		<b>-Diameter (in) *</b>			
<b>Max Speed (RPM) *</b>		2		<b>-Blade Thickness (in) *</b>			
<b>Operating Speed (RPM) *</b>		2		<b>-Hardness (BHN) *</b>			
<b>Air Displacement (SCFM) *</b>				<b>-Tip Speed (fps) *</b>			
<b>BHP, at Std Air (hp) *</b>				<b>-Direction of curvature *</b>			
<b>BHP, at Oper. Temp. (hp) *</b>				<b>-Max. Allow tip speed (fps) *</b>			
<b>Inlet *</b>				<b>-Min. Allow. Flow (CFM) *</b>			
<b>- Diameter (in) *</b>				<b>Rotation (viewed from driver end) *</b>			
<b>- Flange specification *</b>				36-N31-025		CW 3	
<b>- Position *</b>				36-N31-026		CCW 3	
<b>Outlet *</b>							
<b>- Diameter (in) *</b>							
<b>- Flange specification *</b>							
<b>- Position 36-N31-025 *</b>		BAUCW 3					
<b>36-N31-026 *</b>		BAUCCW 3					
<b>Additional Features:</b>				<b>Coupling</b>			
<b>Speed Sensor (Yes/No)</b>		Yes 2		<b>Manufacturer *</b>			
<b>Anti-static Features (Yes/No)</b>		No		<b>Type *</b>			
<b>Coupling Guard (Yes/No)</b>		Yes		<b>Gear Ratio *</b>			
<b>Inlet Filter (Yes/No)</b>		No		<b>Material *</b>			
<b>Case Drain (Yes/No)</b>		Yes		<b>Service factor (based on motor Hp)</b>		1.5	
				<b>Split taper-lock bushings</b>		yes	
				<b>Thermal Isolation reqd *</b>		B	
<b>Date</b>	8-Oct-04	22-Oct-04	1-Nov-04	21-Dec-04	6-Jan-05	19-Oct-05	13-Feb-06
<b>By</b>	DW	DW	DW	DW	DW	TM	JCMc
<b>Chkd</b>	AP	AP	AP	AP	AP	TM	<i>JCMc</i>
<b>Rev.</b>	A	B	C	0	1	2	3



TECHNICAL DATA SHEETS

Data sheet 2 of 2

Motor		Rev			Rev
Manufacturer	*		Pull-up torque % of locked rotor torque	*	
Power	(HP)	400	3	Speed	(RPM) *
Frame size	*		Efficiency	*	
NEMA Design	*		Torque	(ft-lbs) *	
Service Factor	*	1.15 (MIN)	3	Current	(A) *
Duty	*	INVERTER	3	Paint Finish	*
Corrosion protection	*		Weight	(lb) *	
Enclosure Type and Rating		TEFC		Position	*
Voltage	(V)	460		VSD capable	yes 3
Frequency	(Hz)	60		Insulation Class (NEMA MG-1)	F
Phases		3		RTD ( 3 phases )	(ohms) 100 B

Materials of Construction					
Housing	*		Motor Enclosure	*	
Fan Shaft	*		Guards	*	
Fan Base	*		Bearing Pedestal	*	
Spacer Ring	*				

Bearings				Bolting Material	
Manufacturer	*		Bolts		
Size	*		- size	(in) *	
Number	*		- number	*	
Type	*		Nuts		
L <sub>10</sub> Life	(hrs)	100,000	- size	(in) *	
Vibration Transducer/Switch	**		- number	*	
RTD fan drive bearing	(ohms)	100	3		

Surface Preparation and Finish				Weight	
By VENDOR (Yes/No)		Yes		Total Shipping Weight	(lb) *
Surface Preparation	*				
System	*	-			
Finish type	*	-			
Finish Dry Film Thickness	(in) *	-			

**Comments:**

1. Items marked with an \* shall be filled in by VENDOR  
 \*\* Vendor to recommend type

The fan is to meet applicable requirements of the ASME AG-1 Sections per appendix B of the Specification 145579-V-SP-004.

The fans shall be mirror image discharge as shown on drawing 36-V-0007

Date	8-Oct-04	22-Oct-04	1-Nov-04	21-Dec-04	6-Jan-05	19-Oct-05	13-Feb-06
By	DW	DW	DW	DW	DW	TM	JCMc
Chked	AP	AP	AP	AP	AP	TM	<i>OD</i>
Rev.	A	B	C	0	1	2	3



## TECHNICAL DATA SHEETS

PROJECT:	Final DBVS Design	145579-V-DS-004.1	REV. 3
PROJECT NO.:	145579	EXHAUST FANS	
CLIENT:	AMEC E&E - Richland, Washington	EQUIPMENT NO.: 36-N31-025, -026	

**BIDDERS DRAWING AND DATA COMMITMENTS**

Vendor shall supply all drawings, manuals and documentation in the quantities indicated. Approval drawings are due within the listed number of calendar days after issue of the Purchase Order or Letter of Intent. The dates set out for drawing and data submissions are governed by the engineering design schedule of the project. The Vendor shall supply one Autocad disk file and requested number of copies within the listed number of calendar days. Final drawings must be certified as correct and bear the Vendors name, equipment number and Purchase Order Number. Drawing Transmittals listing the document numbers, revision numbers, quantities, status and document types must be included with all submissions (including electronic submittals)

<p><b>SEND ALL DOCUMENTS TO:</b></p> <p>Submit all documents via courier service.</p> <p>Faxed documents must be followed by the originals. Electronic E-mail or FTP transmissions of drawings &amp; data must be copied to Document Control <b>Always include a transmittal</b></p>	<p><b>AMEC E&amp;E</b> 1135 Jadwin Avenue Richland, WA 99352</p> <p>Attn: Document Control</p> <p>Phone: (509) 942-1114, Ext. 118 Fax: (509) 942-1122</p>
--	---

**BIDDERS MUST PROVIDE ESTIMATED LEAD TIMES FOR APPROVAL DRAWINGS**

Proposal	Bidder shall include this data for each item			REVIEW ITEMS DUE WITHIN (DAYS)	VENDOR COMMITMENT (SEE NOTE 4) (DAYS)
	Review	Required before ordering or start of fabrication			
		Final	Required within 7 days prior to shipment and before final payment		
PROPOSAL	REVIEW	FINAL	DESCRIPTION	(DAYS)	(DAYS)
1			QA Program that satisfies the requirements of NQA-1-1994	Bid	
1			Experience list and maintainability information	Bid	
E+3	E+3		Design, fabrication & delivery schedule	PO+7	
E+3	E+3	E+6	Outline drawings and layout drawings indicating weights and dimensions	PO+14	
E+3	E+3	E+6	Technical brochures on purchased components	PO+21	
	E+3	E+6	Calculations	PO+21	
	E+1	E+6	Spare parts list	Del-14	
	E+1	E+6	Set of installation and maintenance manuals c/w technical literature for all equipment and devices	Del-14	
		6	NEC inspection certificate & electromagnetic interference test results	Del-7	
		6	UL and motor lists	Del-7	
		6	Site commissioning record & test results	COM+14	

Legend:  
E = Electronic Copy - PO's Due within 7 calendar days of PO Issuance. O = Original - Due within 7 calendar days of PO Issuance. COM = Due within 14 calendar days of commissioning.

**THE TIMELY RECEIPT OF THE VENDOR DOCUMENTS IS CRITICAL TO THIS PROJECT  
BUYER COMMITS TO A 10 WORKING DAY TURNAROUND ON REVIEW ITEMS**

I agree to provide the listed documentation and data and the dates shown above.

\_\_\_\_\_  
Vendor Signature

\_\_\_\_\_  
Date

145579-V-DS-004.02

**TECHNICAL DATA SHEET**  
 AMEC Americas Limited



*The document revision number is indicated below. Please replace all revised pages of this document and destroy the superseded copies.*

<b>PROJECT:</b>	Final DBVS Design	145579-V-DS-004.02	REV. A
<b>PROJECT NO.:</b>	145579	Exhaust Fan Variable Frequency Drive	
<b>CLIENT:</b>	AMEC E&E - Richland, Washington		

REV NO	ISSUED FOR	ORIGIN	DATE	INITIAL
A	Internal Review	DAK	2/13/2006	DAK

**DOCUMENT APPROVAL**

<p><b>CLIENT APPROVAL (AMEC RICHLAND)</b>  <i>Original Approvals on File</i></p> <p>Project Manager: <u>[Signature]</u></p> <p>Date: <u>2/17/06</u></p> <p>Q.A. Rep.: <u>[Signature]</u></p> <p>Date: <u>02-17-06</u></p>	<p><b>DMJM APPROVAL</b>  <i>Original Approvals on File</i></p> <p>Project Manager: <u>[Signature]</u></p> <p>Date: <u>2/13/06</u></p> <p>Discipline Lead: <u>[Signature]</u></p> <p>Date: <u>2/13/06</u></p> <p>Originator: <u>[Signature]</u></p> <p>Date: <u>2/13/06</u></p>
<p><b>CLIENT APPROVAL (CH2M HILL)</b></p> <p>Project Manager: <u>[Signature]</u></p> <p>Date: <u>2/27/06</u></p>	



**TECHNICAL DATA SHEET**

<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-DS-004.02</b>	<b>REV. A</b>
<b>PROJECT NO.:</b>	<b>145579</b>	<b>Exhaust Fan Variable Frequency Drive</b>	
<b>CLIENT:</b>	<b>AMEC E&amp;E - Richland, Washington</b>		

**REFERENCE SPECIFICATION**

<b>Document No.</b>	<b>Specification</b>
145579-V-SP-004	Exhaust Fans

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<b>PROJECT NO.:</b>		145579		Exhaust Fan					
<b>CLIENT:</b>		AMEC E&E - Richland Washington		Variable Frequency Drive					
<b>No. Required:</b>		2		<b>Area</b>		36			
<b>PFD #</b>		F-145579-00-A-0023		<b>Stream No.</b>		45			
<b>Reference Specification:</b>		145579-V-SP-004		<b>Quality Assurance Level</b>				Enhanced	
<b>Operating Conditions</b>				<b>Rev</b>		<b>Rev</b>			
Location (Indoors/Outdoors)		Indoors		Operation - Maximum days per event		365			
Operation (Continuous/Intermittent)		Continuous		- Hours per day		24			
Max. Ambient Air Temp. (° F)		85		Availability %		95			
Min Ambient Air Temp. (° F)		40		Elevation (ft)		663			
Normal Pressure		Atmospheric		Environment - Radioactive		No			
				- Toxic		No			
				- Corrosive		No			
				- Flammable		No			
<b>Specifications</b>				<b>Interface:</b>					
Model / Make				Dimensions W x H x D (in)					
Minimum Capacity (HP)		400		Weight lb					
NRTL-Listed and Labeled		Yes		Programmable Analog Inputs		2			
Efficiency, Full Load (min.) %		96		Programmable Digital Inputs		4			
Starting Torque, of Rated Torque %		100		Loss of Input Signal Detection		Yes			
Speed Regulation %		1		Disconnect Switch Sensing Function (Note 2)		Yes			
Short Circuit Rating (min.) kA		22		Power Terminal Blocks Rating (° C)		90			
Enclosure		NEMA 1		Communication Interface		ControlNet			
Nameplate w/equipment no. and designation		Yes		Operator Interface		LCD HMI			
<b>INPUT</b>				Numeric Keypad		Yes			
Voltage (Vac)		480 +/- 10%							
Frequency (Hz)		60 +/- 5%							
Phase		3ph, 3 W							
Primary Slide Power Factor (min.)		0.97							
Transient Surge Protection		Yes		<b>Equipment Designations and Numbers</b>					
AC Line Reactor		Yes		36-E41-025A OGTS EXHAUST FAN VFD					
<b>OUTPUT</b>				36-E41-026A OGTS EXHAUST FAN VFD					
Control Mode		Sensorless Vector		<b>Suggested Manufacturers and Models:</b>					
Modulation		Pulse Width		Allen-Bradley (PowerFlex 700H)					
Drivers		IGBT		Columbia Electric Supply					
Frequency Range (min.) (Hz)		0 - 320		1913 W "A" Street					
Load Duty Rating		Normal		Pasco, WA 99301					
Brake IGBT		No		(509) 547-9733					
Brake Resistor		No		Contact: Jack Wood					
Peak Overload Current		110% for 1 min.							
<b>Protection</b>				ABB Inc. (ACH550-UH)					
Loss of Phase		Yes		Drives, Motors and Power Electronics					
Short Circuit		Yes		16250 W. Glendate Drive					
Adjustable Overload Protection		Yes		New Berlin, Wisconsin 53151					
				(262) 785-3200					
<b>Notes:</b>									
1. All items with an * shall be filled in by the VENDOR									
2. The VFD shall incorporate a disconnect switch sensing function. This sensing function shall allow the VFD to shut down normally when a power disconnect switch located between the VFD and the associated motor is opened during operation.									
<b>Date</b>		13-Feb-06							
<b>By</b>		DAK							
<b>Chked</b>		<i>[Signature]</i>							
<b>Rev.</b>		A							



145579-V-SP-005

**TECHNICAL SPECIFICATION**  
AMEC Americas Limited



The document revision number is indicated below. Please replace all revised pages of this document and destroy the superseded copies.

PROJECT:	Final DBVS Design	145579-V-SP-005	REV. 3
PROJECT NO:	145579	STEEL EXHAUST STACK	
CLIENT:	AMEC E&E - Richland, Washington		

REV NO.	ISSUED FOR	ORIGIN	DATE	INITIAL
A	Internal Review	DW	02-Sep-04	DW
B	Internal Approval	DW	12-Oct-04	DW
C	CH2M Hill Review	DW	19-Oct-04	DW
0	Construction	DW	15-Dec-04	DW
1	Bid Request	DW	11-Jan-05	DW
2	Bid Request	DW	02-Feb-05	DW
3	Construction	SH	24-Mar-05	SH

**DOCUMENT APPROVAL**

<p><b>CLIENT APPROVAL (AMEC RICHLAND)</b></p> <p style="text-align: center;"><i>Original Approvals on File</i></p> <p>Project Manager: <u><i>[Signature]</i></u> Date: <u>3/28/05</u></p> <p>Q.A. Rep.: <u><i>[Signature]</i></u> <u>3/28/05</u></p>	<p><b>AMEC AMERICAS LIMITED (TRAIL)</b></p> <p style="text-align: center;"><i>Original Approvals on File</i></p> <p>Project Manager: <u><i>[Signature]</i></u> Date: <u>Mar 24, 05</u></p> <p>Discipline Lead: <u><i>[Signature]</i></u> Date: <u>28 Mar 05</u></p>
<p><b>CLIENT APPROVAL (CH2M HILL)</b> <i>with comments*</i></p> <p>Project Manager: <u><i>[Signature]</i></u> Date: <u>4/7/05</u></p>	<p>Originator: <u><i>[Signature]</i></u> Date: <u>24 Mar-05</u></p>

\* See attached e-mail.

**Shuford, David H (Dave)**

---

**From:** Shuford, David H (Dave)  
**Sent:** Thursday, April 07, 2005 1:32 PM  
**To:** Hamilton, Dennis W  
**Cc:** 'Theresa Carreiro'; Mark Lucas; 'Bill Bishop'; John Stephens (TRL); 'Luey, Ja-Kael'; Davis, Susan C (Chris); Mcevoy, Terri; May, Thomas H (Tom); Tony Heim  
**Subject:** Steel Stack Specification 145579-D-SP-005 Rev 3

I have reviewed the steel stack specification 145579-D-SP-005 Rev 3, associated data sheets 145579-D-DS-005.1 Rev 3 and 145579-D-DS-005.2 Rev 0 and TECN 017.002. I recommend that you approve these items **with the following comments:**

1. Revise 145579-V-SP-005 Section 3.3.2.6 to reflect a soil type classification of "SC" vice "SE".
2. Revise 145579-V-SP-005 Section 3.3.11 to delete the current text and replace with:

**"Section 3.3.11 Qualification**

*The Seller will be expected to provide testing of their equipment per DOE-HDBK-1169 "US DOE, Nuclear Air Cleaning Handbook" section 5.5 Guidelines. Testing and inspection shall also adhere to the standard described in ASME STS-1 chapter 8. Seller shall provide testing equipment."*

3. Revise 145579-D-DS-005.1 to reflect a maximum temperature of 372 °F vice 248 °F.
4. Revise 145579-D-DS-005.1 to reflect a maximum flow rate of 9000 ACFM vice 7305 ACFM.
5. Revise 145579-D-DS-005.1 to reflect that the stack environment is toxic.
6. Reconcile the stack port locations on F-145579-36-V-0021 Rev D and data sheet 145579-D-DS-005.1 and make them consistent.
7. Revise 145579-D-DS-005.1 exhaust gas inlet dimension from 24" to 22".
8. Reconcile the exhaust gas inlet location on F-145579-36-V-0021 Rev D (22' 8") and data sheet 145579-D-DS-005.1 (20') and make them consistent.

These comments and the resolutions were discussed with AMEC and agreed to at the 4/7/2005 design review meeting. A hard copy will be provided for your signature. Please contact me if you have any questions.

Dave

Chris – this closes action #548

**TECHNICAL SPECIFICATION**  
*AMEC Americas Limited*



<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-SP-005</b>	<b>REV. 3</b>
<b>PROJECT NO.:</b>	<b>145579</b>	<b>STEEL EXHAUST STACK</b>	
<b>CLIENT:</b>	<b>AMEC E&amp;E – Richland, WA</b>		

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**TECHNICAL SPECIFICATION**  
*AMEC Americas Limited*



<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-SP-005</b>	<b>REV. 3</b>
<b>PROJECT NO.:</b>	<b>145579</b>	<b>STEEL EXHAUST STACK</b>	
<b>CLIENT:</b>	<b>AMEC E&amp;E – Richland, WA</b>		

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**ATTACHMENTS**

145579-V-DS-005.1 Exhaust Stack Technical Data Sheet

F-145579-36-V-0021 Bulk Vitrification Off-Gas Exhaust Stack Details

H-14-106796 Off Gas Area – FDNS Plans & Sections

145579-V-DS-005.2 Inlet Air Stack Technical Data Sheet

F-145579-36-V-0015 Bulk Vitrification ICV Inlet Air Stack Details

H-14-106800 Bulk Vitrification Miscellaneous Foundations Plans & Details

**TECHNICAL SPECIFICATION**  
*AMEC Americas Limited*



<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-SP-005</b>	<b>REV. 3</b>
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**ABBREVIATIONS AND ACRONYMS**

°C	degrees Celsius
°F	degrees Fahrenheit
µm	micrometers
AC	alternating current
acfm	Actual Cubic Feet per Minute
AISC	American Institute for Steel Construction
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society of Nondestructive Testing
ASTM	American Society for Testing and Materials
AWG	American wire gauge
AWS	American Welding Society
BTU	British thermal unit
CH2M HILL	CH2M HILL Hanford Group, Inc.
Ci	Curies
CO <sub>2</sub>	Carbon Dioxide
CoC	Certificate of Conformance
cfm	Cubic Feet per Minute
CMTR	Certified Material Test Report
CPE	Customer-provided equipment
CWI	Certified Welding Inspector
DCS	Distributed Control System
DBVS	Demonstration Bulk Vitrification System
EMT	electrical metallic tubing
FAT	Final acceptance testing
ft <sup>3</sup>	cubic feet
gpd	gallons per day
gpm	gallons per minute
HCl	Hydrochloric Acid
HEPA	High Efficiency Particulate Air
hp	horsepower
Hz	hertz
ICV™ <sup>1</sup>	In-Container Vitrification™
IEEE	Institute of Electrical and Electronic Engineers

<sup>1</sup> ICV™ (In-Container Vitrification™) is a trademark of AMEC Inc.

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in. Hg	inches of mercury
in. WG	inches of water gauge
lb	pound
lbm	pound mass
mA	milliamp
mph	miles per hour
MSS	Manufacture Standard Practice
NCR	nonconformance report
NDE	Nondestructive Examination
NEC	National Electrical Code
NEMA	National Equipment Manufacturers Association
NFPA	National Fire Protection Association
NOx	Oxides of Nitrogen
NPT	National Pipe Thread
NQA	Nuclear Quality Assurance
OGTS	Off-Gas Treatment System
PLC	Programmable Logic Controller
ppm	parts per million
psi	pounds per square inch
psig	pounds per square inch gage
PVC	Polyvinyl Chloride
QA	quality assurance
RGS	rigid galvanized steel
SAE	Society of Automotive Engineers
SMF	Sintered Metal Filter
SOx	Oxides of Sulphur
TBD	to be determined
TEFC	totally enclosed fan cooled
TEMA	Tank Equipment Manufacturers Association
UBC	Uniform Building Code
UL	Underwriters Laboratories
US	United States
V	volt
vol	volume
wt%	weight percent

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## 1.0 SCOPE

### 1.1 PURPOSE

AMEC is part of a team that has been selected by the CH2M HILL Hanford Group, Inc. (CH2M HILL) to design, fabricate, test, and deploy a Demonstration Bulk Vitrification System (DBVS) using a process referred to as In-Container Vitrification™ (ICV™) to receive, dry, and immobilize waste from an underground storage tank located in the 200 West Area of the Hanford Nuclear reservation. A main subsystem of the DBVS is the Off-Gas Treatment System (OGTS). The primary function of the OGTS is to filter radioactive particulate and reduce NO<sub>x</sub> and SO<sub>x</sub> emissions produced from the ICV™ melt process.

Important components of the off gas treatment system are the Exhaust Stack and Inlet Air Stack. The Exhaust Stack and Inlet Air Stack will be designed to disperse the filtered off-gas to the atmosphere without disturbance to local air conditions. The Exhaust stack will also house the air velocity probe and the air-sampling probe. The Exhaust Stack and Inlet Air Stack must be able to withstand high wind loads associated with the possible environmental conditions.

Throughout this specification, contract responder shall act as the Seller and AMEC shall act as the Buyer.

Any discrepancies noted in this specification or between this specification and other documentation shall be noted and referred to the Buyer for resolution before proceeding with design or fabrication of the item in question.

### 1.2 SCOPE OF SUPPLY

The Scope of Supply for this specification includes the design, analysis, fabrication, inspection, testing, documentation, packaging, and shipping of the Exhaust Stack and Inlet Air Stack, fittings and supports as per the drawings. The Exhaust Stack and Inlet Air Stack assembly shall include, but not be limited to:

**Exhaust Stack and Inlet Air Stack** – The stacks shall be free standing.

**Included with Exhaust Stack** – Exhaust stack, lightning protection, paint, ladders, landing, gas sampling ports, velocity port, drainage port, support rings,

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access doors, supports, lighting, connection flanges, gaskets, nuts, anchors, washers, bolts, material for field joints, touch up paint, and any other components for a fully operational unit.

**Included with Inlet Air Stack** – Inlet Air stack, lightning protection, paint, drainage port, support rings, access doors, supports, lighting, connection flanges, gaskets, nuts, anchors, washers, bolts, material for field joints, touch up paint, and any other components for a fully operational unit.

**Portable Emergency Breathing Air Supply** – complete with safety mask, supply air and respirator.

**Special Tooling** – Special Tooling, spreader bars or other recommended fabricated devices for lifting shall be provided by the Seller.

**Detail Design** – structural calculations for stack thickness, supports and anchoring, including preparation of shop drawings, bill of materials, erection drawings, as-built drawings and other submittals according to Bidder's Drawing and Data Commitment Sheet. Vendor shall design anchorage assuming drilled and grouted anchors to the foundation shown on Attached Drawing H-14-106796, Rev 0, Foundation #10 and H-14-106800 Rev. C. A professional engineer registered in the state of Washington shall stamp all drawings.

The Vendor shall identify any requirements that are not in this specification, but may be essential for this goal. The Exhaust Stack and Inlet Air Stack shall be supplied as indicated on the drawings, ready for installation by the buyer (match marked and disassembled for shipping if required).

Work not included in this specification includes installation of the Exhaust Stack and Inlet Air Stack and any interconnected equipment.

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## 2.0 APPLICABLE DOCUMENTS

Documents applicable to the work scope are shown in Table 2-1 and Table 2-2. The latest issue and addenda to the documents in effect at the time of procurement (unless otherwise specified) shall apply and form a part of the basis of design for this specification to the extent specified in the applicable sections of this document. In the event of a conflict between documents referenced herein and the requirements of this specification, the requirements of this specification shall take precedence. All conflicts shall be brought to the attention of the Buyer for resolution. Equipment shall comply to the most recent edition of the indicated document.

## 2.1 GOVERNMENT DOCUMENTS

Table 2-1: Applicable Government Documents

<b>Government Documents</b>	<b>Title</b>
DOE-HDBK-1169	U.S. Dept. of Energy, Nuclear Air Cleaning Handbook
DOL 29 CFR 1910	Occupational Safety and Health Standards – Code of Federal Regulations
EPA CFR 40 Part 60 Appendix B	Standard of performance for new stationary sources
NCR 10 CFR 830	Nuclear Safety Management, <i>Code of Federal Regulations</i> , as amended.

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## 2.2 NON-GOVERNMENT DOCUMENTS

Table 2-2: Applicable Non-Government Documents

Code/Standard	Title
ASCE 7	American Society of Civil Engineers - Minimum Design Loads for Buildings and Other Structures
ANSI/HPS N13.1	Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities
ASME B16.5	Pipe Flanges and Flared Fittings
ASME NQA-1-1994* (See Note at end of Table)	Quality Assurance Requirements for Nuclear Facility Applications
ASME N510	Testing of Nuclear Treatment Systems
ASME STS-1	Steel Stacks
ASTM A182	Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
HNF-SD-GN-ER-501	Natural Phenomena Hazards, Hanford Site, Washington
RPP 8530	Tank Farm Labeling Standard
UBC	Uniform Building Code

\*The relevant requirements of NQA-1 are included in Section 4.0.

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### 3.0 TECHNICAL REQUIREMENTS

#### 3.1 ITEM DEFINITION

For this specification, the item is the Exhaust Stack and Inlet Air Stack. The Exhaust Stack and Inlet Air Stack assembly should be free standing and will consist of multiple sections in series as necessary to meet the stack dimensions as well as the transportability requirements. The Exhaust Stack and Inlet Air Stack shall meet the requirements of ASME STS-1 "Steel Stacks." The Exhaust Stack and Inlet Air Stack shall satisfy the requirements shown in drawings F-145579-36-V-0021 and F-145579-36-V-0015 and the Technical Data Sheets 145579-V-DS-005.1 and 145579-V-DS-005.2.

All components of the items shall be detailed according to drawings and specifications supplied by the purchaser.

##### 3.1.1 Item Diagram

See Figure 3-1: Exhaust Stack Diagram.

##### 3.1.2 Interface Definition

The Exhaust Stack and Inlet Air Stack will interface with:

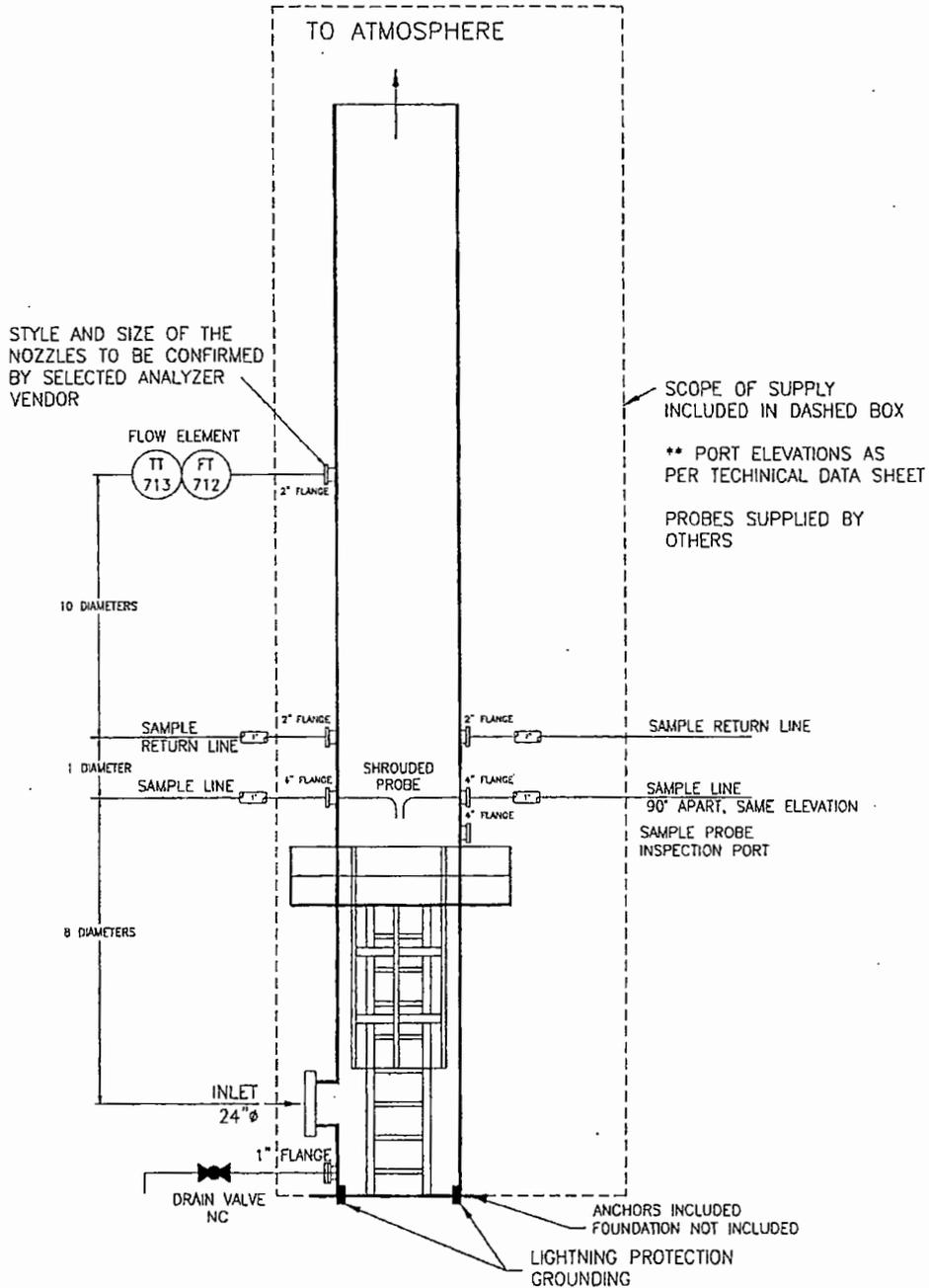
- Mild steel ductwork
- Sampling ports (exhaust stack only).

These interfaces are detailed in the supplied drawings and in the technical data sheet 145579-V-DS-005.1 and 145579-V-DS-005.2.

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**Figure 3-1: Exhaust Stack Diagram**

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### 3.2 CHARACTERISTICS

The characteristics (e.g., functional, physical, performance, and environmental) with which Exhaust Stack and Inlet Air Stack must comply with in order to satisfy the requirements of this specification are described in Sections 3.2.1 through 3.2.7.

#### 3.2.1 Functional Characteristics

The Exhaust Stack and Inlet Air Stack shall be designed to transport filtered off-gas safely to the atmosphere without disturbing the local air quality. The Exhaust Stack and Inlet Air Stack will be leak tested to applicable standards before arrival on site and after completion of installation. The performance range and operating conditions for the Exhaust Stack and Inlet Air Stack are described in this section and on the Technical Data Sheets, 145579-V-DS-005.1 and 145579-V-DS-005.2.

#### 3.2.2 Physical Characteristics

Exhaust Stack and Inlet Air Stack and fittings shall be fabricated out of carbon steel and have the physical characteristics of carbon steel.

Dimensions shall be as per Off-Gas Exhaust Stack Details F-145579-36-V-0021 and ICV Box Inlet Air Stack Details F-145579-36-V-0015. Measurements will be taken upon arrival on site to ensure 'as built' drawings are accurate.

#### 3.2.3 Reliability

The Bulk Vitrification plant is expected to operate 24 hours per day, 7 days per week. Service work will be done during scheduled downtimes. High reliability is required. Service life shall be 2 years and design life 5 years.

#### 3.2.4 Maintainability

All Exhaust Stack and Inlet Air Stack components shall be designed to have a minimum 2 years of service life. All 'minimum service life' requirements for the Exhaust Stack and Inlet Air Stack shall be submitted to the Buyer before fabrication.

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The Exhaust Stack and Inlet Air Stack shall be designed for ease of service (access openings/spacing, test fixtures, etc.). The Buyer shall identify possible requirements for service access door replacement, gasket replacement, etc.).

Instruments shall require periodic calibration, as per EPA 40 CFR 60, Appendix B.

### 3.2.5 Environment

This equipment will be operated outdoors. Any equipment and related enclosures installed outside shall be designed to operate and be stored in the climatic and environmental conditions as per HNF-SD-GN-ER-501 "Natural Phenomena Hazards, Hanford Site, Washington." For convenience the key factors are listed below:

- (a) Ambient air temperature range is -25°F to 115°F.
- (b) Relative humidity ranges from near 0 to 100%;
- (c) Maximum precipitation is 1.6 inches in a 24-hour period;
- (d) Sand and dust concentrations are  $1.10 \times 10^{-5}$  lbm/ft<sup>3</sup> with a typical size of 150  $\mu$ m;
- (e) Solar radiation is expected to be a maximum 900 langleys.

### 3.2.6 Transportability and Storage

The Exhaust Stack and Inlet Air Stack shall separate into two sections, sized for transport using local roadways and freeways (i.e., less than 14 feet tall, 8 feet 6 inches wide, and 53 feet long; while mounted on the transport trailer).

### 3.2.7 Safety

The Exhaust Stack and Inlet Air Stack shall be designed to maintain the safety of operators, general public and equipment. The equipment supplied by the Seller shall incorporate any design features to comply with the applicable subparts of DOL 29 CFR 1910, "Occupational Safety and Health Standards" and EPA CFR 40 Part 60 "Protection of the Environment."

See Table 2-1 for reference safety codes / standards.

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### 3.3 DESIGN AND CONSTRUCTION

The seller shall provide and submit to the buyer for approval all designs and calculations necessary for the Exhaust Stack and Inlet Air Stack. The calculations and design shall be consistent with ASME STS-1. The Buyer shall provide all design drawings necessary for the Exhaust Stack and Inlet Air Stack, which includes, but is not limited to: drawing outlines, interface drawings, dimensional drawings. The Seller shall provide hard and electronic copies of: dimensional drawings, erection drawings and rigging sketches, and as-built drawings. Drawings shall be submitted hard and electronically to the Buyer in accordance with the Bidders Drawing and Data Commitments Sheet attached to the Technical Data Sheet, 145579-V-DS-005.1 and 145579-V-DS-005.2. A Professional Engineer, registered in the state of Washington, shall certify drawings and calculations correct.

Alternative equipment designs are permissible if proven to be effective in meeting the reliability specified in Section 3.2.3. Any alternative design must be thoroughly explained with text supplemented by drawings or sketches and proposed with the original bid. Buyer approval is required before proceeding with an alternative stack design.

#### 3.3.1 Parts/Materials/Processes

The Exhaust Stack and Inlet Air Stack shall be constructed from Low Carbon Mild Steel being weldable, formable, and capable of withstanding operating temperatures and pressures as per Technical Data Sheets 145579-V-DS-005.1 and 145579-V-DS-005.2.

Off-gas inlet flange shall be fabricated as per Off-Gas Exhaust Stack Details drawing F-145579-36-V-0021.

The flanges shall be at minimum class 150 and meet the requirements of ASTM A182 "Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service" and ASME B16.5 "Pipe Flanges and Flared Fittings."

The Exhaust Stack and Inlet Air Stack shall have a false bottom and a minimum of 1" diameter drainage port.

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### 3.3.1.1 Air Sample Ports

The exhaust stack shall have four sample ports, 90 degrees apart, constructed of mild steel, schedule 40 pipe. One sample return port of same type as sample ports is required above the sample ports. Details are as per Off-Gas Exhaust Stack Details Drawing F-145579-36-V-0021.

Monitoring port details shall be as per Off-Gas Exhaust Stack Details Drawing F-145579-36-V-0021.

The air sample ports will be located relative to Exhaust Stack entry point. This distance shall be as per ANSI/HPS N13.1 "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities."

### 3.3.1.2 Welding

Shall be done to ASME STS-1 welding specifications.

### 3.3.1.3 Ladder and Landing

Shall be as per ASME STS-1.

One landing required at 40 ft from ground, dimensions shall be as per ASME STS-1 and DOL 29 CFR 1910.

One Ladder required, with safety cage to the landing designed as per ASME STS-1 and DOL 29 CFR 1910.

## 3.3.2 Industry and Government Standards

### 3.3.2.1 Design Loads

The equipment shall conform to allowable loading factors as defined by the American Institute for Steel Construction (AISC). The structural analysis is to be submitted with the shipment.

The following loads on the Exhaust Stack and Inlet Air Stack shall be considered: dead loads, additional dynamic loads, live loads, design wind load, constraints of free displacement load, and snow load. All load calculations of the stack's static

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response shall account for minimum corrosion allowance of 1/16" of steel shell thickness.

### 3.3.2.2 Dead Loads

Dead loads include the weight of all permanent materials and equipment, including the weight of materials being handled.

### 3.3.2.3 Live Loads

Live loads are those loads produced by the use of the Exhaust Stack and Inlet Air Stack and do not include construction and environmental loads such as wind load, snow load, rain load, earthquake load, flood load, or dead load. Operators, maintenance workers and equipment produce live loads.

- Live load shall not be less than the minimum uniform load or concentrated load stipulated in ASCE 7 "American Society of Civil Engineers - Minimum Design Loads for Buildings and Other Structures."

### 3.3.2.4 Snow Loads

Snow loads for the Exhaust Stack and Inlet Air Stack shall be in conformance with ASCE 7. A ground snow load,  $P_g$  of 15 lbf/ft<sup>2</sup> shall be used for calculating roof snow load. Unbalanced snow loads resulting from drifting or sliding shall be considered. Snow loads, full or unbalanced, shall be substituted for roof live loads where such loading results in larger members or connections.

### 3.3.2.5 Wind Loads

The Exhaust Stack and Inlet Air Stack shall be designed to resist pressures from wind from any direction. Partial wind loading shall be considered if it produces a more severe effect. Wind load design shall comply with ASCE 7, using the 85 mph "three-second gust wind velocity" with an importance factor of 1.15 exposure category C and velocity pressure exposure coefficient evaluated at stack height.

Seller shall provide resonance calculations for Exhaust Stack and Inlet Air Stack response on wind dynamic load per ASME STS-1.

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### 3.3.2.6 Seismic Load

The Exhaust Stack and Inlet Air Stack shall be designed for earthquake induced horizontal forces. The method may be as described in the UBC "Uniform Building Code." The site seismic zone is 2B and Soil Type SE.

### 3.3.2.7 Constraints of free displacement load

This refers to the loads induced due to the displacements caused by thermal expansion and contraction of the ductwork and the breaching because of the extreme temperatures of the gases during the off gas process. These temperatures will cycle from ambient to their highest point during the melt with each batch of the process. The ductwork geometry will expand and contract in phase with this cycle. These loads must be accounted for.

### 3.3.3 Radiation

1. Electromagnetic. Does not apply to Exhaust Stack and Inlet Air Stack
2. Nuclear. The Exhaust Stack and Inlet Air Stack will not be exposed to nuclear radiation from the process.

### 3.3.4 Cleanliness

Before assembly, and before preparing for shipment, all components shall be cleaned by flushing clean water and/or blown clean and dry with compressed air to the extent that extraneous materials, such as those listed below, are not present:

- (a) Metallic or other dusts (shop dust), chips, turnings, and weld splatter;
- (b) Abrasive particles;
- (c) Rust and other loose corrosion particles;
- (d) Magnetic/liquid penetrant residues, dye check, etc.;
- (e) Foreign material, such as paper, tape, plastic, sand, and wood;
- (f) Cutting oils;
- (g) Excess lubrication, grease, and oil; and
- (h) Marking dyes.

The fabrication traveler shall describe the cleaning and packaging steps taken.

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The equipment ports and pipe openings shall be temporarily capped following cleaning and drying for shipment. Packaging requirements following cleaning are documented in Section 5.2.

### 3.3.5 Corrosion of Parts

This should not be a concern, as all parts of the Stacks shall be manufactured from mild steel. However, it shall be noted that dissimilar metal couples shall be avoided where at all possible.

### 3.3.6 Protective Coatings

All surfaces exposed to the environment or the process shall be coated with appropriate corrosion protective coatings.

Ladders and landings shall be colored in accordance with aforementioned safety standards.

In addition, slip resistant coatings must be used on all ladder rungs, landings and stairs in accordance with the safety standards.

The Exhaust Stack and Inlet Air Stack shall be factory painted with a suitable primer for the operating temperature of the flue gas. Touch-up paint shall be provided for application in the field after the Exhaust Stack and Inlet Air Stack have been erected.

The materials shall be clean and free of dirt, scale, oil, rust or other conditions that create potential situation for a poor bond of the coatings to the base material.

### 3.3.7 Interchangeability

This section does not apply.

### 3.3.8 Identification and Marking

The Exhaust Stack and Inlet Air Stack shall have a temporary Manufacturer's nameplate using the Seller's standard practice for delivery and storage of the equipment. The nameplate shall include the equipment number (provided by the Buyer, see Technical Data Sheet 145579-V-DS-005.1 and 145579-V-DS-005.2),

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assembly weight, purchase order number, lifting bail working load limits, Manufacturer data for swivel hoist rings (as applicable), and this specification number, 145579-V-SP-005, latest revision. Clearly mark and identify any components required for removal before equipment installation (e.g., shipping blocks).

**3.3.9 Nameplate**

Seller shall provide a nameplate that conforms to the relevant sections of the Hanford Specification, RPP-8530 "*Tank Farm Labeling Standard.*"

**3.3.10 Human Engineering**

Human engineering of ladders and landing has been taken care of through the ASME STS-1 "Chapter 6 – Access and Safety." Ladders shall be cage protected and insulated from extreme temperatures as detailed in ASME STS-1. Whichever requirements are safer between the ASME STS-1 and DOL 29 CFR 1910 shall be applied.

**3.3.11 Qualification**

The Seller will be expected to provide a leak testing of their equipment per DOE-HDBK-1169 "*U.S. Dept. of Energy, Nuclear Air Cleaning Handbook*" section 8.5.2 Guidelines. The pressure decay method can be used as per ASME N510 "*Testing of Nuclear Treatment Systems.*" Testing and inspection shall also adhere to the standard described in ASME STS-1 chapter 8. Seller shall provide testing equipment.

**3.3.12 Document Submittal**

Each document submittal shall be identified with this specification number, item number, purchase order number, and Seller's identification number. Submittals shall be transmitted to the Buyer in accordance with the directions found in the Request for Quote.

Data shall be sufficiently clear to allow legible copies to be made on standard reproduction equipment after microfilming.

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Along with the bid submittal, the items shown on the Technical Data Sheets 145579-V-DS-005.1 and 145579-V-DS-005.2, Data and Document Requirements Sheet, shall be included. The drawings shall show full compliance with this specification (and the associated drawings/documents) or note any exceptions. The Seller shall allow 10 working days for the Buyer to review and state the disposition of each submittal.

Approval by the Buyer does not relieve the Seller from the responsibility for accuracy or adequacy of design under this specification.

Submittals are divided into two types: (1) Those requiring "approval before proceeding" (i.e., weld procedures or pre-purchase evaluation data); and (2) Those requiring "approval before shipment" (i.e., vendor information data).

Submittals requiring approval before shipment will be reviewed to verify completeness and adequacy for their intended purposes.

Unacceptable items that require approval before proceeding will be handled as specified below.

A submittal requiring approval that is not approved by the Buyer, will be dispositional as:

1. "Not Approved, Revise and Resubmit." The submittal is considered technically deficient, or incomplete, and is therefore unacceptable. Re-submittal is required; hence fabrication, procurement, or performance of procedures shall not proceed.
2. "Approved with Exception." Fabrication, procurement, and performance of procedures may proceed, and re-submittal is required to verify incorporation of the exception. Final acceptance of the item is contingent upon the Buyer's receipt and approval of the corrected submittal.

Submittals requiring approval before shipment that are determined to be incomplete or inadequate will be marked "Resubmit" and will be returned. An explanation of the deficiencies will be included for corrective action by the Seller.

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The Bidders Drawing and Data Commitments Sheet, provides a list of the required submittals, the number of copies, schedule, and approval information for each submittal.

The Seller shall provide fabrication traveler(s) for the fabrication and testing of the above-described equipment. The fabrication traveler(s) shall include detailed procurement, fabrication, assembly, testing, shipping, and handling steps required to properly fabricate, assemble, and test the equipment in accordance with the drawings and specifications.

A proposed schedule of fabrication, inspection, and testing of all equipment shall be submitted for review with the bid and approval with the submittal of the fabrication traveler(s).

The Buyer will insert witness/hold points in the fabrication traveler during their review and approval of the fabrication traveler. Witness points can be waived by the Buyer but must be documented in writing. Hold points require the Buyer personnel to be present during the fabrication, inspection, or test step.

### 3.3.13 Personnel and Training

No personnel training is expected to be necessary.

## 4.0 QUALITY ASSURANCE REQUIREMENTS

### 4.1.1 Quality Assurance Program

The Subcontractor/Supplier shall have a documented, implemented and maintained Quality Assurance Program that is based on a national standard and identifies the activities and items to which it applies. Instructions and procedures must include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities have been satisfactorily accomplished. The Quality Assurance Program must address each of the areas discussed within this QA Requirements Flow-down. The Subcontractor/Supplier must submit the Quality Assurance Program to the Buyer for review prior to award of contract.

The Subcontractor/Supplier shall assess its Quality Assurance Program regularly to assure its effective implementation.

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The Quality Assurance Program shall provide for indoctrination and training, as necessary, of personnel performing activities affecting quality to assure that suitable proficiency is achieved and maintained. Personnel who conduct inspection and test activities shall be qualified to conduct those activities and certification of the qualification must be submitted to the Buyer upon request.

#### 4.1.2 Design

The Subcontractor/Supplier must define, control, and verify designs developed for this contract. Design inputs must be specified on a timely basis and correctly translated into design documents. Design interfaces must be identified and controlled. Persons who did not design the item must be used to verify design adequacy. Design changes, including field changes, must be reviewed and approved by the same personnel who reviewed and approved the initial designs.

#### 4.1.3 Procurement Document Control

Procurement documents must include or reference sufficient quality and technical requirements in order to describe the items and services requested. Procurement documents must be reviewed and approved by the authorized personnel within the Subcontractor's/Supplier's organization, and changes must be reviewed and approved by the same individuals who reviewed and approved the original procurement documents.

The Subcontractor/Supplier must have a process for accepting procured items. This process must include one or a combination of the following: Certificate of Conformance, source verification, receiving inspection, and post-installation testing.

The Subcontractor/Supplier shall provide a legible and reproducible Certificate of Conformance. The Certificate of Conformance shall be signed by the Subcontractor's/Supplier's authorized representative responsible for quality assurance.

The Certificate of Conformance shall contain, as a minimum, the following information:

- Identification of the Buyer's contract or purchase order number under which

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the materials, equipment, component, or service is being purchased;

- Provide traceability by means of positive identification from the material, equipment, component, or service to the Certificate of Conformance;
- Identify the specific procurement requirements met by the material, equipment, component, or service supplied (i.e., codes, standards, or other applicable specification). The procurement requirements shall include any approved changes, waivers, or deviations applicable to the subject materials, equipment, component, or service;
- Identify any procurement requirements that have not been met, together with an explanation and the means for resolving the nonconformance.

The Subcontractor's/Supplier's certification system, including the procedures to be followed in filling out a certificate and the administrative procedures for review and approval of the certificates, shall be described in the Subcontractor's/Supplier's QA Program.

The certification system shall provide a means to verify the validity of Subcontractor/Supplier certificates and the effectiveness of the certification system, such as during the performance of audits of the Subcontractor/Supplier or independent inspection or test of the items. The Buyer shall conduct this verification at intervals commensurate with the Subcontractor's/Supplier's past quality performance.

The Subcontractor/Supplier is required to flow-down all quality assurance requirements from this contract to any sub-tier suppliers/Subcontractor/Suppliers. Any access to the sub-tier suppliers'/Subcontractor/Suppliers' facilities for verification activities will be requested through the Subcontractor/Supplier prior to access, and verification activities may be performed jointly.

The Subcontractor/Supplier shall warrant that all items furnished under the contract are genuine (i.e., new, not refurbished, not counterfeit) and match the quality, test reports, markings, and/or fitness for intended use as required by the contract. Any materials furnished as part of the contract that the government or other duly recognized agency had been previously found to be suspect/counterfeit shall not be used.

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All items are subject to inspection at the Subcontractor's/Supplier's facility or lower-tier subcontractor's facility. The Subcontractor/Supplier shall notify the Buyer at least 7 working days in advance of the time when such items or activities will reach the Buyer's identified inspection hold points. As a minimum, final inspection prior to packaging for shipment shall be considered such a hold point, unless specifically waived by the Buyer.

The Subcontractor/Supplier shall obtain all materials to be delivered under the contract directly from the original manufacturer or an authorized manufacturer's representative. The Subcontractor/Supplier shall provide legible and reproducible documentation, with the materials, that provides objective evidence that the items were provided by the original manufacturer. Such documentation may include a copy of the purchase order to the manufacturer, shipping documentation or manufacturer invoice; each of which would identify that the materials were obtained from the original manufacturer.

The Subcontractor/Supplier shall submit, with or prior to item shipment, a recommended spare parts list. The list shall provide the name and address of the original supplier of the replacement part, and the part's drawings, specification, or catalog identity including applicable change or revision information.

All items and/or services procured under this specification shall be subject to inspection by the Buyer or Buyer's representative throughout the contract. Additionally, procured items and/or services shall be subject to inspection for acceptance.

The Subcontractor/Supplier shall grant access to the Subcontractor's/Supplier's plant facilities and records for inspection or audit by the Buyer, his designated representative, and/or other parties authorized by the Buyer.

#### **4.1.4 Identification and Control of Items**

The Subcontractor/Supplier shall establish controls to assure that only correct and accepted items are used or installed.

All items shall be identified with the applicable part number, model number, or other identifier prescribed in the specification. Identification shall be on the item or the package containing the item. When the identification is on the item, such

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marking shall not impair the service of the item or violate dimensional, chemical, or physical requirements.

The Subcontractor/Supplier shall submit a legible and reproducible copy of the product data sheet (e.g., drawing, catalog cut sheet, brochure, etc.) that provides adequate information to enable the Buyer to verify the form and function of the articles procured. One copy of such documentation, unless otherwise specified, shall accompany the item.

The Subcontractor/Supplier shall identify each item, assembly, package, container, or material, having limited shelf life, with the cure date or date of manufacture and the expiration date. The Subcontractor/Supplier shall specify any storage temperatures, humidity and environmental conditions that should be maintained. Material shall not be furnished having less than 75 percent of total shelf life available at time of shipment.

Certified Material Test Reports (CMTRs) containing actual chemical analysis and mechanical properties of the material being supplied shall be submitted prior to or with each shipment of material. Each CMTR shall contain the following information as a minimum:

- Product Description – specification(s), codes, type of material, etc.;
- Actual results of chemical analysis/mechanical testing in accordance with the provisions of the code, standard, and/or specification;
- The specification and material grade;
- Traceability to the item tested (e.g., heat number, lot number, etc.);
- Name and address of manufacturer (may be identified by letterhead, logo, etc.);
- Manufacturer's ASME certificate number and expiration date;
- Buyer's contract number and item number to which the report applies;
- The report shall be signed by an authorized representative of the manufacturer.

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#### 4.1.5 Control of Processes

The Subcontractor/Supplier shall have processes to control processes, including special processes that control or verify quality (e.g., welding, heat treating, and nondestructive examination). Special processes must be performed by qualified personnel using qualified procedures in accordance with specified requirements.

Subcontractor/Supplier personnel performing weld inspections shall be certified as a CWI in accordance with the requirements of the American Welding Society (AWS), QC-1. The following documentation shall be submitted for Buyer approval prior to the start of fabrication:

- Current AWS CWI certification;
- Current/valid visual acuity examination (must be given every 3 years); and
- Visual weld inspection procedure(s).

Welding procedures and personnel shall be qualified in accordance with applicable AWS or ASME requirements specified in the contract. The Subcontractor/Supplier shall submit copies of all welding procedures, procedure qualification records, and welder qualification records to be employed. Buyer review and approval of these documents is required prior to start of fabrication.

Nondestructive Examination (NDE) personnel shall be qualified and certified in accordance with the recommended guidelines of the American Society of Nondestructive Testing (ASNT) SNT-TC-1A. The Supplier is not authorized to begin fabrication until the following documentation has been approved by the Buyer:

- NDE personnel qualification and certification procedure;
- Level I, II, and/or III personnel qualification and certification records, including objective evidence of NDE training, formal education, examination, experience, date of hire and current visual acuity exam;
- NDE method procedure(s) compliant with the applicable requirements of the Buyer's contract.

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NDE reports and radiographs shall be traceable to the item examined, shall include all essential examination parameters, and shall be signed and dated by a qualified/certified NDE examiner. All NDE reports and radiographs shall accompany or precede shipment of the item or component. Radiographs and radiographic technique and examination reports shall be subject to approval by the Buyer prior to shipment.

These requirements shall be passed to lower-tier subcontractors.

#### 4.1.6 Inspection

The Subcontractor/Supplier shall have a process to plan and execute inspections to verify conformance of an item or activity to specified requirements. The process shall document the characteristics to be inspected and inspection methods to be employed. The Subcontractor/Supplier shall document the results of inspections. Inspections for acceptance shall be performed by persons other than those who performed or directly supervised the work being inspected.

The Subcontractor/Supplier shall submit, as required by the contract, legible, reproducible copies of inspection and/or test reports. The reports shall include, as a minimum, the following information:

- Identification of applicable inspection and/or test procedure;
- Resulting data for all characteristics evaluated, as required by inspection or test procedures, including reference to information on action taken in connection with nonconformances;
- Traceability to the item inspected/tested (e.g., serial number, part number, lot number, etc.), date of inspection, name of inspector, type of observation; and
- Signature of the Subcontractor/Supplier's authorized representative or agency performing the inspection or test.

#### 4.1.7 Test Control

The Subcontractor/Supplier shall have a process to plan and execute tests to verify conformance of an item or activity to specified requirements. The process shall document the characteristics to be tested and test methods to be employed.

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The Subcontractor/Supplier shall prepare a detailed test plan. Prior to starting work, the plan shall be submitted to the Buyer for approval and insertion of Buyer's designated source inspection/witness notification points. The test plan shall provide the following at a minimum:

- Traceability to Buyer's purchase/contract order document number;
- Name or description of the item to be tested (e.g., components, assemblies, subassemblies); and
- Method/procedure to be used during test.

Subsequent revisions/modifications to the test plan require review and approval by the Buyer prior to implementation of the changes.

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The Subcontractor/Supplier shall provide test reports that include, as a minimum:

- Item tested,
- Date of test,
- Tester or data recorder,
- Type of observation,
- Results and acceptability,
- Action taken in connection with any deviations noted, and
- Person evaluating test results.

Test plans and test reports must be submitted to the Buyer for the project records.

#### **4.1.8 Control of Measuring and Test Equipment**

The Subcontractor/Supplier shall control tools, gages, instruments, and other measuring and test equipment used for activities affecting quality, and shall calibrate at specified periods and adjust to maintain accuracy within necessary limits.

The Subcontractor/Supplier shall maintain legible, reproducible copies of the Certificates of Calibration, traceable to the National Institute of Standards and Technology (NIST), for each article contracted. Each Certificate of Calibration shall be signed by the Supplier's representative responsible for calibration, attesting to its authenticity, and shall be identified with the following information:

- Buyer's contract number;
- Identification of the article to which the Certificate of Calibration applies; and
- Standards used for calibration.

In addition, the Subcontractor/Supplier shall submit a report of actual calibration results. The report shall be identifiable to the acceptance criteria of the items submitted and shall meet the contract requirements. The report shall contain the signature of the authorized representative of the agency verifying compliance. One copy of the documentation, unless otherwise specified, shall accompany the applicable item(s) shipped.

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The Certification of Calibration will be held on file by AMEC as objective evidence to support the actual test results and attest to the fact that the calibrated item(s) met requirements.

#### 4.1.9 Handling, Storage, and Shipping

The Subcontractor/Supplier shall prepare and submit for Buyer review and approval, prior to use, procedure(s) or plan(s) for the packaging and shipping of materials, equipment, or components to be furnished under the contract. The procedure(s) or plan(s) shall include, as appropriate, cleanliness inspection prior to packaging, use of preservatives and coatings, descriptions of specially designed shipping containers, handling and rigging data, final inspections and the type of transfer and shipping vehicles.

#### 4.1.10 Control of Nonconforming Items

The Subcontractor/Supplier must have a process to control items that do not conform to specified requirements to prevent inadvertent installation or use. These controls must provide for identification, documentation, evaluation, segregation (when practical), and disposition of nonconforming items, and for notification to affected organizations.

All nonconforming conditions identified at the Subcontractor/Supplier's facility, with a proposed disposition of "Accept-as-Is" or "Repair," as defined below, shall be approved by the Buyer before Supplier implementation of the Nonconformance Report (NCR) disposition:

- **Accept-as-Is:** Nonconforming materials will perform its intended function.
- **Repair:** Nonconforming item can be corrected so that its characteristics meet requirements of the contract.

Nonconforming items identified as "Repair" or "Rework" shall be re-examined in accordance with applicable procedures and with the original acceptance criteria, unless the nonconforming item disposition has established alternate acceptance criteria.

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Nonconformances shall be documented by the Subcontractor/Supplier on their own nonconformance form or one provided by the Buyer. After documenting the nonconformance and providing a proposed disposition and technical justification, the report shall be submitted to the Buyer.

After the proposed disposition has been evaluated, and approved or rejected by the Buyer, the form shall be returned to the Subcontractor/Supplier. Corrective action may only take place after Buyer approval. Copies of completed, Buyer approved, NCRs shall be shipped to the Buyer with the affected item.

#### **4.1.11 Corrective Action**

The Subcontractor/Supplier shall have a process to promptly identify conditions adverse to quality, and to correct them as soon as practical. The identification, cause, and corrective action for conditions adverse to quality shall be documented and reported to appropriate levels of management. Follow-up action shall be taken to verify implementation of this corrective action.

During the period of performance of work for this contract, the Subcontractor/Supplier shall provide to the Buyer copies of all documents that constitute reports of conditions adverse to quality (e.g., deficiencies, weaknesses, nonconformances, or noncompliance's with established requirements) related to items or services provided to the Buyer.

In addition, the Subcontractor/Supplier shall assure flow down of these requirements to its sub-tier subcontractors/suppliers of quality-affecting items and/or services procured for work performed for this contractor.

## **4.2 QUALIFICATION VERIFICATION**

Items to be verified:

- (a) Fabrication inspection
- (b) Shop Leak test
- (c) Structural capability test

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#### 4.2.1 Responsibility for Verification

The Seller has responsibility to verify all appropriate functions. All test procedures and data sheets prepared for the verification will be submitted to the Buyer for approval.

#### 4.2.2 Verification Methods

The Seller shall perform verification tests appropriate for the qualifications listed in Section 4.2.

### 4.3 INSPECTIONS AND TESTS

The test plans shall be submitted to the Buyer for review and approval a minimum of 10 working days before testing. The Buyer reserves the right to witness all tests and shall be given a minimum of 10 working days written notice before each test date.

The results of these inspections and tests shall be documented and submitted to the Buyer for review and approval. For the leak and simulated performance test, described in Section 4.3.2 and 4.3.3 respectively, a video record shall be submitted to the Buyer with test records/documents.

#### 4.3.1 Fabrication Inspection

Fabrication and welds shall be inspected as per ASME STS-1.

Dated calibration labels shall be visible on all test equipment. Measuring and test equipment used for acceptance inspections and tests shall be controlled in accordance with the Seller's QA Program and shall meet the requirements of NQA-1 Basic Requirement 12 "Control of Measuring and Test Equipment," and shall be traceable to a national measurement standard.

#### 4.3.2 Leak and Structural Capability Test

Testing of the Exhaust Stack and Inlet Air Stack shall be the same as for ductwork, in accordance with ASME N510 Chapter 6, "Duct and housing leak and structural capability test". The Seller will provide all resources, temporary equipment and instruments necessary to allow testing.

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#### 4.3.3 Performance Tests

The Exhaust Stack and Inlet Air Stack shall be tested for performance along with the entire OGTS. This performance testing shall determine the effectiveness of the design requirements of the Exhaust Stack and Inlet Air Stack. Seller shall witness the performance test at site.

#### 4.3.4 Acceptance Criteria

The Exhaust Stack and Inlet Air Stack section shall pass requirements as per ASME STS-1.

#### 4.3.5 Suspect / Counterfeit Parts Inspection

The Seller shall document and submit an inspection report of all parts and components of the equipment to certify that no Suspect or Counterfeit components have been identified.

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## **5.0 PREPARATION FOR DELIVERY**

### **5.1 GENERAL**

Every item that is shipped shall arrive at the job site in the same condition as when it passed all quality control inspections and tests.

#### **5.1.1 Instruction Manual**

The instruction manuals, which will be turned over, shall be provided in 3-ring binders. The binders shall provide a table of contents and be organized by tabbed categories and/or items.

A recommended spare part list, if applicable, shall be prepared and provided to the Buyer. Spare parts shall be itemized in the instruction manual and provided to the Buyer.

### **5.2 PRESERVATION AND PACKAGING**

Before packaging, all residual water present in the systems from acceptance testing shall be thoroughly drained and dried by purging oil-free dry air through the system. All open ductwork or pipe ends shall be sealed to prevent ingress of debris and vermin into the system. The assembly shall be thoroughly cleaned to remove any dirt or dust that may have accumulated on the equipment during testing per Section 4.3.4. Moving parts shall be secured to prevent movement during shipping.

### **5.3 PACKAGING**

The Seller shall package equipment to protect items during shipping. Bracing structures shall be installed where items could be damaged or vibrate loose during transportation. All bracing must be clearly identified both in the unpacking instructions and by labeling on the outside of the equipment.

The Seller shall prepare rigging sketches or a handling procedure by for items that require special handling. These sketches will identify weights, sling locations, balance points, methods of attachment, and other information necessary for safe handling.

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Packaging and/or preservative coatings shall be visually inspected after loading. Damaged areas shall be repaired. Items shipped with desiccants shall be inspected after loading to verify that seals are intact.

Cushioning shall be used where protection from shock and vibration is required. Cushioning materials shall have sufficient strength to provide the required protection, shall exhibit no corrosive effect when in contact with the item being cushioned, and shall not readily support combustion.

Blocking and bracing used for protection of the load shall prevent item movement and withstand thrust and impact applied in any direction. Blocking and bracing used in direct contact with the item being blocked shall not have a corrosive effect on the item.

Instrumentation, electrical and electronic equipment, motors, and other electrical assemblies and equipment shall be packaged in a waterproof enclosure. For items without waterproof enclosures, a vapor barrier shall be placed around the enclosure. In either case, the enclosure shall be able to exclude dirt and facilitate handling and marking of the item. Barrier materials shall be non-halogenated if used in contact with austenitic stainless steels, shall be noncorrosive, shall not readily support combustion, and shall not be otherwise harmful to the item being packaged. Desiccants may be used inside the enclosure or vapor barrier.

#### **5.4 MARKING**

Packages shall be properly and clearly marked. At a minimum, the required information shall include the contract number, the name of the item within the package, the actual weight of the package and its contents, and the orientation of the equipment within the crate. Each package shall be labeled as part of the entire shipment, such as "Crate 1 of 2."

#### **5.5 HANDLING**

The Seller shall lift equipment using a forklift or crane, utilizing the lifting points designed by the stack manufacturer for that purpose.

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## 5.6 SHIPPING/TRANSPORTATION

The Seller's truck driver shall carry bills of lading for each shippable unit that is delivered to the Buyer.

The Seller shall obtain approval to ship from the Buyer before the equipment is prepared for shipment.

## 6.0 NOTES

There are no notes for this specification.

## 7.0 APPENDICES

The following appendices make up part of this specification:

Appendix	Title
A	Control of Suspect / Counterfeit Items (TFC-ESHQ-Q_C-C-03)

## 8.0 ATTACHMENTS

Document No.	Title	Rev.
145579-V-DS-005.1	Exhaust Stack Technical Data Sheet	3
145579-V-DS-005.2	Inlet Air Stack Technical Data Sheet	0
F-145579-36-V-0015	Bulk Vitrification ICV Inlet Air Stack Details	D
F-145579-36-V-0021	Bulk Vitrification Off-Gas Exhaust Stack Details	D
H-14-106796	Off Gas Area – FDNS Plans & Sections	0
H-14-106800	Bulk Vitrification Miscellaneous Foundations Plans & Details	C



## TECHNICAL SPECIFICATION

PROJECT:	Final DBVS Design	145579-V-SP-005
PROJECT NO.:	145579	APPENDIX A
CLIENT:	AMEC E&E – Richland, WA	TFC-ESHQ-Q_C-C-03 (REV. B)

## APPENDIX A

TFC-ESHQ-Q\_C-C-03, REV. B  
CONTROL OF SUSPECT COUNTERFEIT ITEMS

<b>CH2M HILL Hanford Group, Inc.</b>	<b>Manual</b>	<b>ESHQ</b>
<b>CONTROL OF SUSPECT/ COUNTERFEIT ITEMS</b>	<b>Document</b>	<b>TFC-ESHQ-Q_C-C-03, REV B</b>
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	<b>Issue Date</b>	<b>December 31, 2003</b>
	<b>Effective Date</b>	<b>December 31, 2003</b>
<b>APPROVAL AUTHORITY:</b>		<b>R. L. Higgins</b>
<b>DOCUMENT OWNER:</b>		<b>J. L. Logston</b>

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## 1.0 PURPOSE AND SCOPE

(7.1.1, 7.1.2, 7.1.3, 7.1.4)

This procedure describes the process for the identification, prevention, evaluation, notification, and disposition of suspect/counterfeit items (S/CIs) at CH2M HILL. This procedure applies to items that are:

- In the procurement cycle
- In source or receiving inspection
- In inventory at warehouses and staging areas
- Installed
- In operation.

This procedure applies to:

- Company ordered material
- Material supplied by subcontractors
- Material and test equipment supplied by test sponsors
- Construction
- Fabrication shops
- Laboratory work and experiments
- Surplus/excess property
- Government property
- Material obtained from U.S. Department of Energy (DOE) sources.

## 2.0 IMPLEMENTATION

This procedure is effective on the date shown in the header.

## 3.0 RESPONSIBILITIES

### 3.1 Procurement Personnel

Maintain awareness of S/CI and support S/CI program implementation.

### 3.2 Inspection Personnel

Perform inspections for conformance or acceptance of material including verifications that the item(s) being inspected do not exhibit indications attributed to potential suspect/counterfeit items.

### 3.3 Quality Assurance Engineer

1. Ensures appropriate procurement controls are implemented to preclude entry of S/CI to the site through review of procurement documents.
2. Notifies the S/CI coordinator of nonconformance reports (NCRs) associated with S/CI.

### 3.4 S/CI Coordinator

Apprises company, DOE, and DOE local Office of the Inspector General personnel of S/CI status and final disposition.

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### 3.5 Assigned Engineering Personnel

1. Evaluate S/CI information for applicability to design and procurement specifications, system configuration, and operating conditions.
2. Provide technical specifications, critical characteristics, and acceptance methods in support of procurement and inspection activities to prevent introduction of S/CI.

### 3.6 Responsible Managers and Supervisors

1. Maintain awareness of S/CI.
2. Control potential S/CI.
3. Evaluate training needs based on job classification and ensure individuals receive training in S/CI awareness, prevention, detection, and reporting, as appropriate, to respective assignments.

## 4.0 PROCEDURE

### 4.1 Introduction

The two most common S/CIs found at DOE facilities have been threaded fasteners fraudulently marked as high-strength bolts, and refurbished electrical circuit breakers sold and distributed under false certifications. Purchasers have also been misled into accepting S/CIs that do not conform to specified requirements by falsified documentation.

NOTE: Questions about a specific item should be referred to the S/CI coordinator. Attachment A provides a historical listing of suspect components. Equipment/material types or classes have been established to identify those specific items which are classified as potentially misrepresented or S/CI. Attachment B provides a listing of those classifications and items subject to S/CI control at tank farm facilities.

### 4.2 Procurement

CH2M HILL  
Personnel

1. Ensure material requirements are specified in subcontracts to preclude the purchase or introduction of S/CI. Use the information in Attachments A, B, C, D, E, F, G, H, and I to identify specific components, characteristics, precautions, and other considerations that are to be addressed during the procurement process to prevent introduction of S/CI.
2. Ensure material requests for quality level 1, 2, and 3 items and services include appropriate technical specifications, procurement quality clauses, documentation, and inspection requirements to prevent introduction of S/CI.
3. In maintenance and construction/fabrication subcontracts, specify appropriate requirements to preclude the purchase or introduction of S/CI.

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- |                            |  |
|----------------------------|--|
| Quality Assurance Engineer | 4. Review procurement documents to ensure they contain the appropriate procurement controls to preclude entry of S/CI to the site.   |
| Procurement Personnel      | 5. Ensure vendor selection complies with qualification requirements for the quality level of the items and services and is based on the vendor's ability to demonstrate the capability of delivering acceptable items. |

#### 4.3 Inspection for Potential S/CI

- |                               |   |
|-------------------------------|---|
| Bill of Material Preparers    | 1. For quality level 0 and P-Card items listed in Attachment B, designate an S/CI inspection in the special instruction of the Bill of Material (BOM) in accordance with the requirements of <u>TFC-BSM-FPM MC-C-01</u> . |
|                               | 2. Ensure quality level 0 and P-Card items are inspected prior to material issuance.  |
| First Line Manager            | 3. Obtain on-site S/CI inspection for quality level 0 and P-Card items prior to material issue and use.   |
| Engineering Personnel         | 4. Provide technical specifications, critical characteristics, and acceptance methods to facilitate inspection planning for S/CI prevention and detection.  |
| Quality Assurance Engineer    | 5. Ensure S/CI detection criteria is incorporated into QA inspection planning activities.   |
| Assigned Inspection Personnel | 6. Use Attachments G, H, and I as resources for detecting S/CIs during walkdowns and inspections. Specific items are subject to inspection.   |
|                               | 7. Verify and document that the items being inspected do not exhibit indications attributed to potential S/CIs as described in Attachments G through J.   |
|                               | 8. If an S/CI is detected during inspection activities, document and control the S/CI in accordance with <u>TFC-ESHQ-Q ADM-C-02</u> .   |

#### 4.4 Control of Material Identified as S/CI

- |                                 |  |
|---------------------------------|--|
| Responsible Manager or Delegate | 1. Ensure items identified as potential S/CI are documented as nonconforming and controlled in accordance with <u>TFC-ESHQ-Q ADM-C-02</u> . Non conformances identified as S/CI shall be reviewed and processed within four working days to determine whether or not the items are S/CI. |
|                                 | 2. Transfer tagged S/CIs to 2101-HV for storage.   |
| Cognizant Quality Engineer      | 3. Notify the S/CI coordinator of all NCRs associated with the S/CI.   |

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#### 4.5 Reporting of S/CI

- |                               |  |
|-------------------------------|--|
| Assigned Company<br>Personnel | 1. Report all items identified as potential S/CI in accordance with <u>TFC-OPS-OPER-C-24</u> . (7.1.1)   |
|                               | NOTE: Reporting of S/CIs is required regardless of safety class, where the S/CIs are located (receiving inspection, inventory/storage areas, fabrication and maintenance areas, installed, etc.), or their operating status.   |
| S/CI Coordinator              | 2. Notify the DOE S/CI coordinator of all occurrence reports associated with S/CIs. As appropriate, transmit copies of NCRs and applicable documentation.  |
|                               | 3. Notify the DOE local Office of Inspector General of all S/CIs. Notification should be e-mailed to the DOE local Office of Inspector General points of contact providing information in the following format:  |
|                               | <ul style="list-style-type: none"> <li>• NCR number</li> <li>• Date NCR was written</li> <li>• Purchase order/job control number (if known)</li> <li>• End use of product</li> <li>• Name of manufacturer, distributor, supplier</li> <li>• Safety class (if known)</li> <li>• Occurrence report number</li> <li>• Value of item(s)</li> <li>• Point(s) of contact</li> <li>• Description of item(s)</li> <li>• Quantity</li> <li>• Description of nonconformance</li> <li>• Any other pertinent information that would help the DOE local Office of Inspector General.</li> </ul> |

#### 4.6 Acceptance, Removal, and Disposition of S/CI

- |                  |  |
|------------------|--|
| S/CI Coordinator | 1. Notify responsible company personnel that S/CI may not be destroyed or disposed of without written release from the DOE local Office of Inspector General.  |
|                  | 2. Prior to destroying or disposing of S/CIs, consult the Inspector General to determine if there is a need to retain the items as evidence for potential litigation. Based on the Office of Inspector General's decision, either: |
|                  | a. Retain S/CI material as evidence for potential litigation, or   |
|                  | b. Release S/CI material for final disposition and/or disposal as directed by the S/CI coordinator.  |

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- |                               |   |
|-------------------------------|---|
| Engineering<br>Personnel      | 3. Evaluate S/CI to determine if its use could create a safety hazard in its current/proposed application.  |
| Assigned Company<br>Personnel | <p>4. If the engineering evaluation of the S/CI has determined that its use could not create a safety hazard in its current/proposed application:</p> <p>a. Disposition the S/CI to remain in place.</p> <p>NOTE: Criteria for dispositioning S/CI is by acceptance, removal, or replacement after an engineering evaluation. This should be based on the deficient characteristic of the particular item.</p> <p>b. Identify the accepted S/CI by marking with orange paint or other appropriate methods and note its location.</p> <p>c. In areas where operating temperatures are 500°F and above or are subject to cyclic loading where fatigue failure is likely to occur, replace all grades 8 and 8.2 S/CI fasteners prior to further use of the equipment.</p> <p>d. Engineering must also identify a way to prevent its reuse in an application it may not be suitable for.</p> <p>e. If removed, prepare the S/CI for disposal.</p> <p>5. If the engineering evaluation of the S/CI has determined that its use could create a safety hazard in its current/ proposed application:</p> <p>a. Contact Waste Feed Operations (WFO) Shift Operations to secure the equipment.</p> <p>b. Remove the S/CI as soon as practical.</p> <p>c. Tag, segregate, or otherwise control the S/CI to prevent inadvertent use.</p> <p>d. Prepare the S/CI for disposal.</p> |
| S/CI Coordinator              | <p>6. Ensure that all S/CI material dispositioned for disposal is properly controlled and arranged for the material to be permanently and irrevocably altered so that it cannot be used. Examples of alterations include:</p> <ul style="list-style-type: none"> <li>• Melting</li> <li>• Shredding</li> <li>• Destroying the threads on fasteners.</li> </ul>  |

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7. If the DOE/Office of Inspector General has approved disposal, arrange for pick-up and disposal of the altered S/CI material on a yearly basis. Burying S/CIs may be acceptable if they do not contain hazardous material or material prohibited by federal, state, or local regulations.

#### 4.7 Surplus/Excess Material

Responsible  
Personnel

1. Remove S/CI from surplus/excess material before they are released for sale or transfer of accountability.
2. Ensure surplus items received from DOE or other facilities are inspected for S/CI prior to installation.

#### 4.8 Assessments

Quality Assurance

1. Conduct assessments of the effectiveness of the S/CI program.  
  
NOTE: The assessment should be performance based and designed to determine if company activities are conducted in accordance with this procedure, DOE 414.1A, DOE O 440.1A, DOE G 440.1-6, and 10 CFR 830, Subpart A.
2. Lines of inquiry will be used as appropriate during assessments in areas that interface with the S/CI process. See Attachment J.

#### 4.9 Training

Managers and  
Supervisors

1. Evaluate individual training needs of assigned personnel to ensure they are proficient in S/CI identification and control procedures within their areas of responsibility.
2. All personnel involved in the following specific areas will receive S/CI process and hands-on training, whether it be formal, continuing training, or required reading. The formal training course that is available is Module #1, Course 170720, "Suspect/Counterfeit Items."
  - Quality Assurance/technicians
  - Engineers (design, systems, etc.) who procure materials/equipment
  - Maintenance personnel (electricians, pipefitters, millwrights, instrument technicians)
  - Warehouse personnel who handle and process materials/equipment
  - Tool Crib attendants.

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## 5.0 DEFINITIONS

Counterfeit part. A part made or altered so as to imitate or resemble an "approved part" without authority or right, and with the intent to mislead or defraud by passing the imitation as original or genuine. (Source: U. S. Department of Transportation Federal Aviation Administration Advisory Circular 21-29B, Detecting and Reporting Suspected Unapproved Parts).

Fastener (regardless of the safety classification). (Source: Fastener Quality Act, Public Law 101-592 as amended by Public Law 104-113).

- A screw, nut, bolt, or stud with internal or external threads or a load-indicating washer with a nominal diameter of 5 millimeters or greater in the case of such items described in metric terms; or 1/4 inch or greater in the case of such items in terms of the English system of measurement which contains any quantity of metal and held out as meeting a standard or specification which requires through-hardening; or
- A screw, nut, bolt, or stud having internal or external threads which bears a grade identification marking required by a standard or specification; or
- A washer to the extent that it is subject to a standard or specification applicable to a screw, nut, bolt, or studs described above, except that such term does not include any screw, nut, bolt, or stud that is produced and marked as American Society for Testing and Materials (ASTM) A 307 Grade A or produced in accordance with ASTM F432.

Grade identification. Any symbol appearing on a fastener purporting to indicate that the fastener's base material, strength properties, or performance capabilities conform to a specific standard of a consensus standards organization or government agency.

Graded classifications. System used to determine minimum requirements for structures, systems and components (e.g., design, operation, procurement, and maintenance requirements). The graded classifications in order of precedence are safety class, safety significant, and enhanced quality general services.

High strength graded fastener. Fasteners having a minimum tensile strength of 75 ksi, including those produced and procured in accordance with the Society of Automotive Engineers Standard J429, Grades 5, 5.2, 8, and 8.2; ASTM Standard A325, Types 1, 2, and 3; ASTM A490, ASTM A354, ASTM A449 (I&II), and some ASTM F468.

Item. An all-inclusive term used in place of any of the following: appurtenance, assembly, component, equipment, material, module, part, structure, subassembly, subsystem, system, or unit. (Source: ASME-NQA-1-1989, Quality Assurance Requirements for Nuclear Facilities).

An all-inclusive term used in place of any of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, structure, subassembly, subsystem, system, unit, documented concept, or data. (Source: DOE G 440.1-6, Implementation Guide for use with Suspect/Counterfeit Items Requirements of DOE O 440.1, Worker Protection Management; 10 CFR 830.120; and DOE 5700.6C, Quality Assurance).

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Substantial safety hazard. A loss of safety function to the extent that there is a major reduction in the degree of protection to the public or employee health and safety. (Source: U.S. Department of Energy (DOE) M 232.1-1A, "Occurrence Reporting and Processing of Operations Information").

Suspect/counterfeit items. A suspect item is one in which there is an indication by visual inspection, testing, or other information that it may not conform to established Government or industry-accepted specifications or national consensus standards. A counterfeit item is a suspect item that is a copy or substitute without legal right or authority to do so or one whose material, performance, or characteristics are knowingly misrepresented by the vendor, supplier, distributor, or manufacturer. An item that does not conform to established requirements is not normally considered S/CI if the nonconformity results from one or more of the following conditions, which should be controlled by site procedures as nonconforming items:

- Defects resulting from inadequate design or production quality control
- Damage during shipping, handling, or storage
- Improper installation
- Deterioration during service
- Degradation during removal
- Failure resulting from aging or misapplication, or
- Other controllable causes.

(Source: DOE G 440.1-6, Implementation Guide for use with Suspect/Counterfeit Items Requirements of DOE O 440.1, "Worker Protection Management;" 10 CFR 830.120; and DOE 700.6C, "Quality Assurance").

## 6.0 RECORDS

No records are generated during the performance of this procedure.

## 7.0 SOURCES

### 7.1 Requirements

1. DOE-O-232.1A Part 4.f. (1), "Occurrence Reporting and Processing of Operations Information." (S/RID)
2. DOE O 414.1A, "Quality Assurance."
3. 10 CFR 830, Subpart A, "Quality Assurance Requirements."
4. DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees."

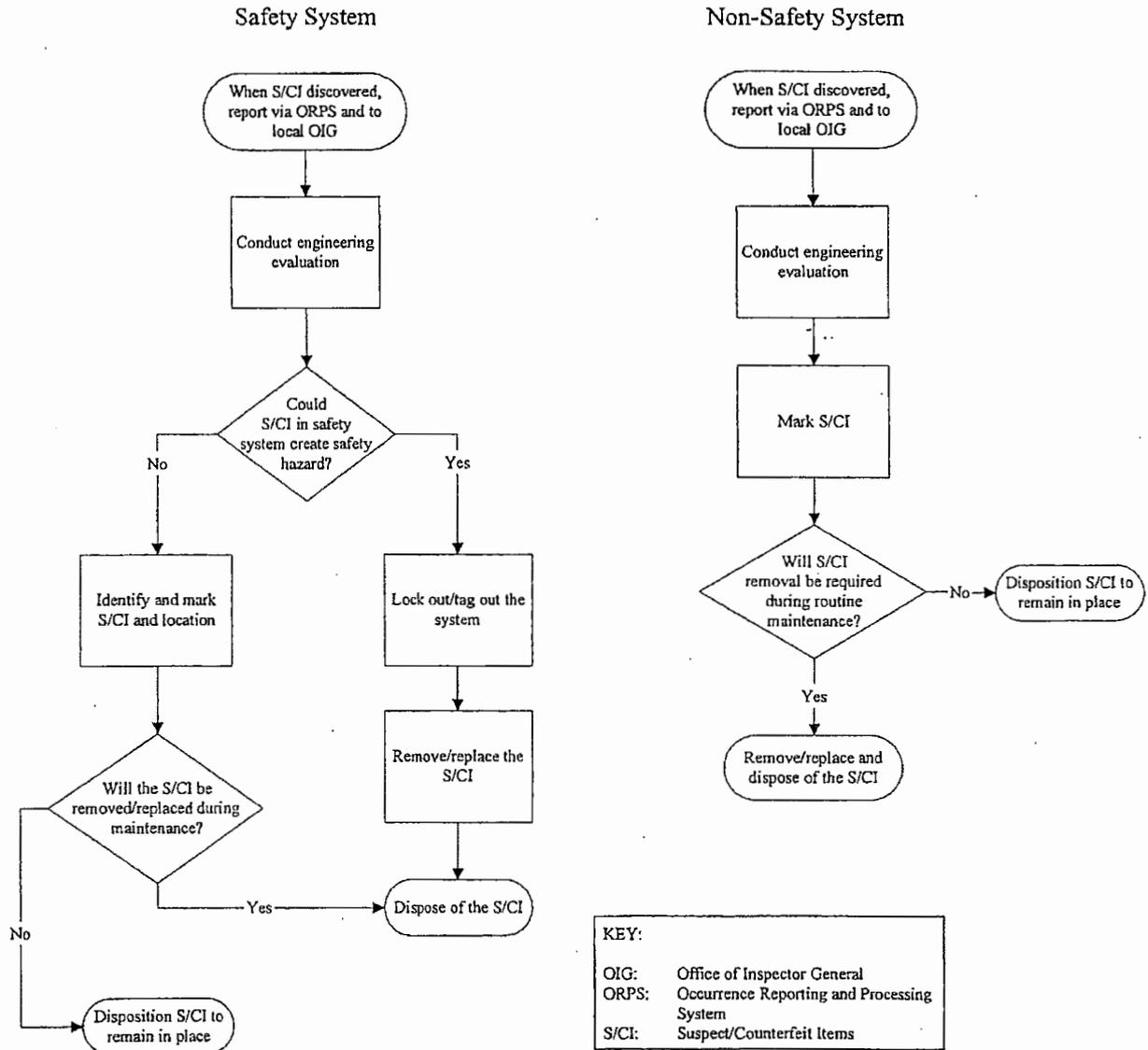
### 7.2 References

1. HNF-SD-MP-SRID-001, "Standards/Requirements Identification Document for the Tank Farm Contractor."

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2. DOE G 440.1-6, "Implementation Guide for use with Suspect/Counterfeit Items Requirements of DOE O 440.1, Worker Protection Management; 10CFR830.120; and DOE5700.6C, Quality Assurance."
3. NRC Information Notice 89-70: "Possible Indications of Misrepresented Vendor Products."
4. NRC Information Notice 89-70, Supplement 1: "Possible Indications of Misrepresented Vendor Products."
5. TFC-BSM-CP CPR-C-01, "Purchasing Card (P-Card)."
6. TFC-BSM-CP CPR-C-03, "Buyer's Technical Representative Process."
7. TFC-BSM-CP CPR-C-06, "Procurement of Items (Materials)."
8. TFC-BSM-CP CPR-C-09, "Supply Chain Process."
9. TFC-BSM-CP CPR-C-11, "Acquisition Planning."
10. TFC-BSM-FPM MC-C-01, "Material Receipt, Storage, Issuance, Return, and Excess Control."
11. TFC-ESHQ-Q ADM-C-02, "Nonconforming Item Reporting and Control."
12. TFC-OPS-OPER-C-24, "Occurrence Reporting and Processing of Operations Information."
13. TFC-PLN-03, "Engineering Program Management Plan."

Figure 1. Management of Suspect/Counterfeit Items.



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**ATTACHMENT A - SUSPECT COMPONENTS LIST**

This list was extracted from the U.S. Department of Energy Quarterly Reports on the "Analysis and Trending of Suspect/Counterfeit Items at Department of Energy Facilities," July 1997.

NOTE: It is not necessarily a negative reflection on a supplier or manufacturer if S/CIs are reported regarding its particular product. Reputable manufacturers and suppliers have a vital interest in preventing the manufacture or distribution of S/CI associated with themselves. It may be that the supplier or manufacturer was victimized and is pursuing S/CI associated with its products in an aggressive, prudent, and professional manner in order to get such items off the market. Therefore, each particular case regarding the manufacture or supply of S/CI must be examined on its own merit without making premature conclusions regarding fault or culpability of the manufacturer or supplier whose name is associated with the S/CI. In short, what follows is a "suspect components list" and not a "suspect manufacturer or supplier list." The manufacturer or supplier identified in the following table should not be considered to have engaged in any wrongdoing without additional information.



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Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Westinghouse (Component Examples)			
	<ul style="list-style-type: none"> <li>• TF136090</li> <li>• TF361050WL</li> <li>• TED1130020</li> </ul>	Commercial Grade	Westinghouse Electric Supply Co. (WESCO)	NRC I.N. 91-48
	<ul style="list-style-type: none"> <li>• Not Provided</li> </ul>			
	<ul style="list-style-type: none"> <li>• DB-25 &amp; DS-416</li> </ul>	Low Voltage	Satin America & Circuit Breaker Systems, Inc.	NRC I.N. 89-45 & Supplement #2
	<ul style="list-style-type: none"> <li>• FSN-5925-628-0641</li> <li>• DB-25</li> <li>• DB-50</li> <li>• HKB3150T</li> <li>• FB3020</li> <li>• FB3070</li> <li>• FB3050</li> <li>• EHB3025</li> <li>• LBB3125</li> <li>• HKA31250</li> <li>• JA3200</li> <li>• EHB2100</li> <li>• 225N</li> </ul>	Trip units; Navy Trip units; 1, 2, & 3 pole various amp. ratings	General Circuit Breaker & Electrical Supply	NRC I.N. 88-46, Supplements and Attachments
	<ul style="list-style-type: none"> <li>• EB 1020</li> <li>• HDEA 2030</li> <li>• MCP331100R</li> <li>• MCP431550CR</li> <li>• BAB3060H</li> <li>• 656D14 8G03</li> <li>• FA-2100</li> <li>• EH-2050</li> <li>• HFB-3050</li> <li>• HFD(B)-3020</li> <li>• MA3600</li> <li>• F2020</li> <li>• EH2100</li> <li>• EB3050</li> <li>• HMC3800F</li> <li>• EA2090</li> <li>• FA3125</li> <li>• HMCP 150</li> </ul>		HLC Electrical Supply	Office Of Nuclear Safety 93-9
			California Breakers, Inc.	
			PENCON International (DBA) General Magnetics/Electric Wholesale	
			ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	
			Molded Case Circuit Breakers	
			NSSS, Inc.	
			Spectrum, Tech.	
			Rosen Electric	
		Luckow Circuit Breaker		

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Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Westinghouse (cont.) (Component Examples)			
	<ul style="list-style-type: none"> <li>• HFD</li> <li>• EH2070</li> <li>• FA2050</li> <li>• JA2225</li> <li>• JL3B125</li> <li>• JL3B070</li> <li>• JL3B150</li> <li>• JL3B200</li> <li>• JL3B090</li> <li>• JL3B100</li> <li>• HLM3800T</li> <li>• F3100N</li> <li>• MA3500</li> <li>• EH2015</li> <li>• FA3035</li> <li>• FA2100</li> <li>• HLA2125OTM</li> <li>• EH2070</li> <li>• JB3100</li> <li>• EB2030</li> <li>• 8MC800</li> <li>• CAH3200</li> <li>• EHB3040</li> <li>• JL3-B150</li> <li>• JL3-B200</li> <li>• JL3-B090</li> <li>• JL3-B1000</li> <li>• HFA, HFB, FA</li> <li>• JL3-(B)8070</li> <li>• JL3-B125</li> <li>• EH-2020</li> <li>• FA-3035</li> <li>• EH-2050</li> <li>• FA-2100</li> <li>• FA-2050</li> <li>• HFB-3050</li> <li>• JA-2225</li> <li>• HLM3800T</li> <li>• F3100N</li> <li>• MA3500</li> <li>• EH2015</li> <li>• LA3200WL</li> <li>• HLA3200T</li> <li>• 2602D58U9</li> </ul>	Shunt Trips Aux. Contacts 2 & 3 pole circuit breakers of various amperages	<p>General Circuit Breaker &amp; Electrical Supply</p> <p>HLC Electrical Supply</p> <p>PENCON International (DBA) General Magnetics/ Electric Wholesale</p> <p>ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply</p> <p>Molded Case Circuit Breakers Co. (MCCB)</p>	NRC I.N. 88-46 Supplements and Attachments

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Westinghouse (cont.) (Component Examples)			
	<ul style="list-style-type: none"> <li>• HLB3200T</li> <li>• 262156G19</li> <li>• 1A &amp; 1B</li> <li>• HL300T</li> <li>• HLA2400TM</li> <li>• HMA3600T</li> <li>• HMA3700T</li> <li>• HKA3225T</li> <li>• HNB2700T</li> </ul>	225 amp, 3 pole 3 pole, 20 amp 3 pole, 30 amp 1 pole, 20 & 30 amp 2 pole, 20 & 30 amp 3 pole, 60 amp	Not Provided	NRC I.N. 88-46 Supp. & Attach.
	<ul style="list-style-type: none"> <li>• MDL#KAF</li> <li>• QNB3020</li> <li>• QNB3030</li> <li>• BA</li> </ul>	3 pole, 20 amp	Not Provided	SENS ID #10 3-17-89 SENS ID #11 3-3-89
	<ul style="list-style-type: none"> <li>• BA</li> <li>• BA</li> <li>• E3060</li> <li>• F3020</li> </ul>			SENS Report ID #12 10-19-88 NRC I.N. 88-46
Circuit Breakers	ITE (Component Examples)			
	<ul style="list-style-type: none"> <li>• Model - E43B015</li> </ul>	3-phase 480 volt	Cal. Breakers/Elect. Wholesale Supply Co.	SENS Report ID #8, 5-5-89
	<ul style="list-style-type: none"> <li>• EQ-B</li> </ul>	1 pole, 20 amp 3 pole, 30 amp	Not Provided	SENS ID #10 3-17-89 SENS ID #11 3-3-89
	<ul style="list-style-type: none"> <li>• EE-3B030</li> <li>• EF3B070</li> <li>• EF3H050</li> <li>• EF3B125</li> <li>• EF3B040</li> <li>• E42B020</li> <li>• QJ2B200</li> <li>• JL3B400</li> </ul>	2 & 3 pole various amperages	General Circuit Breaker & Electrical Supply  HLC Electrical Supply	NRC I.N. 88-46, Supplements and Attachments

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	ITE (cont.) (Component Examples) <ul style="list-style-type: none"> <li>• HE9B040</li> <li>• EE3B050</li> <li>• BQ2B030</li> <li>• EE3B070</li> <li>• EE2B100</li> <li>• EE2B050</li> <li>• EE2B030</li> <li>• FJ3B225</li> <li>• ET</li> <li>• KA</li> <li>• EH-313015</li> <li>• JL-3B070</li> <li>• JL-3B150</li> <li>• E43B015</li> <li>• EF2-B030</li> <li>• EH3B100</li> <li>• QP1B020</li> <li>• QJ3B200</li> <li>• EF3B100</li> <li>• 1193</li> </ul>		California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ATS Circuit Breakers, Inc.  Panel Board Specialties  Rosen Electric Equipment	
Circuit Breakers	ITE, Gould & ITE Imperial  Brown Boveri Elect. (BBE) ASEA Brown Boveri (Component Examples) <ul style="list-style-type: none"> <li>• Type HK</li> <li>• 5 HK</li> <li>• 7.5 HK</li> <li>• 15 HK</li> <li>• 38 HK</li> <li>• ITE 62-6</li> </ul>	Not Provided ID-4KV Not Provided Not Provided	Brown Boveri ASEA Brown Boveri	NRC I.N. 89-86  NRC I.N. 87-41  Office of Nuclear Safety, 92-25
Circuit Breakers	Square "D" Co. Component Examples <ul style="list-style-type: none"> <li>• KHL 36125 (Any Type)</li> </ul>	Molded Case	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale	NRC I.N. 88-46 Supp. & Attach.  NRCB 88-10  NRC I.N. 90-46

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Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Square "D" Co. Component Examples (cont.)		ANTI THEFT Systems Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	
	• QOB220	1 pole, 15 amp	Not Provided	SENS ID #10 3-17-89
	• QO220 • LO-3	2 & 3 pole 20 & 50 amp breakers	General Circuit Breaker & Electrical Supply	NRC I.N. 89-45 & Supplement #2
	• SBW-12 • 989316 • FAL3650-16M or • FAL36050-16M • KA36200	3 pole - 200 amp breaker 30A/600V	HLC Electric Supply California Breakers, Inc.	
	• 999330	Not Provided	PENCON International (DBA) General Magnetics/Electric Wholesale	
	Manufacturer not Provided	Not Provided	Stokely Enterprises Molded Case Circuit Breakers	DOE Letter 8-26-91 Reprinted NuVEP: Bulletin 7-26-91
Circuit Breakers	Fed. Pacific (Component Examples)		General Circuit Breaker & Electrical Supply	
	• NEF431020R • NE111020 • NE	3 pole, 20 amp 1 pole, 20 amp 1 pole, 15 amp	HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale	SENS ID. #10 3-17-89

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Fed. Pacific (Component Examples) (cont.)  <ul style="list-style-type: none"> <li>NF63-1100</li> <li>NE22-4060</li> <li>NE22-4100</li> <li>NEF-433030</li> <li>2P125</li> </ul>	1, & 3 pole - 30, 60 & 100 amp breakers	ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply  General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.	SENS ID. #11 3-3-89  NRC I.N. 88-46, Supp. & Attach.
	Jefferson (Component Examples)	Not Provided	PENCON International (DBA) General Magnetics/electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply  Mid West Co.	NRC I.N. 88-46, Supp. & Attach.
Circuit Breakers	Superior (Component Examples)  <ul style="list-style-type: none"> <li>246U-3</li> </ul>	Not Provided	General Circuit Breaker & Electrical Supply  Rosen Electric  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46 Supp. & Attach.

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Circuit Breakers	Manufacturer Not Provided (Component Examples)  50DHP250	2 pole - 50 amp	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46, Supp. & Attach.
Circuit Breakers  Heaters	Cutler Hammer (Component Examples)  <ul style="list-style-type: none"> <li>• 10177H13</li> <li>• 10177H21</li> <li>• 10177H32</li> <li>• 10177H036</li> <li>• 10177H1049</li> </ul>	Not Provided	AAKER  General Circuit Breaker & Electrical Supply  HLC Electrical Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46, Supp. & Attach.

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Switches	(Component Examples)  Crouse Hinds #EDSC2129  Sq. D Type G. Class 9012, 9025, 9016	Tumbler, ft. op	Platt Electric Supply Co.  Gen. Motors, Electro-Motive Design	SENS ID #16 1-27-92  Office of Nuclear Safety 93-24 & 93-27
Transmitters	Rosemount	(Component Examples)  • Model 1151 GP • Model 1151 DP	Venetech	E.L. Wilmot letter dated 8-1-91  H. Richardson letter HR-81-91 dated 8-15-91
Motors	Siemen & Allis (Component Examples)  INP 143 T 215 T	10 H.P.	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply  Rosen Electric Equipment	NRC I.N. 88-46, Supplements and Attachments

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Relays	Potter & Brumfield (Component Examples)  MDR-138, 173-1 134-1, 142-1	Not-latching rotary	Stokely Enterprises  Spectronics, Inc.  Nutherm International  The Martin Co.	NRC I.N. 90-57 & Attach.
	Teledyne	All qualified to MIL-R-28776 and MIL-R-39016	Not Provided	DOE-ID Wilmot letter, 7-16-91
	G.E. & Exide (Component Examples)  • 12HGA-11S52 • NX 400	Overload & Aux.	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46, Supp. & Attach.
	Manufacturer not provided  • FSC-5945	Not Provided	Stokely Enterprises	DOE Letter 8-26-91 Reprinted NuVEP: Bulletin 7-26-91
	Amerace (or Agastat) (Component Examples)  Models: E7024 E7022	Electro Pneumatic Timing Relays	Amerace  Control Components Supply	SENS ID #1 11-1-91  NRC I.N. 92-24
	A through L Series Model 7032	PRB		

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Fuses	Bussman Co. (Component Examples)  REN 15 & NOS-30	15A-250V & 30A-600V	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46, Supp. & Attach.
	Class 1E	All Supplied by PMS	Preventive Maintenance Systems (PMS)	NRC I.N. 88-19
Controllers	Manufacturer Not Listed (Component Examples)	Motor Controllers	Stokely Distributors & Stokely Enterprises, Inc.	DOE letter 8-26-91 & NUVEP Bulletin 7-26-91
Starters	Westinghouse (Component Examples)	Not Provided	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-45 Supp. & Attach.
	626B187G17 626B187G13			
Resistors	Unknown	All	Impala Electronics	NRC I.N. 91-01

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Semiconductors	Solid State Devices Inc. (SSDI) SFF 9140	P-Channel MOSFET	SSDI	DOE Albuquerque Letter, 06-25-96 to DOD Inspector General
	SPD 1511-1-11	Pin Diode (SA3059)		
	2A14/18 or 2A14/52	Ion Implanted Diode		
	SSR4045CTTXV	SCHOTTKY Diodes		
	SFF9140TWX	Power Transistors		
	SPMF106ANH	Special Pack MOSFET Switch		
	SPD 5818 or IN5858JTXV	Axial Leaded SCHOTTKY Diode		
	2N797	Transistor		
	Unknown	Diode (SA 3436)		
Starter Controls	Westinghouse (Component Examples)	Not Provided	General Circuit Breaker & Electrical Supply	NRC I.N. 88-48
	• A200MICAC		HLC Electric Supply	
	• A201KICA		California Breakers, Inc.	
	• A201L2CA			
	• AN13A		PENCON International (DBA) General Magnetics/Electric Wholesale	
			ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	

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**ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)**

Component	Manufacturer/Type	Description	Supplier	References
Gauge Glasses	Siemen & Allis (Component Examples)  #00-737-637-118 215 T	Not Provided	Rosen Electric Co.	NRC I.N. 88-46 Supp. & Attach.
Mercury Lamps	Spectro Inc. (Component Examples)  V00014	Not Provided	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46
Electrical Frames	Westinghouse (Component Examples)  LA2600F LA3600F MA2800F	Not Provided	General Circuit Breaker & Electrical Supply  HLC Electric Supply  California Breakers, Inc.  PENCON International (DBA) General Magnetics/Electric Wholesale  ANTI THEFT Systems, Inc. (DBA) ATS Circuit Breakers and AC Circuit Breaker - Electrical Supply	NRC I.N. 88-46
Push button station	Crouse Hinds (Component Examples)  #00-737-637-118	Single gang, pushbutton	Platt Electric Supply Co.	SENS Report ID #16 I-27-92

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Overload Relay Thermal Unit	Square D (Component Examples)  B19.5, B22	Not Provided	Not Provided	NRC I.N. 88-46
Piping, Fittings Flanges, and Components	Tube-line Corp. Ray Miller, Inc.	Subassemblies, fittings, flanges, & other components  (Carbon and Stainless Steel components)	Tube-line  Ray Miller, Inc.	NRC IEB 83-06 NRC I.N. 89-18 NRC IEB 83-07 NRC I.N. 83-01
Piping, Fittings, Flanges, and Components	Piping Supplies, Inc. & West Jersey Mfg. & Chews Landing Metal Mfg.	Carbon and Stainless Steel Fittings and Flanges	Piping Supplies, Inc. & West Jersey Mfg. & Chews Landing Metal Mfg.	NRC Bulletin 88-05 & Supplements
Valves	VOGT	Full port design 2-inch Model SW-13111 & 1023	CMA International IMA Valve Refurbisher	NRC I.N. 88-48 & Supplements
	Crane	4"-1500psi, pressure sealed	Southern Cal. Valve Maintenance co., Amesse Welding Service & CMA Int.	NRC I.N. 91-09
	ITT Grinnell Valve Co., Inc	Diaphragm valves	ITT Grinnell Valve Co. Inc. Div. of Diaflo & ITT Engineered Valves	NRC Comp. Bulletin 87-02
	Crane, Pacific, Powell, Walworth & Lunkenheimer	Gate Valves	Coffeyville Valve Inc.	NRC I.N. 92-56
	Pacific	8" & 3" Globe Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48, Supp. & Attach.
	Crane Chapman	24" Check Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48, Supp. & Attach.
	Pacific	Check Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48, Supp. & Attach.

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**ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)**

Component	Manufacturer/Type	Description	Supplier	References
Valves	Kerotest	8" Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48 Supp. & Attach.
	Pacific	4" Gate Valve	CMA & IMA Valve Refurbisher	NRC I.N. 88-48 Supp. & Attach.
	Lukenheimer	6" Model 1542 20" Model 3013	CMA & IMA Valve Refurbisher	NRC I.N. 88-48 Supp. & Attach.
	Crane	All	CMA & IMA Valve Refurbisher	NRC I.N. 88-48 Supp. & Attach.
Flanges	China Ding Zinang Nan Xi Li Flange Co. Shou Gang Mach. Eng. Co.	Flanges, ASTM A105, ASME SA105	Billiongold Co. LTD. Tain Gong Co. Sanxi Province Overseas Trading Corp	NRC I.N. 92-68 and Attachments  Office of Nuclear Safety 92-25, 93-23, and 92-35  National Board of Boiler and Pressure Vessel Inspectors (NBBI) Bulletin: Special Report, 1992, Volume 48, Number 2, The Chinese Flange Investigation
Valve Replacement Parts	Masonilian-Dresser Industries	Plug stem, stem to plug anti-rotation pin, seat ring, valve plugs, bushings, cages & packing box components	Cor-Val, Control Valve Specialists, H.H. Barnum & M.D. Norwood, Sample Webtrol Controls, Inc.	NRC I.N. 88-97 Supp. & Attach.
Pumps & Replacement Parts	Hayward Tyler Pump Co.	HTPC ASME Nuclear Code	Hayward Tyler Pump Co.	IEB 83-05 & Attachments
Channel Members	Unistrut Corporation	Continuously slotted channels, structural framing members, fasteners, nuts, fittings, pipe clamps	Unistrut Corporation	NRC I.N. 91-25
Fire Barriers	Thermal Science Inc.	Thermo-Log 330	None Listed	ES&Q Update #8 NRC I.N. 92-55
Valve Actuator	Limitorque	Eyebolts on housing cover	None Listed	Office of Nuclear Safety 93-25  NRC I.N. 93-37

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## ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)

Component	Manufacturer/Type	Description	Supplier	References
Steel	Alloy & Carbon Steel Co. Inc., Atlantic Steel Co., Levingston Steel Co., & Copperweld Steel co.	Plate Angle Flat Bar Bar	Meredith Corporation Pressure Vessel Nuclear Alloy & Carbon Steel Co., Inc.	NRC I.N. 89-56, Attachments and Supplements
Fasteners (Bolts, Screws, Nuts, and Washers)	(parentheses designated headmark)  Asahi (A) Daiichi (D) Daiei (E) Fastener Co. of Japan (FM) Hinomoto Metal (H) Jin Her (J) Kyowa (K) Kosaka Kogyo (KS) Kyoei Minamida Seiybo (M) Mnato Kogyo (MS) Nippon (NF) Takai (RT) Tsukimori (S) Unytte (UNY) Yamadai (Y) Ivaco, Infasco (hollow triangled)	<ul style="list-style-type: none"> <li>Those with suppliers or manufacturers</li> <li>Those that are improperly marked</li> <li>Those of foreign manufacture that do not meet Public Law 101-592. Fastener Quality Act</li> </ul>	Note: Listed suppliers may also be manufacturers  Lawrence Engineering & Supply Co. Metal Building Bolts Nichimin Corporation UNICO Ace Corporation E. K. Fasteners, Inc. H. Y. Port Fasteners Co. Kobayashi Metals, LTD. Takai Screw Mfg. Co. LTD. Yamaguchi Sesakusho Co. LTD. Highland Bolt & Nut Porteous Fastener Co. Northwest Fasteners Ziegler Bolts & Parts Co. Edgewater Fasteners, Inc. Reynolds Fasteners A & G Engineering	Commercial Carrier Journal Articles for: 6/88, 1/90, 2/90, 3/90, 4/90, 6/90, 7/90, 12/90  INEL Suspect Headmark List  SENS Report #5 2/6/91  SENS Report #13 2/6/91  HR 3000, U.S. House of Representatives, July 1988  J. A. Jones, Ltr, 9/23/92  Memo from L. Kubicek, 3/28/91  Memo from D. Sanow, 3/8/91  "Fastener Technology International," Feb., April, and June 1993  Rep. J. Dingell Ltr to Comm. Dept. & NRC June 18, 1993  Office of Nuclear Safety 93-26, 93-22, 93-11  DOE Quality Alert, Bulletin, Issue No. 92-4, August 1992  FDH Hanford Suspect Headmark List

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**ATTACHMENT A - SUSPECT COMPONENTS LIST (cont.)**

Component	Manufacturer/Type	Description	Supplier	References
Fasteners (Bolts, Screws, Nuts, and Washers)	NUCOR	1-1/4" x 2" Zinc Chromate plated surface Hexhead cap screws	Cordova Bolt, Inc.	SENS ID #13 11-6/91
	Any	Any	Aircon Barnett Bolt Works Bolts & Nuts, Inc. Glasser & Assoc. Knoxville Bolt & Screw Metal Fastener Supply Phoell Mfg. Co. Service Supply Co. Southeastern Bolt & Screw Sure Loc Victory Bolt	NRC Compliance Bulletin 87-02 NRC I.N. 89-59

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**ATTACHMENT B - CLASSIFICATION OF POTENTIALLY SUSPECT/COUNTERFEIT  
ITEMS**

**A. ELECTRICAL ITEMS**

- Molded Case Circuit Breakers
- Motor Control Centers
  - Complete Units
  - Components
  - Starters
  - Starting coils
  - Contactors
  - Overload relays
  - Starter control relays
  - Overload heaters
- Protective/control relays
- DC power supplies/chargers
- AC inverters
- Current/potential transformers
- Exciters/regulators
- Bus transfers/auto bus transfers
- Motor generator sets
- Generators
- Rewindable motors
- Printed circuit boards
- Bulk commodity items
  - Fuses
  - Splices
  - Electrical connectors
- Indicators/controllers
- Panel lights/switches
- Transmitters/instrument switches
- Isolation devices.

The following items are excluded unless required by the applicable program/project: 600V or less: motors; outlets, switches, and plugs; boxes, conduit (i.e., bodies and covers, nipples, fittings, EMT, flex, liquid tight, rigid); wire; miscellaneous wire connections #10 and below; fixtures; lights.

**B. MECHANICAL ITEMS**

- Welding materials
  - Rod
  - Wire
  - Flux
- Structural members (pipe supports)
- Channel members

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**ATTACHMENT B - CLASSIFICATION OF POTENTIALLY SUSPECT/COUNTERFEIT  
ITEMS (cont.)**

- Sheet
- Plate
- Bars
- Round stock
- Other raw material which requires an ASTM or national standard
- All lifting/rigging gear (wire rope shall be made in the United States by a member of the Wire Rope Technical Board (WRTB) or the Associated Wire Rope Fabricators (AWRF) (except stainless steel, and unless recommended otherwise by a crane or hoist manufacturer); stainless steel wire rope shall be made in the United States and shall be 302 or 304 grade stainless steel unless otherwise recommended by a crane or hoist manufacturer)
- Ratchet tie-downs/strapping devices and come-a-longs, with fasteners.

The following materials are excluded unless required by the applicable program/project:  
ASTM-A36, brass, copper, sheet metal 7 GA or less, and aluminum.

- C. PIPING - which requires an ASTM or ASME standard
- Fittings
  - Flanges
  - Valves
  - Pipe
  - Components.

The following materials are excluded unless required by the applicable program/project:  
ASTM-A-53, Swagelock; cast iron, galvanized, copper, bronze, and brass; PVC; and gaskets.

- D. FASTENERS - All fasteners 1/4" and above in diameter
- Bolts
  - Studs
  - Cap screws
  - High-strength washers
  - Nuts
  - Anchors.

NOTE: Attachment I identifies headmarkings for stainless steel and carbon steel high strength fasteners that are considered counterfeit. Fasteners exhibiting these headmarks are counterfeit and no further testing is required.

The following items are excluded, unless required by the applicable program/project: sheetmetal screws, wood screws, stove bolts, pan heads, machine screws, lag bolts, threaded rod, rivets, and carriage bolts.

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**ATTACHMENT C - SUSPECT/COUNTERFEIT ITEMS INFORMATION SOURCE LIST**

A wide variety of industry and Government sources publish information relative to suspect/counterfeit products. The following sources provide information which is available on a continuing basis:

**Industrial Fasteners Institute (IFI)**

The following information is available from IFI via subscription:

- "Fastener Application Advisory" (Published Monthly)
- "North American Manufacturers Identification Markings for Fasteners"
- Fastener-related video cassettes.

**The National Board of Pressure Vessel Inspectors (NBBI)**

The NBBI publishes "National Board Bulletins" to alert manufacturers and users of misrepresented products as they are discovered.

**National Highway Traffic Safety Administration (NHTSA)**

The NHTSA's Office of Defects Investigation issued a "Suspect Bolt List" in late 1990 identifying numerous fasteners, which they determined to be misrepresented.

**Trade Journals and Magazines**

There are numerous trade-oriented magazines which have carried articles identifying incidents of failure of substandard parts in industry applications which have caused personal injury and death, as well as serious property damage.

**Newspaper and Television Reports**

Another good source of information are news reports, which provide current accounts of problems encountered as a result of misrepresented products.

**U.S. Nuclear Regulatory Commission (NRC)**

The NRC issues bulletins, notices, and regulatory guidance on a continuing basis to alert nuclear power utilities of potential intrusion of misrepresented products into the operations environment of operating nuclear power plants.

U.S. Department of Defense (DOD) and U.S. Department of Commerce publications are also monitored by the DOE to assure that the deficiencies identified do not contaminate DOE facilities.

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**ATTACHMENT C - SUSPECT/COUNTERFEIT ITEMS INFORMATION SOURCE LIST (cont.)****Government Industry Data Exchange Program (GIDEP)**

The mission of this program, established by the Office of Management and Budget, is to support government systems readiness, logistics effectiveness, productivity, and cost reduction through timely retrieval, storage, and distribution of data among government and industry organizations.

**U.S. Department of Energy**

The following documents are issued by the DOE to provide information and guidance relative to the suspect/counterfeit parts issue:

- DOE Orders
- Letters of Direction
- Bulletins and Quality Alerts

(In addition, the DOE periodically sponsors seminars/workshops relative to the detection and control of suspect/counterfeit parts).

**U.S. Customs Service**

The U.S. Customs Service has published the Suspect Headmark List (Figure 1) identifying graded fasteners determined to be of indeterminate quality, which has been adopted by DOE and, ultimately, Project Hanford, as a formal guide for use when evaluating currently installed and newly procured graded fasteners to assure their fitness for use on the Hanford Site.

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**ATTACHMENT D - CHARACTERISTICS THAT MAY MAKE PRODUCTS VULNERABLE TO MISREPRESENTATION, FRAUDULENT PRACTICES, AND COUNTERFEITING**

The following information has been extracted from the NRC Information Notice 89-70, Supplement 1, Attachment 3:

- High-turnover usage rate.
- No easy or practical way to uniquely mark the component itself.
- Critical characteristics, including environmental qualification not easily discernable in external visual inspection, or characteristics that are difficult to verify through receipt testing.
- May be widely used in non-critical and critical applications.
- Use may not result in used appearance.
- Often marketed through a supplier and dropped shipped from locations other than that of the original supplier.
- Special processes for ASME materials may be subcontracted (heat treating, testing, and inspections).
- Easily copied by secondary market suppliers.
- Viable salvage market.
- Reduced number of original equipment manufacturers.
- Obsolete or hard-to-get components.
- Components manufactured by a company that is no longer in business.
- Items with documentation from a plant where construction has been suspended, canceled, or deferred.
- Moderate or low cost.
- High potential for profit (rejected heats of material are purchased and decertified).

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### **ATTACHMENT E - WHERE TO LOOK FOR SUSPECT/COUNTERFEIT ITEMS**

The following areas should receive increased scrutiny to assure that suspect/counterfeit items are not evident:

#### Items in Supply

- Company supply stock
- Wagon stock
- Other sources of supply contamination.

#### Items in Use

- Plant facilities, components, and systems
- Equipment
- Operations and maintenance.

#### Items Being Procured

- "Known" critical items
- Critical equipment and assemblies
- Non-critical "known" purchases.

#### Operations Decisions

- Major disaster risks
- Personnel safety risks
- Program/mission risks (cost and schedule).

#### Cost of Implementation

- Potential consequential costs
- Management risk assessment
- Cost of focusing established controls
- Impact on schedule and program mission.

#### Cost of Focus on Known Suspect/Counterfeit Parts

- Uses existing procurement program
- Focuses on "known parts first"
- Reduction in major disaster potential
- Program costs low/benefits high.

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION**

It is very important to remember that just because an item is identified as being "suspect/counterfeit" it may not be appropriate to simply reject it. A review should be performed prior to formal disposition of the item to assure that it is indeed unfit for the intended application.

**DETECTION METHODS****Visual Inspection**

Items may be substandard or fraudulent when:

- Nameplates, labels, or tags have been altered, photocopied, painted over, are not secured well, show incomplete data, or are missing (e.g., preprinted labels normally show typed entries).
- Obvious attempts at beautification have been made, e.g., excess painting or wire brushing, evidence of hand painting (touch-up), or stainless steel is painted.
- Handmade parts are evident, gaskets are rough cut, shims and thin metal part edges show evidence of cutting or dressing by hand tools (filing, hacksaw marking, use of tin snips or nippers).
- Hand tool marks on fasteners or other assembly parts (upset metal exists on screw or bolt heads) or dissimilar parts are evident (e.g., seven or eight bolts are of the same material and one is a different material).
- Poor fit between assembled items.
- Configuration is not consistent with other items from the same supplier or varies from that indicated in supplier literature or drawings.
- Unusual box or packing of component or item.
- The supplier is not a factory-authorized distributor.
- Dimensions of the item are inconsistent with the specifications requested on the purchase order and/or those provided by the supplier at the time of shipment.
- The item or component matches the description of one that is on a suspect items list (e.g., U.S. Customs Service "Suspect Headmark List," National Board of Boiler and Pressure Vessel Inspectors (NBBI) "Special Bulletin," etc.).

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION (cont.)**

## Documentation

Documents may be suspect/counterfeit when:

- The use of correction fluid or correction tape is evident. Type or pitch change is evident.
- The document is not signed or initialed when required, is excessively faded or unclear (indicating multiple, sequential copying), or data are missing.
- The name or title of the document approved cannot be determined.
- Technical data is inconsistent (e.g., chemical analysis indicates one material and physical tests indicate another).
- Certification or test results are identical between items when normal variations should be expected.
- Document traceability is not clear. The document should be traceable to the item(s).
- Technical data are not consistent with code or standard requirements (e.g., no impact test results provided when impact testing is required or CMTRS physical test data indicate no heat treatment and heat treatment is required).
- Documentation is not delivered as required on the purchase order or is in an unusual format.
- Lines on forms are bent, broken, or interrupted indicating data has been deleted or exchanged (cut and paste).
- Handwritten entries of data are on the same document where typed or preprinted data exists.
- Data on a single line located at different heights indicate the possibility of retyping.

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION (cont.)**

Fasteners

- Headmarkings are marred, missing, or appear to have been altered.
- Threads show evidence of dressing or wear (threads should be of uniform color and finish).
- Headmarkings are inconsistent with a heat lot.
- Headmarkings matching one of those identified on the U.S. Customs Service, "Suspect Headmark List" (Figure QP 3.2-1).
  - Headmarkings which depict both raised and hand-stamped markings, such as those described in WHC Quality Assurance Bulletin # 94-01, "Discrepant Dual Head Stamped Stainless Steel Bolts." This bulletin documents the results of internal inspections and independent testing of stainless steel bolts purchased to ASTM A193, Grade B8, which were found to be substandard.
  - Only manufacturers listed on the "Suspect Fastener Headmark List" (Figure QP 3.2-1) are known to produce substandard graded fasteners. If graded fasteners are discovered which exhibit headmarks matching those on the Suspect/Fastener Headmark List, they shall be considered to be defective without further testing, unless traceable manufacturer's certifications are received which provide documented evidence that the fasteners were not produced by the manufacturer listed on the Suspect Fastener Headmark List.
  - Interpretation of headmark/manufacturers listed on the "Suspect Fastener Headmark List," including newly discovered variations thereto, shall only be provided by the designated S/CI coordinator based on guidance received from the DOE.

Electrical Devices

- Connections show evidence of previous attachment (metal upset or marring).
- Connections show arcing or discoloration.
- Fasteners are loose, missing, or show metal upset.
- Molded case circuit breakers are not consistent with manufacturer-provided checklists for detecting substandard/fraudulent breakers.
- Missing or photocopied Underwriters Laboratories (UL) labels on products requiring such.

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION (cont.)**

Rotating Machinery and Valve Internal Parts

- Shows marring, tool impressions, wear marks, traces of Prussian blue or lapping compound, or other evidence of previous attempts at fit up or assembly.
- Heat discoloration is evident.
- Evidence of erosion, corrosion, wire-drawing or "dimples" (inverted cone-shaped impressions) on valve discs, seats, or pump impellers.

Valves

- Paint
  - Valve appears to be freshly painted and valve stem has paint on it
  - Wear marks on any painted surface
  - Valve stem is protected, but protection has paint on it
  - Paint does not match standard Original Equipment Manufacturer (OEM) color.
- Valve Tags
  - Tags attached with screws instead of rivets
  - Tags attached in a different location than normal
  - Tags appear to be worn or old
  - Tags with paint on them
  - Tags that look newer than the valve
  - Tags with no part numbers
  - Tags with irregular stamping.
- Hand Wheels
  - Old looking hand wheels on new looking valves
  - Hand wheels that look sand blasted or newer than the valve
  - Different types of hand wheels on valves of the same manufacturer.
- Bolts and Nuts
  - Bolts and nuts have a used appearance (excessive wrench marks on flats)
  - Improper bolt/nut material (e.g., a bronze nut on a stainless stem).

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**ATTACHMENT F - SUSPECT/COUNTERFEIT PARTS DETECTION (cont.)**

- Valve Body
  - Ground off casting marks with other markings stamped in the area (OEM markings are nearly always raised, not stamped)
  - Signs of weld repairs
  - Incorrect dimensions
  - Freshly sand-blasted appearance, including eye bolts, grease fittings, stem, etc.
  - Evidence of previous bolt head scoring on backsides of flanges, or evidence that this area has been ground to remove such marks
  - On a stainless valve, a finish that is unusually shiny indicates bead-blasting. A finish that is unusually dull indicates sand-blasting. The finish on a new valve is in-between.

**Manufacturer's Logo**

- Missing.
- Logo plate looks newer than the valve.
- Logo plate shows signs of discoloration from previous use.

**Other**

- Foreign material inside the valve (e.g., metal shavings).
- Valve stem packing that shows all the adjustments have been run out.
- In gate valves, a gate that is off-center when checked through the open end of the valve.
- Obvious differences between valves in the same shipment.

**Price**

- Price is significantly less than that of the competition.

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## ATTACHMENT G - FASTENERS

### 1.0 Counterfeit/Substandard High-Strength Bolts

#### 1.1 General Background

Counterfeit bolts have been found in military and commercial aircraft, surface ships, submarines, nuclear weapon production facilities, bridges, buildings, and the space shuttle. These bolts often do not possess the capabilities of the genuine bolts they counterfeit and can threaten the reliability of industrial and consumer products, National Security, or lives. At Congressional hearings in 1987, the Army testified that they had purchased bolts that bore the headmarks of Grade 8 high-strength bolts, but that were actually inferior Grade 8.2 bolts.

The International Fasteners Institute (IFI) reported finding substandard, mis-marked, and/or counterfeit high-strength Grade 8 bolts in the United States commercial marketplace. In 1988, IFI reported that counterfeit medium-strength Grade 5 bolts had also been found.

Foreign bolts dominate the American marketplace due to their price advantage, and the majority of suspect/counterfeit bolts are imported. Identifying, testing, and replacing these bolts has proven expensive and difficult, both mechanically and technically. Not finding and replacing these bolts, however, has proven fatal in some instances.

#### 1.2 Headmarks

Attachment I may be removed and photocopied, as needed, for use as a poster and reference to known suspect fastener headmarks. Bolts with the headmarkings shown have a significant likelihood of being found to be inferior to standards. Generally, the cost of replacement of these bolts is less than the cost of chemical, hardness, and tensile strength testing. Note also that counterfeit bolts can be delivered with counterfeit certificates. Documentation alone is insufficient to demonstrate compliance with standards.

#### 1.3 Consensus Standards

There are several consensus organizations that have published standards for the properties of fasteners. One of these is the Society of Automotive Engineers (SAE). The SAE grade (or alleged grade on a suspect item) of a bolt is indicated by raised or indented radial lines on the bolt's head, as shown in Attachment I. These markings are called headmarks. DOE is currently concerned with two different grades of fasteners: one has three equally spaced radial lines on the head of a bolt which indicate that it should meet the specifications for a Grade 5 bolt; the other has six equally spaced radial lines which indicate a Grade 8 bolt. Letters or symbols on the head of a bolt indicate the manufacturer.

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#### ATTACHMENT G - FASTENERS (cont.)

Attachment I is a Suspect/Counterfeit Headmark List that was prepared by the United States Customs Service after extensive testing of many samples of bolts from around the nation. Any bolts anywhere in the DOE community that are currently in stock, in bins, or installed that are on the Customs Headmark List should be considered suspect/counterfeit. The headmarks on this list are those of manufacturers that have often been found to have sold bolts that did not meet the indicated consensus standards. Sufficient testing has been done on the bolts on this list to presume them defective without further testing.

#### 1.4 Precautions: Selective Testing

Some facilities (manufacturers, distributors, etc.) perform selective testing of sample bolts rather than have an independent testing laboratory run all the tests required by consensus standards. In many cases, a new counterfeit bolt has roughly the same physical strength as the graded bolt it mimics, but does not have either the chemical composition or the heat treatment specified by the consensus standards. As a result, it will stretch, exhibit metal fatigue, or corrode under less harsh service than the genuine bolt. Simple tensile strength tests cannot be used to identify substandard high-strength fasteners and should not be solely relied upon in performing acceptance test.

#### 1.5 Using Suspect/Counterfeit Grade 5 Bolts in Grade 2 Applications

Some sites use suspect/counterfeit Grade 5 bolts in applications that only call for Grade 2 bolts. Eventually, the suspect/counterfeit Grade 5 bolts may find its way into an application that requires a genuine Grade 5 bolt and that application may fail. In some cases, cheap imported graded bolts have been purchased in place of upgraded bolts because the small price differential made the extra quality seem to be a bargain. Given the expense of removing suspect bolts from DOE facilities, the practice of using suspect bolts for any application should be discontinued.

#### 1.6 Keep Bolts in Original Packages

All bolts purchased should be kept in the original packages, not emptied into bins. The packages should have labels or other markings that would permit them to be associated with a particular procurement action and a specific vendor. Approved supplier lists should be checked to assure that fastener suppliers on that list have been recently qualified/audited for adequacy of their quality programs.

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### ATTACHMENT G - FASTENERS (cont.)

#### 2.0 Stainless Steel fasteners

##### 2.1 Purpose

To provide follow-up information to the previous notification sent to the DOE field and contractor organizations in late 1996.

##### 2.2 Background

In November 1993, the Industrial Fastener Institute (IFI) issued a Fastener Advisory regarding 18-8 stainless steel bolts. The advisory warned about a "bait and switch" tactic in which a distributor takes an 18-8 bolt (indicated by two radial lines 90 degrees apart), but no manufacturer's marking, and sells them as ASTM A320 Grade B8 bolts after hand-stamping B8 on to the heads.

As a result of this IFI Advisory, DOE sites conducted a search of facility stores for stainless steel fasteners with hand-stamped B8 grade marks. Hundreds of stainless steel bolts with hand-stamped B8 grade markings, along with a variety of other raised and depressed head and manufacturer's markings were identified in facility stores throughout the DOE complex.

For example, an inspection of shop stock at a Hanford Site facility revealed bolts with three different raised grade markings, 18-8, 304, and F593C, along with raised manufacturer's identifications of CK, H, HP, C, SO, CS, PMC, TH, THE, and a STAR. The majority of the remaining samples found at Hanford exhibited raised grade markings of 18-8 and 304, with a B8 grade marking and manufacturer's identification hand-stamped into the head of the bolt.

Finally, a few samples did not display any manufacturer's markings. Most of the bolts discovered were purchased with the specification to meet a national consensus standard, American Society for Testing and Materials (ASTM) A193, B8 Class 1 rather than the ASTM A320 standard discussed in the IFI warning.

The Savannah River Site also conducted a site-wide search of facility stores with similar results. A total of 159 stainless steel fasteners with hand-stamped B8 grade marks and raised or hand-stamped manufacturer's symbols were found. Fifteen stainless steel fasteners that had no manufacturer's symbol were also found.

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**ATTACHMENT G - FASTENERS (cont.)**

2.3 Issue

The requirements of the ASTM A193 standard regarding fastener marking and certification are very similar those required by the ASTM A320 standard discussed in the IFI advisory. The ASTM A193 standard requires that grade and manufacturer's identification symbols be applied to the heads of bolts that are larger than 1/4" in diameter. The standard, however, does not specifically differentiate between raised and depressed headmarkings, but states only that "for the purposes of identification marking, the manufacturer is considered the organization that certifies the fastener was manufactured, sampled, tested, inspected in accordance with this specification." In other words, the standard allows for some of the required markings to be formed into the head of the bolt (either raised or lowered) during manufacturing, and the rest to be applied later on via hand-stamping.

Since ASTM A193 does not differentiate between raised and depressed markings, these fasteners can be counterfeited in the same way as the ASTM A320 fasteners discussed in the November 1993 IFI warning. For example, distributors can procure 18-8 stainless steel bolts that were manufactured by an anonymous party, and without conducting the necessary upgrading process or certification testing, a second party could hand-stamp B8 and a manufacturer's marking into the heads to indicate that the fasteners exhibit the mechanical and chemical properties required of ASTM A193 Grade B8 Class 1.

Unless the certification documentation is specifically requested, and in most cases it is not, there is no way to determine by visual inspection whether these fasteners were properly certified and tested to meet the requirements of the ASTM standard.

ATTACHMENT H - DOE HEADMARK LIST



# Help Stamp Out Suspects/Counterfeits

## Suspect Stainless Steel Fastener Headmark List

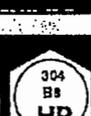
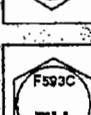
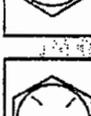
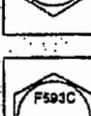
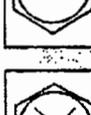
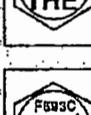
Examples of stainless steel fasteners that have been upgraded from 18-8 to ASTM A320 or ASTM A193 Grade B8 after hand stamping. The last three examples show samples of fasteners to indicate conformance to two non-compatible standards, ASTM A193 and ASTM F 593C.

Any bolt on this list should be treated as defective without further testing and process in accordance with HNF-PRD-301. Note: This list was originally Published by DOE /EH-0186, Issue No. 87-6

If any of these fasteners are located, contact your facility S/CI Point of Contact (POC) for instructions. The POC list is on the Hanford Intranet at: <http://docs.rl.gov/han.info/hiansci/hiansci.doc>. Scroll to the end of the document for the list.

	Surrounding White Color Illustrates Head Markings Before Hand Stamping
	Surrounding Black Color Illustrates Head Markings After Hand Stamping

**Suspect**

ATTACHMENT H - DOE HEADMARK LIST (cont.)

**Help Stamp Out Suspects/Counterfeits**



**Suspect Fastener Headmark List**

All Grade 5 and Grade 8 fasteners of foreign origin which do not bear any manufacturers' headmarks:



Grade 5



Grade 8

Grade 5 fasteners with the following Manufacturers' headmarks:

Mark	Manufacturer	Mark	Manufacturer
	J Jinn Her (TW)		KS Kosaka Kogyo (JP)

Grade 8 fasteners with the following Manufacturers' headmarks:

Mark	Manufacturer	Mark	Manufacturer
	A Asahi Mfg (JP)		KS Kosaka Kogyo (JP)
	NF Nippon Fasteners (JP)		RT Takai Ltd (JP)
	H Hinomoto Metal (JP)		FM Fastener Co. of Japan (JP)
	M Minamida Sieybo (JP)		KY Kyohei Mfg (JP)
	MS Minato Kogyo (JP)		J Jinn Her (TW)
	Hollow Triangle Infasco (CA, TW, JP, YU) (Greater than 1/2-inch diameter Grade 8 Hollow Triangle only)		
	E Daitel (JP)		UNY Unyttite (JP)

Grade 8.2 fasteners with the following headmarks:



Mark	Manufacturer
KS	Kosaka Kogyo (JP)

Grade A325 fasteners (Bennett Denver target only) with the following headmarks:

Type	Mark	Manufacturer
Type 1		A325 KS Kosaka Kogyo (JP)
Type 2		
Type 3		

Key: CA-Canada, JP-Japan, TW-Taiwan, YU-Yugoslavia

Any bolt on this list should be treated as defective without further testing.

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### ATTACHMENT I - REFURBISHED MOLDED CASE CIRCUIT BREAKERS

Investigations thus far of electrical components at DOE facilities uncovered over 700 suspect/ counterfeit molded-case circuit breakers that were previously used, refurbished and sold to DOE contractors.

#### 1. Recognition Factors

The following factors should be recognized regarding suspect or refurbished circuit breakers:

- A. The quality and safety of refurbished molded-case circuit breakers is questionable since they are not designed to be taken apart and serviced or refurbished. There are no electrical standards established by Underwriters Laboratory (UL) for the refurbishing of molded-case electrical circuit breakers, nor are there any "authorized" refurbishes of molded case circuit breakers. Therefore, "refurbished" molded-case circuit breakers should not be accepted for use in any DOE facility.
- B. One source of refurbished molded-case circuit breakers is from the demolition of old buildings. Some refurbishes are junk dealers who may change the amperage labels on the circuit breakers to conform to the amperage ordered and then merely clean and shine the breakers.

This situation was brought to DOE's attention by the Nuclear Regulatory Commission (NRC), which, in turn, had been informed of the practice by the company that manufactures circuit breakers. In early 1988, a sales representative identified "refurbished" circuit breakers at Diablo Canyon Nuclear Power Plant. A subsequent investigation confirmed that circuit breakers sold to the power plant as new equipment were actually refurbished. The managers of the two firms that refurbished and sold these breakers have been convicted of fraud and have paid a substantial fine.

- C. NRC published information Notice No. 88-46 dated July 8, 1988, on the investigation findings and circulated it to all applicable government agencies, including DOE. On July 20, 1988, DOE notified all field offices that refurbished circuit breakers may have been installed in critical systems. Shortly thereafter, DOE established the Suspect Equipment Notification System (SENS), a sub-module of ES&H Events and News on the Safety Performance Measurement System (SPMS). SENS has since been replaced by the Supplier Evaluation and Suspect Equipment (SESE) sub-module which includes Suspect Equipment Reports.
- D. Some of DOE's older sites have circuit breakers in use that are no longer manufactured. According to the Nuclear Management and Resources Council (NUMARC), examples of such breakers are Westinghouse breakers with frames E, EA, F, and FA. If a DOE contractor has an electrical box that requires a breaker with one of these frame sizes, that contractor would not have been able to purchase it from Westinghouse for several years. If the contractor were to order a replacement breaker from an authorized Westinghouse dealer, the dealer could not get a new replacement breaker from the manufacturer. To fill the order, the dealer had to turn to the secondary or refurbished market.

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### ATTACHMENT I - REFURBISHED MOLDED CASE CIRCUIT BREAKERS (cont.)

Dealing with an authorized distributor does not preclude ending up with refurbished circuit breakers. Westinghouse has announced that it is considering satisfying this market by manufacturing circuit breakers that will fit in these applications.

The solution, as recommended by NUMARC, is not to focus on the credentials of the distributor but on the traceability of the circuit breaker itself. A purchaser can be assured of having a new circuit breaker only if the breaker can be traced back to the original manufacturer.

#### 2. Indicators of Refurbished Breakers

Typically, refurbished circuit breakers sold as new equipment have one or more of the following characteristics:

- The style of breaker is no longer manufactured.
- The breakers may have come in cheap, generic-type packaging instead of in the manufacturer's original boxes.
- Refurbished circuit breakers are often bulk-packaged in plastic bags, brown paper bags, or cardboard boxes with handwritten labels. New circuit breakers are packed individually in boxes that are labeled with the manufacturer's name, which is usually in two or more colors, and are often date stamped.
- The original manufacturer's labels and/or the Underwriter's Laboratory (UL) or Factory Mutual (FM) labels may have been counterfeited or removed from the breaker. Refurbishing operations have been known to use copying machines to produce poor quality copies of the original manufacturer's and the certifying body's labels.
- Breakers may be labeled with the refurbisher's name rather than the label of a known manufacturer.
- The manufacturer's seal (often multicolored) across the two halves of the case of the breaker is broken or missing.
- Wire lugs (connectors) show evidence of tampering.
- The surface of the circuit breaker may be nicked or scratched yet have a high gloss. Refurbishers often coat breakers with clear plastic to produce a high gloss that gives the casual observer the impression that the breaker is new. The plastic case of new circuit breakers often have a dull appearance.
- Some rivets may have been removed and the case may be held together by wood screws, metal screws, or nuts and bolts.

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**ATTACHMENT I - REFURBISHED MOLDED CASE CIRCUIT BREAKERS (cont.)**

- Contradictory amperage ratings may appear on different parts of the same refurbished breaker. On a new breaker, the amperage rating is stamped into, raised from, or machine-painted on the handle of the circuit breaker. In order to supply a breaker with a hard-to-find rating, refurbishers have been known to file down the surface of the handle to remove the original rating and hand-paint the desired amperage rating.

3. Testing

In a news release dated February 6, 1989, the National Electrical Manufacturers Association (NEMA) announced the cancellation of its Publication AB-2-1984 entitled, "Procedures for Field Inspection and Performance Verification of Molded-Case Circuit Breakers used in Commercial and Industrial Applications," and stated the following:

"These procedures were intended for use with breakers that had been originally tested and calibrated in accordance with NEMA Standards Publication AB 1 or Underwriters Laboratories Standard UL 489, and not subsequently opened, cleaned or modified...Therefore, the Standards Publication contained none of the destructive test procedures...necessary to verify the product's ability to withstand such conditions as full voltage overload or short circuit. Without such tests, even if a rebuilt breaker had passed the tests specified in AB-2, there would be no assurance that it would not fail under overload or short circuit conditions. It is NEMA's position that regardless of the results of electrical testing, refurbished electrical circuit breakers are not reliable and should not be used."

4. Precautions

Follow these precautions regarding suspect or refurbished circuit breakers.

- Require that molded-case breakers be new and unaltered. Proof that they are new and unaltered requires the vendor to show traceability back to the original manufacturer.
- Do not rely completely on dealing with authorized dealers for protection from purchasing refurbished molded-case circuit breakers.
- Approve formal procedures for inspecting circuit breakers that are received and installed according to the indicators of refurbished breakers listed above.
- Contact the original manufacturer if any indication of misrepresentation is encountered. There are many original manufacturers of molded-case circuit breakers whose products are being refurbished and sold as new. These manufacturers have the most specific information about how to ensure that their products have not been refurbished.

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**ATTACHMENT I - REFURBISHED MOLDED CASE CIRCUIT BREAKERS (cont.)**

5. Disposition
- A. Segregate and retain all circuit breakers found with indications that they may be refurbished. These will be retained as potential evidence until specifically released by the Office of Inspector General and the Office of Nuclear Safety for Price Anderson Enforcement. Circuit breakers that may be refurbished may only be disposed of when the above organizations no longer need them as evidence.
  - B. Report suspect electrical components to Occurrence Reporting and Processing System (ORPS). The ORPS categorization group should be identified as "Cross-Category items, Potential Concerns or issues." The description of cause section in the ORPS report should include the text "suspect counterfeit parts."
  - C. Witness and document the destruction of all suspect/counterfeit circuit breakers when approval is given for disposal.

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#### **ATTACHMENT J - ASSESSMENT/SURVEILLANCE LINES OF INQUIRY**

1. S/CI processes and other S/CI related processes are effective in addressing the safety-related aspects of S/CI.
2. Formal supplier qualification and re-qualification processes are established and implemented, including routine collection of evaluations of feedback on vendor performance.
3. Controls are established on a graded basis that considers the risks involved and historical experience with S/CIs.
4. Controls are implemented for segregation and separate storage of material identified as suspect/counterfeit
5. Subcontractors have established and implemented sufficient controls to preclude an introduction or use of S/CIs. These controls address construction materials, maintenance or modification equipment and components, and the use subcontractor owned or rented equipment (cranes, hoists, etc.) on site.
6. S/CI processes, requirements, and controls are fully integrated into Integrated Safety Management (ISM) and quality assurance programs and procedures, e.g. training, procurement, maintenance, and assessment) to ensure adequate linkage to S/CI elements.
7. Expectations are established for timeliness in determining whether nonconforming items are S/CI.
8. Protocols are established for clearly identifying S/CIs that are determined to be acceptable for use
9. Inspections for S/CI materials are incorporated into routine maintenance activities, and clear guidance is provided for the disposition of installed S/CI materials identified during routine inspections and maintenance activities.
10. Expectations for S/CI controls are integrated within existing processes, such as routine and special inspections for S/CIs in site procedures, and guidance is provided for performing such inspections.
11. Roles and responsibilities and interfaces for management of S/CIs are clearly assigned, including provisions for the handling of sensitive information and interfacing with the local Office of the Inspector General (IG), to ensure effective, consistent, and timely communication of S/CI information.
12. S/CI reporting requirements are effectively integrated into the site contractors' processes for disposition of non-conforming items, such as NCR processes, as required by appropriate DOE directives.
13. Lessons learned processes are evaluated to determine whether all available and relevant information resources, such as the Government Industry Data Exchange Program (GIDEP), are being utilized for screening S/CI and other relevant information for potential applicability to site activities.

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**ATTACHMENT J – ASSESSMENT/SURVEILLANCE LINES OF INQUIRY (cont.)**

14. Lessons learned processes are evaluated to ensure that significant requirements and performance expectations have been established for the documentation of applicability reviews, needed actions, and actions taken for lessons learned that require line management attention and action.
15. Lessons learned requiring line management actions are integrated with the site's corrective action management processes to ensure formal tracking, feedback, and closure of actions taken.
16. Corrective actions and management procedures include formal linkage to S/CI reporting requirements for the site office, Occurrence Reporting System (ORPS), contractor General Counsel, and the IG.
17. Site mechanisms, such as a controlled product list, are established and used to maintain current and accurate information on S/CIs. Provisions are available for making this list readily available to site personnel who have S/CI responsibilities for procurement, inspection, and other areas associated with the implementation of S/CI controls.
18. S/CI training programs-include the identification of positions and associated personnel required to receive training, the processes for designating those personnel who must receive initial and refresher training, and the required frequencies for refresher training.
19. All personnel involved in design, system engineering, procurement, inspection, maintenance, and other functions involving potential S/CI materials receive S/CI process and hands-on training.
20. Training programs place special emphasis on ensuring that system engineers involved in the design, procurement, and inspection of materials and components with the potential for S/CI receive such training.
21. Subcontractors involved in the procurement or handling of potential S/CI materials and components receive initial and refresher training and are knowledgeable of site S/CI processes, procedures, requirements, and controls.
22. S/CI training addresses site-specific processes and procedures for identifying, dispositioning, and reporting S/CIs, including reporting to the IG.
23. S/CI processes are subject to regular self-assessment, consistent with site self-assessment protocol.
24. Assessments are performed for S/CI processes to evaluate significant changes to the S/CI processes and to establish a baseline for implementation where appropriate. Based on that baseline review, further assessments are tailored to the maturity of the S/CI processes.
25. S/CI lines of inquiry are considered and evaluated, as appropriate, during assessments of areas that interface with S/CI processes (procurement process, NCR process, etc.).

**TECHNICAL DATA SHEET**  
AMEC Americas Limited



*The document revision number is indicated below. Please replace all revised pages of this document and destroy the superseded copies.*

<b>PROJECT:</b>	Final DBVS Design	145579-V-DS-005.1	REV. 3
<b>PROJECT NO.:</b>	145579	<b>EXHAUST STACK</b>	
<b>CLIENT:</b>	AMEC E&E - Richland Washington	<b>EQ. NO.:</b>	36-N26-024

REV. NO.	ISSUED FOR	ORIGIN	DATE	INITIAL
A	Internal Review	DW	02-Sep-04	DW
B	Internal Approval	DW	12-Oct-04	DW
C	CH2M Hill Review	DW	19-Oct-04	DW
0	Construction	DW	15-Dec-04	DW
1	Bid Request	DW	11-Jan-05	DW
2	Bid Request	DW	02-Feb-05	DW
3	Construction	SH	24-Mar-05	SH

**DOCUMENT APPROVAL**

<p><b>CLIENT APPROVAL (AMEC RICHLAND)</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u>[Signature]</u> Date: <u>3/28/05</u></p> <p>Q.A. Rep.: <u>[Signature]</u> Date: <u>3/28/05</u></p>	<p><b>AMEC AMERICAS LIMITED (TRAIL)</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u>J. Heim</u> Date: <u>March 24, 2005</u></p> <p>Discipline Lead: <u>[Signature]</u> Date: <u>28 Mar 05</u></p> <p>Originator: <u>[Signature]</u> Date: <u>24-Mar-05</u></p>
<p><b>CLIENT APPROVAL (CH2M HILL)</b> <i>with comments</i></p> <p>Project Manager: <u>[Signature]</u> Date: <u>4/7/05</u></p>	

\* See attached e-mail.

**Shuford, David H (Dave)**

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**From:** Shuford, David H (Dave)  
**Sent:** Thursday, April 07, 2005 1:32 PM  
**To:** Hamilton, Dennis W  
**Cc:** 'Theresa Carreiro'; Mark Lucas; 'Bill Bishop'; John Stephens (TRL); 'Luey, Ja-Kael'; Davis, Susan C (Chris); Mcevoy, Terri; May, Thomas H (Tom); Tony Heim  
**Subject:** Steel Stack Specification 145579-D-SP-005 Rev 3

I have reviewed the steel stack specification 145579-D-SP-005 Rev 3, associated data sheets 145579-D-DS-005.1 Rev 3 and 145579-D-DS-005.2 Rev 0 and TECN 017.002. I recommend that you approve these items **with the following comments:**

1. Revise 145579-V-SP-005 Section 3.3.2.6 to reflect a soil type classification of "SC" vice "SE".
2. Revise 145579-V-SP-005 Section 3.3.11 to delete the current text and replace with:

**"Section 3.3.11 Qualification**

*The Seller will be expected to provide testing of their equipment per DOE-HDBK-1169 "US DOE, Nuclear Air Cleaning Handbook" section 5.5 Guidelines. Testing and inspection shall also adhere to the standard described in ASME STS-1 chapter 8. Seller shall provide testing equipment."*

3. Revise 145579-D-DS-005.1 to reflect a maximum temperature of 372 °F vice 248 °F.
4. Revise 145579-D-DS-005.1 to reflect a maximum flow rate of 9000 ACFM vice 7305 ACFM.
5. Revise 145579-D-DS-005.1 to reflect that the stack environment is toxic.
6. Reconcile the stack port locations on F-145579-36-V-0021 Rev D and data sheet 145579-D-DS-005.1 and make them consistent.
7. Revise 145579-D-DS-005.1 exhaust gas inlet dimension from 24" to 22".
8. Reconcile the exhaust gas inlet location on F-145579-36-V-0021 Rev D (22' 8") and data sheet 145579-D-DS-005.1 (20') and make them consistent.

These comments and the resolutions were discussed with AMEC and agreed to at the 4/7/2005 design review meeting. A hard copy will be provided for your signature. Please contact me if you have any questions.

Dave

Chris – this closes action #548



**TECHNICAL DATA SHEET**

<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-DS-005.1</b>	<b>REV. 3</b>
<b>PROJECT NO.:</b>	<b>145579</b>	<b>EXHAUST STACK</b>	
<b>CLIENT:</b>	<b>AMEC E&amp;E - Richland Washington</b>	<b>EQ. NO.:</b>	<b>36-N26-024</b>

**REFERENCE SPECIFICATION**

<b>Document No.</b>	<b>Specification</b>
145579-V-SP-005	EXHAUST STACK

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Data Sheet \_\_\_\_\_ 2 Pages

Bidders Drawing & Data Commitments Sheet \_\_\_\_\_ 1 Page



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<b>PROJECT NO.:</b>		145579		EXHAUST STACK			
<b>CLIENT:</b>		AMEC E&E - Richland Washington		<b>EQ. NO.:</b>		36-N26-024	
<b>Data Sheet 1 of 2</b>							
<b>No. Required</b>		1		<b>Area</b>		36	
<b>PFD #</b>		F-145579-00-A-0023		<b>Stream Number</b>		46	
<b>Reference Specification:</b>		145579-V-SP-005		<b>Quality Assurance Level</b>		EQ	
<b>Operating Conditions</b>							
		<b>Rev</b>				<b>Rev</b>	
<b>Location (Indoors/Outdoors)</b>		Outdoors		<b>Environment</b>			
<b>Operation (Cont. / Intermittent)</b>		Continuous		-Radioactive		No	
<b>Days per year</b>		365		-Toxic		No	
<b>Hours per day</b>		24		-Corrosive		Yes	
<b>Availability (%)</b>		100		-Flammable		No	
<b>Site Elevation (ft)</b>		663		<b>Ambient temp - min (°F)</b>		-25	
<b>Stack Temperature - max (°F)</b>		248		<b>Ambient temp - max (°F)</b>		115	
<b>Stack Temperature - min (°F)</b>		-25					
<b>Description</b>							
<b>Service</b>				<b>Process Data:</b>			
<b>Outside Diameter (in)</b>		24		<b>Design Temp (°F)</b>		248 to -25	
<b>Wall Thickness (in) *</b>				<b>Design Pressure (in WG)</b>		2	
<b>Height (ft)</b>		155		<b>Gas Flow (ACFM)</b>		7305	
<b>Top of Stack El. (ft)</b>		818		<b>Gas Velocity (fpm) *</b>		2	
<b>Weight No greater than (lbs)</b>		40,000		<b>Stack Exit Velocity (fpm)</b>		2677	
<b>Concrete Pad Dimensions</b>				<b>Minimum Stack Exit Velocity (fpm)</b>		2500	
- Height (ft)		4		<b>Corrosion Allowance (in)</b>		0.0625	
- Width (ft)		20		<b>Wind Loads:</b>			
- Length (ft)		30		Velocity (3 second gust) (mph)		85	
<b>Supports:</b>		*		Importance Factor		1.15	
				Exposure Category		C	
				Seismic Loads: (Zone 2b, soil type SB)			
				Coeff Aa		2	
<b>Anchor Bolts:</b>		*		Coeff Av		2	
<b>Number</b>		*		<b>Grating Floor Load (psf) *</b>		2	
<b>Size (in) *</b>							
<b>Construction</b>							
	<b>Type</b>	<b>Material</b>	<b>Number</b>	<b>Thickness</b>	<b>Comments</b>		<b>Rev</b>
Shell							
Bottom							
Strakes							
Stiffeners							
Internal Pipe							
Internal Plate							
<b>Date</b>	02-Sep-04	12-Oct-04	18-Oct-04	15-Dec-04	11-Jan-05	02-Feb-05	24-Mar-05
<b>By</b>	DJW	DW	DW	DW	DW	DW	DW
<b>Chked</b>	AP	AP	AP	AP	AP	AP	AP
<b>Rev.</b>	A	B	C	0	1	2	3



TECHNICAL DATA SHEETS

Data sheet 2 of 2

Construction cont'd

	Type	Material	Number	Thickness	Comments	Rev
Pipe Supports						
Platforms	Landing at 17.5 ft.		1		See ASME STS-1	
Grating	Floor of landing				See ASME STS-1	
Ladder	Up to landing		1		See ASME STS-1	
Handrails	Around Landing				See ASME STS-1	
Supports						
Gaskets, external						
Gaskets, internal						
Bolts, external						
Bolts, internal						
Nuts, internal						
Insulation						
Grounding Lugs	Terminals	Steel	2	3/16" min	Opposite sides	
Lifting Lugs						
Lining						
Grout						
Lighting (Volt/Phase/Hz)	110/1/60					3
Interface options for client control system	No					

Testing & Inspections

Coatings and Insulation

	Witness Req'd	Rev		
Dye Penetrant	welds	as per STS-1	2	External Surface Preparation *
Magnetic Particle	welds	as per STS-1	2	External Coatings, Primer *
Radiograph	welds	as per STS-1		External Coatings, Finish *
				Internal Surface Preparation *
				Internal Coating *

Instrumentation Connection Ports - Minimum nozzles required indicated below

Purpose	Size	Number	Rating	Elevation(s)	Comments
Sample Return Lines	2"	2	150#	31'-6"	at 90° offset
Sample Lines	4"	2	150#	29'-6"	at 90° offset
Visual Inspection	4"	1	150#	28'-6"	
Flow Element	2"	1	150#	51'-6"	
Inlet	24"	1	150#	20'	Angled -45° from horizontal
Stack Drain	1"	1	150#	Lowest drainage point	

Comments:

1. Items marked with an \* shall be filled in by VENDOR

\*\*\* For the exact locations of the grounding lugs see drawing F-145579-36-V-0021

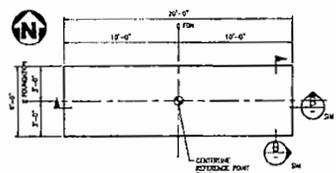
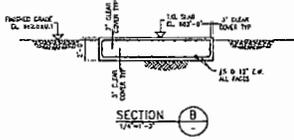
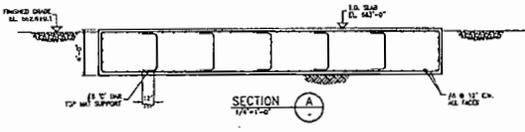
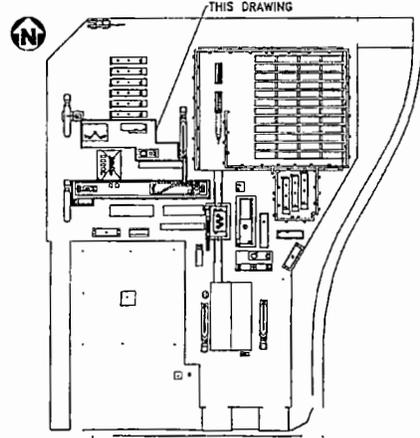
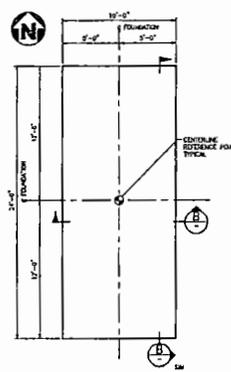
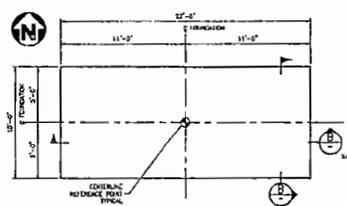
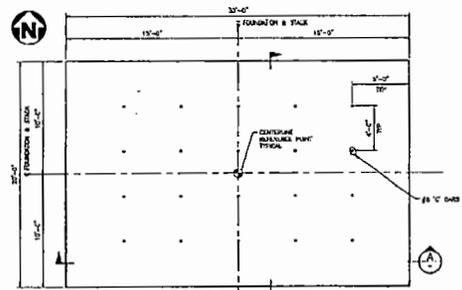
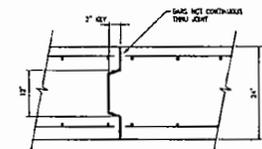
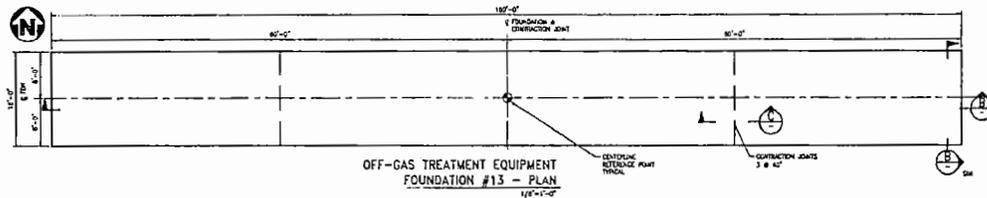
Date	02-Sep-04	12-Oct-04	18-Oct-04	15-Dec-04	11-Jan-05	02-Feb-05	24-Mar-05
By	DW						
Chked	AP						
Rev.	A	B	C	0	1	2	3





GS-1019

In making requests for amendment of this or any other drawing, the Engineer and/or contractor shall specify the exact location of the change to be made and the nature of the change. All changes shall be made in accordance with the provisions of the contract documents. The Engineer shall be responsible for the accuracy, completeness or correctness of the data.



NOTES:  
FOR GENERAL NOTES, DESIGN CRITERIA, MATERIAL SPECIFICATIONS, AND FOUNDATION LOCATIONS REFER TO DRAWING H-14-10678V BULK VITRIFICATION - CIVIL SITE IMPROVEMENTS

THIS DRAWING FORMERLY ISSUED AS AMEC DRAWING F-143543-00-C-0211.

amec		145579-FINAL DBVS DESIGN	
NAME		U.S. DEPARTMENT OF ENERGY	
DESIGNER		Office of Heavy Foundation	
CHECKER		BULK VITRIFICATION	
DRAWN		OFF-GAS AREA	
SCALE		FDNS - PLANS & SECTIONS	
DATE		H-14-106796 D	
PROJECT		2410 0000	
SHEET NO.		1	
SHEET TOTAL		82115	

DWG NO	TITLE	REF NUMBER	TITLE	DATE	BY	CHKD	REV
DRAWING TRACEMILITY LIST		AMEC USDO OH	H-14-10678D				

RPP-24544 REV 1d

**TECHNICAL DATA SHEET**  
AMEC Americas Limited



*The document revision number is indicated below. Please replace all revised pages of this document and destroy the superseded copies.*

<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-DS-005.2</b>	<b>REV. 0</b>
<b>PROJECT NO.:</b>	<b>145579</b>	<b>INLET AIR STACK</b>	
<b>CLIENT:</b>	<b>AMEC E&amp;E - Richland Washington</b>	<b>EQ. NO.:</b>	<b>36-N26-121</b>

REV. NO.	ISSUED FOR	ORIGIN	DATE	INITIAL
A	Internal Review (Issued under 145579-V-DS-016.1)	SH	18-Feb-05	SH
B	Internal Approval (New Document No. 145579-V-DS-005.2)	SH	01-Mar-05	SH
C	CH2M Hill Review	SH	07-Mar-05	SH
D	90% Report	SH	15-Mar-05	SH
0	Construction	SH	24-Mar-05	AI

**DOCUMENT APPROVAL**

<p><b>CLIENT APPROVAL (AMEC RICHLAND)</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u><i>[Signature]</i></u></p> <p>Date: <u><i>3/28/05</i></u></p> <p>Q.A. Rep.: <u><i>[Signature]</i></u></p> <p>Date: <u><i>3/28/05</i></u></p>	<p><b>AMEC AMERICAS LIMITED (TRAIL)</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u><i>J. Heim</i></u></p> <p>Date: <u><i>March 24, 2005</i></u></p> <p>Discipline Lead: <u><i>[Signature]</i></u></p> <p>Date: <u><i>28 MAR 05</i></u></p> <p>Originator: <u><i>[Signature]</i></u></p> <p>Date: <u><i>24-Mar-05</i></u></p>
<p><b>CLIENT APPROVAL (CH2M HILL)</b></p> <p>Project Manager: <u><i>[Signature]</i></u></p> <p>Date: <u><i>4/8/05</i></u></p>	


**TECHNICAL DATA SHEET**

<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-DS-005.2</b>	<b>REV. 0</b>
<b>PROJECT NO.:</b>	<b>145579</b>	<b>INLET AIR STACK</b>	
<b>CLIENT:</b>	<b>AMEC E&amp;E - Richland Washington</b>	<b>EQ. NO.:</b>	<b>36-N26-121</b>

**REFERENCE SPECIFICATION**

<b>Document No.</b>	<b>Specification</b>
145579-V-SP-005	Steel Exhaust Stack

**CONTENTS**

Data Sheet \_\_\_\_\_ 3 Pages

Bidders Drawing & Data Commitments Sheet \_\_\_\_\_ 1 Page



TECHNICAL DATA SHEETS

<b>PROJECT:</b>		Final DBVS Design		145579-V-DS-005.2		REV. 0	
<b>PROJECT NO.:</b>		145579		INLET AIR STACK			
<b>CLIENT:</b>		AMEC E&E - Richland Washington		<b>EQ. NO.:</b>		36-N26-121	
<b>Data Sheet 1 of 2</b>							
<b>No. Required</b>		1		<b>Area</b>		36	
<b>P&amp;ID#</b>		F-145579-36-A-0099 Rev G		<b>Stream Number</b>			
<b>Reference Specification:</b>		145579-V-SP-005		<b>Quality Assurance Level</b>		EQ	
<b>Operating Conditions</b>							
		<b>Rev</b>				<b>Rev</b>	
<b>Location (Indoors/Outdoors)</b>		Outdoors		<b>Environment</b>			
<b>Operation (Cont. / Intermittent)</b>		Continuous		-Radioactive		No	
<b>Days per year</b>		365		-Toxic		No	
<b>Hours per day</b>		24		-Corrosive		No	
<b>Availability (%)</b>		100		-Flammable		No	
<b>Site Elevation (ft)</b>		663		<b>Ambient temp - min (°F)</b>		-25	
<b>Stack Temperature - max (°F)</b>		200		<b>Ambient temp - max (°F)</b>		115	
<b>Stack Temperature - min (°F)</b>		-25					
<b>Description</b>							
<b>Service</b>				<b>Process Data:</b>			
<b>Outside Diameter (in)</b>		24(minimum) D		<b>Design Temp (°F)</b>		115	
<b>Wall Thickness (in) *</b>				<b>Design Pressure</b>		atm	
<b>Height (ft)</b>		155		<b>Gas Flow (ACFM)</b>		777	
<b>Top of Stack El. (ft)</b>		818		<b>Gas Velocity (fpm) *</b>			
<b>Weight No greater than (lbs)</b>		40,000		<b>Stack Entry Velocity (fpm)</b>		N/A	
<b>Concrete Pad Dimensions</b>				<b>Minimum Stack Velocity (fpm)</b>		N/A	
- Height (ft)		4		<b>Corrosion Allowance (in)</b>		0.0625	
- Width (ft)		22					
- Length (ft)		22					
<b>Supports (Self-Supporting): *</b>							
<b>Anchor Bolts:</b>							
<b>Number *</b>							
<b>Size (in) *</b>							
<b>Construction</b>							
		<b>Type</b>		<b>Material</b>		<b>Number</b>	
<b>Shell</b>							
<b>Bottom</b>							
<b>Strakes</b>							
<b>Stiffeners</b>							
<b>Internal Pipe</b>							
<b>Internal Plate</b>							
<b>Date</b>		18-Feb-05		01-Mar-05		07-Mar-05	
<b>By</b>		SH		SH		SH	
<b>Chked</b>		GJ		AP		AP	
<b>Rev.</b>		A		B		C	



TECHNICAL DATA SHEETS

Data sheet 2 of 2

Construction cont'd

	Type	Material	Number	Thickness	Comments	Rev
Supports						
Gaskets, external						
Gaskets, internal						
Bolts, external						
Grounding Lugs	Terminals	Steel	2	3/16" min.	Opposite sides	
Lifting Lugs						
Lining						
Grout						
Lighting (Volt/Phase/Hz)	110/1/60					
Interface options for client control system	No					

Testing & Inspections

Coatings and Insulation

	Witness Req'd	Rev		
Dye Penetrant	welds	as per STS-1	External Surface Preparation	*
Magnetic Particle	welds	as per STS-1	External Coatings, Primer	*
Radiograph	welds	as per STS-1	External Coatings, Finish	*
			Internal Surface Preparation	*
			Internal Coating	*

Minimum nozzles required indicated below

Purpose	Size	Number	Rating	Elevation(s)	Comments
Inlet N1	6"	1	150#	46'-2"	Angled -45° from horizontal
Inlet N2	10"	1	150#	33'	Angled -45° from horizontal
Stack Drain	1"	1	150#	Lowest drainage point	

Comments:

1. This Data Sheet shall be used in conjunction with specification 145579-V-SP-005, Steel Exhaust Stack
2. See attached drawings F-145579-36-V-0015 and H-14-106800
3. Items marked with an \* shall be filled by VENDOR

Date	18-Feb-05	01-Mar-05	07-Mar-05	15-Mar-05	24-Mar-05		
By	SH	SH	SH	SH	SH		
Chked	GJ	AP	AP	AP	AP		
Rev.	A	B	C	D	0		



**TECHNICAL DATA SHEETS**

<b>PROJECT:</b>	<b>Final DBVS Design</b>	<b>145579-V-DS-005.2</b>	<b>REV. 0</b>
<b>PROJECT NO.:</b>	<b>145579</b>	<b>INLET AIR STACK</b>	
<b>CLIENT:</b>	<b>AMEC E&amp;E - Richland, Washington</b>		

**BIDDERS DRAWING AND DATA COMMITMENTS**

Vendor shall supply all drawings, manuals and documentation in the quantities indicated. Approval drawings are due within the listed number of calendar days after issue of the Purchase Order or Letter of Intent. The dates set out for drawing and data su

<p><b>SEND ALL DOCUMENTS TO:</b></p> <p>Submit all documents via courier service                  Faxed documents must be followed by the originals.                  Electronic E-mail or FTP transmissions of drawings &amp; data must be copied to Document Control                  Always include a transmittal</p>	<p><b>AMEC Americas Limited</b>                  1385 Cedar Avenue                  Trail, BC, Canada                  V1R 4C3                  Attn: Document Control                  Phone: (250) 368-2400                  Fax: (250) 368-2401</p>
--	--

**BIDDERS MUST PROVIDE ESTIMATED LEAD TIMES FOR APPROVAL DRAWINGS**

Proposal	Bidder shall include this data for each item			REVIEW ITEMS DUE WITHIN (DAYS)	VENDOR COMMITMENT (SEE NOTE 4) (DAYS)
	Review	Required before ordering or start of fabrication			
		Final	Required within 7 days prior to shipment and before final payment		
PROPOSAL	REVIEW	FINAL	DESCRIPTION	(DAYS)	(DAYS)
1			QA program	Bid	
1			Experience list and maintainability information	Bid	
E+3			Design, fabrication & delivery schedule	PO+7	
E+3	E+3	E+6	Outline drawings and layout drawings indicating weights and dimensions	PO+14	
E+3	E+3	E+6	Technical brochures on purchased components	PO+21	
	E+3	E+6	Calculations	PO+14	
	E+1	E+6	Spare parts list	Del-14	
	E+1	E+6	Set of installation and maintenance manuals c/w technical literature for all equipment and devices	Del-14	
		6	Site commissioning record & test results	COM+14	

Electronic or Fax: (250) 368-2400 within 7 calendar days after issue of PO or Letter of Intent. All dates are within 7 calendar days of delivery of drawings. All dates are within 7 calendar days of completion.

**THE TIMELY RECEIPT OF THE VENDOR DOCUMENTS IS CRITICAL TO THIS PROJECT**

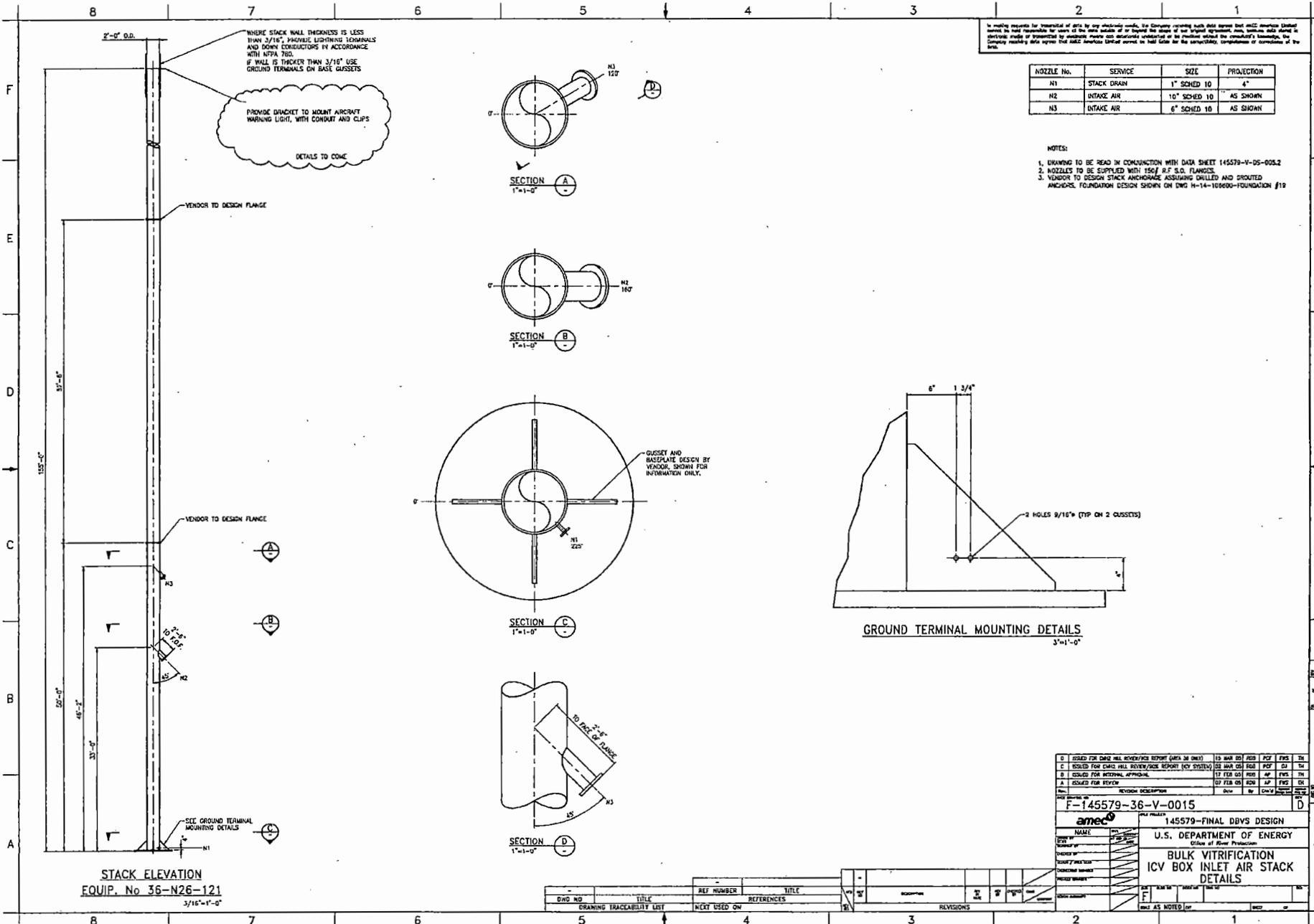
I agree to provide the listed documentation and data and the dates shown above.

---

Vendor Signature Date

GS-1025

RPP-24544 REV 1d



In making requests for presentation of data by any electronic media, the Company operating such data system shall agree that AMEC America Limited accepts no responsibility for errors of the kind outside of or beyond the scope of our original agreement, then, however, shall accept its electronic media or presentation by electronic means with reasonable understanding of its provision without the consultant's knowledge, the Company hereby agrees that AMEC America Limited shall not be liable for the consequences, completion or non-completion of the work.

NOZZLE No.	SERVICE	SIZE	PROJECTION
N1	STACK DRAIN	1" SCHED 10	4"
N2	INTAKE AIR	10" SCHED 10	AS SHOWN
N3	INTAKE AIR	6" SCHED 10	AS SHOWN

- NOTES:
1. DRAWING TO BE READ IN CONJUNCTION WITH DATA SHEET 145579-V-05-005.2
  2. NOZZLES TO BE SUPPLIED WITH 150# R.F.S.O. FLANGES.
  3. VENDOR TO DESIGN STACK ANCHORAGE ASSUMING DRILLED AND GROUTED ANCHORS. FOUNDATION DESIGN SHOWN ON DWG H-14-10-0000-FOUNDATION #10

STACK ELEVATION  
EQUIP. No 36-N26-121  
3/16"-1'-0"

GROUND TERMINAL MOUNTING DETAILS  
3'-1'-0"

NO.	REVISION DESCRIPTION	DATE	BY	CHK'D	APP'D
1	ISSUED FOR DESIGN REVIEW	13 MAR 03	DBS	PCP	TH
2	ISSUED FOR DESIGN REVIEW	02 APR 03	DBS	PCP	TH
3	ISSUED FOR INTERNAL APPROVAL	17 FEB 03	DBS	AP	TH
4	ISSUED FOR REVIEW	07 FEB 03	DBS	LAP	TH
5	REVISION DESCRIPTION	1	DBS	TH	TH

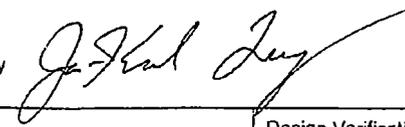
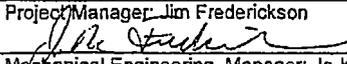
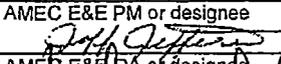
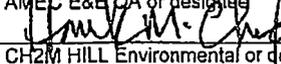
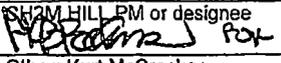
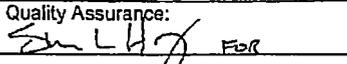
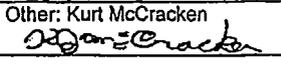
F-145579-36-V-0015

AMEC  
145579-FINAL DBVS DESIGN  
U.S. DEPARTMENT OF ENERGY  
Office of River Protection  
BULK VITRIFICATION  
ICV BOX INLET AIR STACK  
DETAILS

DWG NO	TITLE	REF NUMBER	TITLE	DATE	BY	CHK'D	APP'D
5	DRAWING TRACEABILITY LIST						
4	NEXT USED ON						
3	REVISONS						



V-SP-005.R03.3

		<h2 style="margin: 0;">CHANGE NOTICE</h2>				CN No. <b>V-SP-005.R03.3</b> Revision 1							
Change Notice (CN) Category (Check One) Supplemental <input checked="" type="checkbox"/> Direct Revision <input type="checkbox"/> Cancel <input type="checkbox"/> Quality Program Procedure Change <input type="checkbox"/>		Originator's Name and Signature. Ja-Kael Luey 				Date 11/10/05							
Affects Cost? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		Project Title/ Project No. Demonstration Bulk Vitrification System / 145579		Design Verification Required (Independent Review) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Safety Class (If Rq'd) N/A							
Affects Schedule? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Primary Document Changed by this CN (include sheet no. and rev) Steel Exhaust Stack Specification 145579-V-SP-005, Rev 3		Affected Documents Superseded Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Contract No.							
Other Documents Affected by this CN: N/A		Reason for Change: 1) During the Process Hazards Analysis for the DBVS Project the design was modified to eliminate the need for the Inlet Stack. 2) During an AMEC E&E review of the specification for testing requirements a number of items were noted that require clarification in the specification to ensure performance can be determined. 3) Ensure comments from approval of Revision 3 are captured. 4) Incorporate additional inlet port for Exhaust Stack for tie-in to new By-Pass system. 5) Criteria for nozzle locations not provided on previous drawing revision.											
Detailed Description of Change (Use Continuation Sheet as Applicable): Specification 145579-V-SP-005 Revision 3: 1. Sections 1.1 and 1.2 – Delete work scope associated with the Inlet Air Stack, an Inlet Air Stack is not required. 2. Table 2-2 – Delete reference to ASME N510 Testing of Nuclear Treatment Systems. Delete reference to RPP-8530. 3. Section 3.1 and all subsections – Delete work scope associated with the Inlet Air Stack. 4. Section 3.1 – Replace third sentence with the following "The Exhaust Stack shall meet the requirements of ASME STS-1 "Steel Stacks" and DOE-HDBK-1169 "U.S. Department of Energy Nuclear Air Cleaning Handbook." 5. Section 3.2 and all subsections – Delete work scope associated with the Inlet Air Stack. 6. Section 3.3 and all subsections – Delete work scope associated with the Inlet Air Stack.													
Review/Approval Authorities: A = Approval, R = Review, I = Information (Check where applicable for change notice)													
Printed Name/Signature			Date	R	A	I	Printed Name/Signature			Date	R	A	I
Program Director:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Independent Review*:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project Manager: Jim Frederickson 			11/10/05	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	AMEC E&E PM or designee 			11/10/05	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Mechanical Engineering Manager: Ja-Kael Luey 			11/10/05	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	AMEC E&E QA or designee 			11/10/05	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Electrical Engineering Manager: Dave King				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CH2M HILL Environmental or designee				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Process Technology Manager:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CH2M HILL PM or designee 			11/10/05	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Quality Assurance:  FOR			11/10/05	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Other: Kurt McCracken 			11/10/05	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
* Design Verification per EP 3.9 required? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Assign Independent Reviewer													
CN Incorporated? PM or designee sign and date: _____													



## CONTINUATION SHEET CHANGE NOTICE

CN No. **V-SP-005.R03.3**

Revision 1

Page 2 of 2

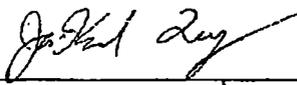
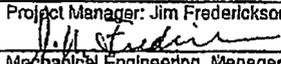
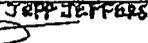
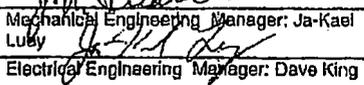
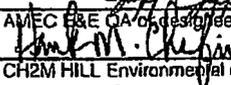
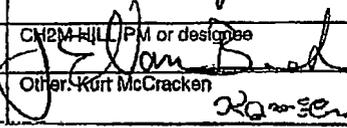
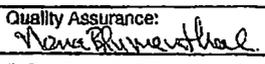
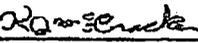
Specification 145579-V-SP-005 Revision 3, continued:

7. Section 3.3 – Insert the following between the first and second paragraphs of the section:  
Calculations prepared by the Seller shall contain the following information clearly stated in the calculation:
- Design Inputs: Design Inputs such as design drawings, vendor cut sheets, and other Seller calculations shall be clearly defined and attached to the calculation as required for clarity.
  - Design References: References shall be stated. Recommend that excerpts be included as calculation attachments if reference is not readily retrievable.
  - Assumptions: State all assumptions.
  - Approach/Design Methodology: Discuss design criteria for which the calculation will be checked against. Identify the approach to be used in the calculation to determine how the criteria will be demonstrated to be met by the design (i.e., analysis using a specific software or approach as defined in a national standard).
  - Conclusions/Results Interpretation: Discuss results in terms of how the design criteria were met. Each design criteria shall be individually addressed in the discussion, with references to attachments as needed for clarity.
  - Software Verification and Validation: Provide documentation that specialty software was checked using vendor-provided test problems and/or literature accepted test problems. Finite element programs and industry-provided software are examples that require Verification and Validation.
8. Replace Section 3.3.11 with the following – “The structural design of the stack shall be qualified by analysis in accordance with Section 3.3.2.1. A complete stack inspection shall be performed in accordance with ASME-STS-1-2000 Section 9.4. Seller shall provide inspection equipment and provide three copies of the final inspection report.”
9. Section 4.0 and all subsections – Delete work scope associated with Inlet Air Stack.
10. Section 4.3.2 – Replace section text with “Inspection and testing of the Exhaust Stack shall be in accordance with ASME STS-1.”
11. Section 8.0 – Attachment 145579-V-DS-005.1 Revision 5 is replaced with Revision 6.
12. Section 8.0 – Attachment 145579-V-DS-005.2 is deleted.
13. Section 8.0 – Attachment F-145579-36-V-0015 is deleted.
14. Section 8.0 – Replace Attachment F-145579-36-V-0021 Revision D with F-145579-36-V-0021 Revision F. Change reflects additional inlet connection point. Change also adds criteria for locating sample nozzles (see 40CFR60, Method 1, Section 11.0).

EP 3.8-1F October 2003

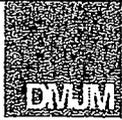
EP 3.8.1F October 2003

145579-V-SP-005-CN-002

		<h2 style="margin: 0;">CHANGE NOTICE</h2>				Page <u>1</u> of <u>2</u>				CN No. 145579-V-SP-005-CN-002			
Change Notice (CN) Category (Check One) Supplemental <input checked="" type="checkbox"/> Direct Revision <input type="checkbox"/> Cancel <input type="checkbox"/> Quality Program Procedure Change <input type="checkbox"/>		Originator's Name and Signature Ja-Kael Luey 						Date 03/08/2006					
Affects Cost? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Project Title/ Project No. Demonstration Bulk Vitrification System / 145579				Design Verification Required (Independent Review) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				Safety Class (If Req'd) N/A			
Affects Schedule? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Primary Document Changed by this CN (include sheet no. and rev) Steel Exhaust Stack Specification 145579-V-SP-005, Rev 3				Affected Documents Superseded Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				Contract No.			
Other Documents Affected by this CN: 145579-V-DS-005.1 Rev B F-145579-36-V-0021 Rev H		Reason for Change: The Exhaust Stack design has evolved through Change Notices and revisions from vendor design calculations. Revised vendor information for the DBVS Exhaust Fans, which interface with the Exhaust Stack, has been received and required changes to the stack design. Changes in the stack design that impact the concrete foundation will be accounted for in the design of the foundation.											
Detailed Description of Change (Use Continuation Sheet as Applicable): Specification 145579-V-SP-005 Revision 3: <ol style="list-style-type: none"> <li>Section 1.2 under Detail Design: Replace sentence "Vendor shall design anchorage assuming drilled and grouted anchors to the foundation shown on Attached Drawing H-14-106796, Rev D, Foundation #10 and H-14-106800 Rev. C" to "Vendor shall design anchors in accordance with STS-1 and provide recommendation for stack foundation. The design of the stack foundation is not in the Seller work scope."</li> <li>Section 8.0: Delete Drawings H-14-106796 and H-14-106800.</li> </ol> BASIS – Based on the calculated size of the anchors needed for Exhaust Stack and the penetration depth, the vendor recommends the use of embedded anchors instead of drilled and grouted anchors. Since the Exhaust Stack foundation has not been designed and poured yet, this change can be accommodated by the project and will result in a more complete overall design (assuming that sufficient space exists to implement the recommendations from the Stack Vendor).													
Review/Approval Authorities: A = Approval, R = Review, I = Information (Check where applicable for change notice)													
Printed Name/Signature			Date	R	A	I	Printed Name/Signature			Date	R	A	I
Program Director:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Independent Review*:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project Manager: Jim Frederickson 			3/5/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	AMEC E&E PM or designee 			3/9/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Mechanical Engineering Manager: Ja-Kael Luey 			3/5/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	AMEC E&E QA or designee 			3/9/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Electrical Engineering Manager: Dave King				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CH2M HILL Environmental or designee				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Process Technology Manager:				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CH2M HILL PM or designee 			3/9/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Quality Assurance: 			3/8/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Other: Kurt McCracken 			3/8/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
* Design Verification per EP 3.9 required? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Assign Independent Reviewer													
CN Incorporated? PM or designee sign and date: _____													

EP 3.5.1F October 2003

Post-it Fax  
 To: SAND  
 Co./Dept: AME  
 Phone # 942-1114  
 Fax # 942-1122



**CONTINUATION SHEET CHANGE NOTICE**

CN No. 145579-V-SP-005-CN-002

Page 2 of 2

Data Sheet 145579-V-DS-005.1 Revision 8:

Under description: Delete 40,000 lbs and replace with an "\*" to denote Seller to provide weight.

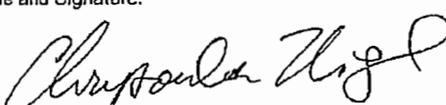
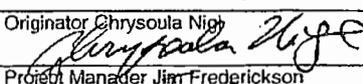
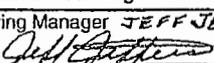
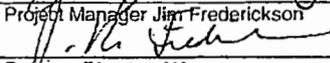
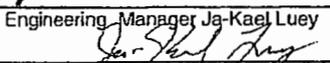
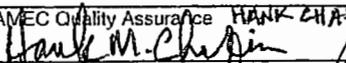
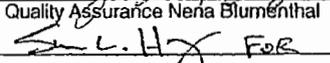
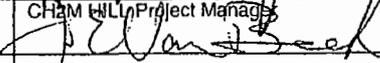
BASIS – The design of the stack has evolved and has a projected total weight of around 46,000 lbs. Original weight limit was based on having the concrete foundation in place prior to information being available for the stack. Since the concrete pad design is now being developed using the stack information as an input, the weight limit no longer applies.

Drawing F-145579-36-V-0021 Revision H, Zone B3: Replace grade to centerline height from "13 feet" to "13 feet 6.5 inches"

BASIS – The height provided on the drawing in Change Notice 145579-V-DS-005.1-CN.001 Revision 1 was based on proposal information for the exhaust fan. Preliminary vendor information for the Exhaust Fan showed the actual fan centerline to be higher than in the proposal. Indicated change is required to account for the new information from the Exhaust Fan vendor.

EP 3.8-1F October 2003

145579-V-DS-005.1-CN-001

		<h2 style="margin: 0;">CHANGE NOTICE</h2>				Page 1 of 1 CN No. 145579-V-DS-005.1-CN.001, Rev 1					
Change Notice (CN) Category (Check One) Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Cancel <input type="checkbox"/> Quality Program Procedure Change <input type="checkbox"/>		Originator's Name and Signature Chrysoula Nigl 				Date 1/24/06					
Affects Cost? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Project Title/ Project No. Demonstration Bulk Vitrification System		Design Verification Required (Independent Review) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Safety Class (If Rq'd) NA					
Affects Schedule? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Primary Document Changed by this CN (include sheet no. and rev) Exhaust Stack Data Sheets, 145579-V-DS-005.1, Rev. 7		Affected Documents Superseded Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		Contract No. 145579					
Other Documents Affected by this CN: F-145579-36-V-0021, Rev. G											
Reason for Change: The Stack Monitoring equipment needs to be placed at least 8 stack diameter lengths after the last disturbance or change in air flow. Therefore, modifications need to be made to the stack to prevent the stack monitoring equipment from being prohibitively high on the stack. Preliminary information for the exhaust fans will allow inlet point to be lower. Size of fans requires two main inlet ports based on DBVS site layout.											
Detailed Description of Change (Use Continuation Sheet as Applicable): <ol style="list-style-type: none"> <li>1. Rev 8 was added to the coversheet "Rev. No = 8, Issued For: Changes made per Client comment, Origin: KJM, Date: 24-Jan-06, Initial: KJM"</li> <li>2. Changed Concrete Pad Dimensions Length from 30 ft to 36 ft</li> <li>3. Changed the Maximum Gas Flow from 9,000 acfm to 10,000 acfm and added the Nominal Gas Flow at 9,500 acfm to match the Stack Monitoring Data Sheets.</li> <li>4. Added the appropriate revision number, date and initials at the bottom of the Data Sheet</li> <li>5. Changed drawing as shown on attached drawing (Rev. H)</li> <li>6. Removed relative elevations and directed reader to drawing</li> <li>7. Increase the number of Inlets from 1 to 2.</li> <li>8. Removed Platform elevation and directed reader to drawing.</li> <li>9. Added Ladder Cage specifications "per OSHA"</li> <li>10. Directed reader to drawing for grounding lug exact locations.</li> </ol>											
<b>Review/Approval Authorities: A = Approval, R = Review, I = Information (Check where applicable for change notice)</b>											
Printed Name/Signature		Date	R	A	I	Printed Name/Signature		Date	R	A	I
Originator Chrysoula Nigl 		1/24/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	AMEC Engineering Manager <b>JEFF JEFFERS</b> 		1/24/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Project Manager Jim Frederickson 		1/24/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Independent Review* NA			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Program Director NA			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Professional Engineer, if required NA			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engineering Manager Ja-Kael Luey 		1/24/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	AMEC Quality Assurance <b>HANK CHAPIN</b> 			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Quality Assurance Nena Blumenthal 		1/24/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CH2M HILL Project Manager 		1/25/06	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
* Design Verification per EP 3.9 required? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Assign Independent Reviewer											
CN Incorporated? PM or designee sign and date: _____											

**TECHNICAL DATA SHEET**  
AMEC Americas Limited



*The document revision number is indicated below. Please replace all revised pages of this document and destroy the superseded copies.*

<b>PROJECT:</b>	Final DBVS Design	145579-V-DS-005.1	REV. 8
<b>PROJECT NO.:</b>	145579	<b>EXHAUST STACK</b>	
<b>CLIENT:</b>	AMEC E&E - Richland Washington	<b>EQ. NO.:</b>	36-N26-024

REV. NO.	ISSUED FOR	ORIGIN	DATE	INITIAL
0	Construction	DW	15-Dec-04	DW
1	Bid Request	DW	11-Jan-05	DW
2	Bid Request	DW	2-Feb-05	DW
3	Construction	SH	24-Mar-05	SH
4	Construction	SH	13-Apr-05	SH
5	Construction	SH	18-Apr-05	SH
6	Changes made to drawing F-145579-36-V-0021	JL	3-Nov-05	JL
7	Changes made to drawing F-145579-36-V-0021	KJM	11-Jan-06	KJM
8	Changes made per Client comments	KJM	24-Jan-06	<i>[Signature]</i>

**DOCUMENT APPROVAL**

<p><b>CLIENT APPROVAL (AMEC RICHLAND)</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u><i>Jeff Pappas</i></u></p> <p>Date: <u>1/24/06</u></p> <p>Q.A. Rep.: <u><i>Hank M. Chaffin</i></u></p> <p>Date: <u>01-24-06</u></p>	<p><b>DMJM H&amp;N</b> <i>Original Approvals on File</i></p> <p>Project Manager: <u><i>J. McFadden</i></u></p> <p>Date: <u>1/24/06</u></p> <p>Discipline Lead: <u><i>Joe Kent Jey</i></u></p> <p>Date: <u>1/24/06</u></p> <p>Originator: <u><i>[Signature]</i></u></p> <p>Date: <u>1/24/06</u></p>
<p><b>CLIENT APPROVAL (CH2M HILL)</b></p> <p>Project Manager: <u><i>J. Van Beek</i></u></p> <p>Date: <u>1/25/06</u></p>	



**TECHNICAL DATA SHEET**

<b>PROJECT:</b>	Final DBVS Design	145579-V-DS-005.1	REV. 8
<b>PROJECT NO.:</b>	145579	<b>EXHAUST STACK</b>	
<b>CLIENT:</b>	AMEC E&E - Richland Washington	EQ. NO.:	36-N26-024

**REFERENCE SPECIFICATION**

Document No.	Specification
145579-V-SP-005	EXHAUST STACK

**CONTENTS**

Data Sheet ..... 2 Pages

Bidders Drawing & Data Commitments Sheet ..... 1 Page

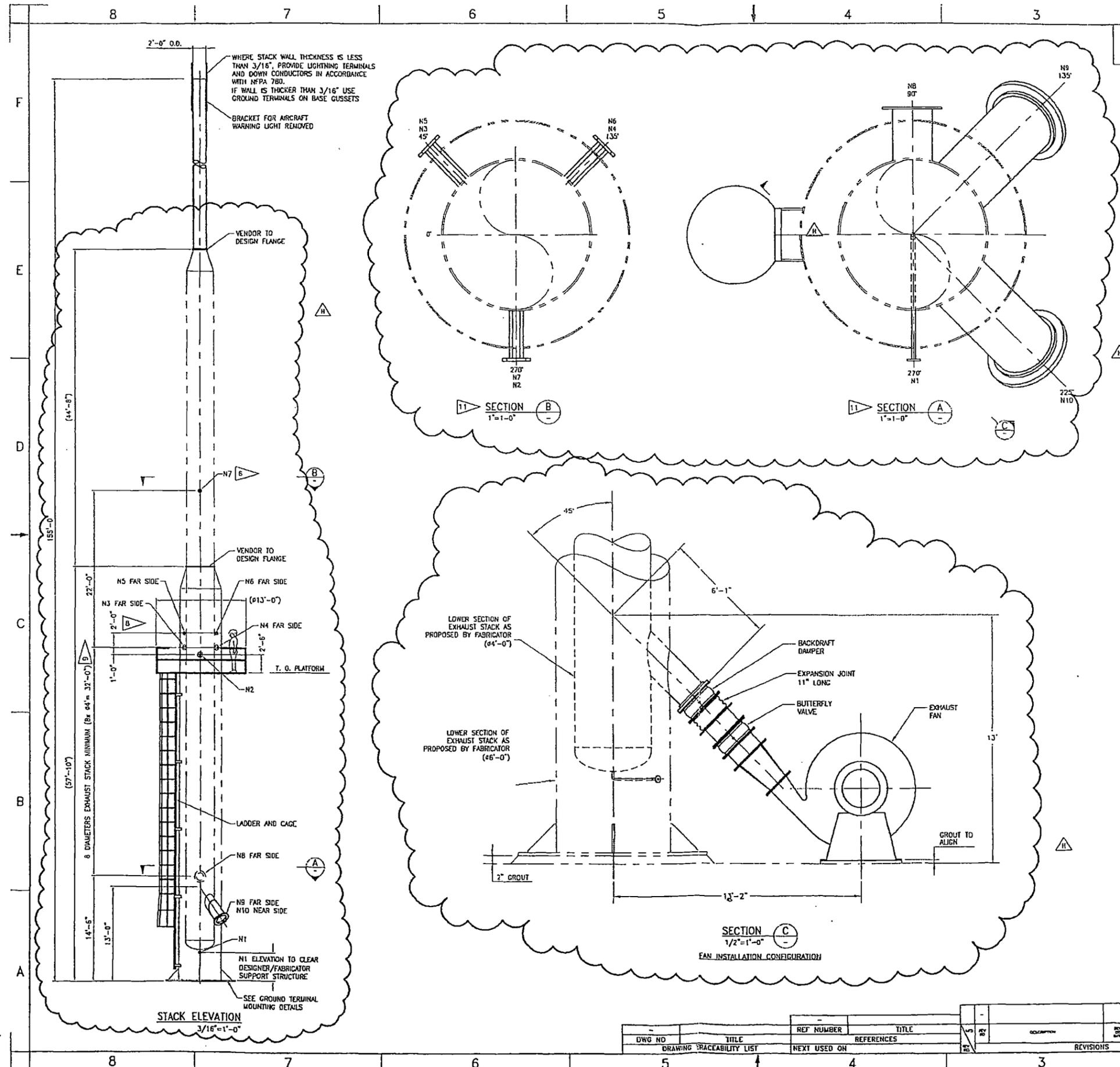




TECHNICAL DATA SHEETS

Data sheet 2 of 2						
Construction cont'd						
	Type	Material	Number	Thickness	Comments	Rev
Pipe Supports						
Platforms	See note 3		1		See ASME STS-1	8
Grating	Floor of landing				See ASME STS-1	
Ladder	Up to landing		1		See ASME STS-1	
Handrails	Around Landing				See ASME STS-1	
Ladder Cage	Around Ladder				Per OSHA	8
Supports						
Gaskets, externa						
Gaskets, internal						
Bolts, external						
Bolts, internal						
Nuts, internal						
Insulation						
Grounding Lugs	Terminals	Steel	2	3/16" min	Opposite sides	8
Lifting Lugs						
Lining						
Grout						
Interface options for client control system	No					
Testing & Inspections			Coatings and Insulation			
		Witness Req'd	Rev	External Surface Preparation	*	
Dye Penetrant	welds	as per STS-1	2	External Coatings, Primer	*	
Magnetic Particle	welds	as per STS-1	2	External Coatings, Finish	*	
Radiograph	welds	as per STS-1		Internal Surface Preparation	*	
				Internal Coating	*	
Instrumentation Connection Ports - Minimum nozzles required indicated below						
Purpose	Size	Number	Rating	Elevation(s)	Comments	
Sample Return Lines	2"	2	150#	See note 3	at 90° offset	
Sample Lines	4"	2	150#	See note 3	at 90° offset	
Visual Inspection	4"	1	150#	See note 3		
Flow Element	2"	1	150#	See note 3		
Inlet	20"	2	150#	See note 3	See note 2	
Stack Drain	1"	1	150#	Lowest drainage point		
By-Pass Inlet	12"	1	150#	See note 3	90° offset from Inlet	
Comments:						
1. Items marked with an * shall be filled in by VENDOR						
2. Angled -45° from horizontal measured to centerline of stack						
3. See Drawing F-145579-36-V-0021						
*** For the exact locations of the grounding lugs see drawing F-145579-36-V-0021						
Date	13-Apr-05	18-Apr-05	3-Nov-05	11-Jan-06	24-Jan-06	
By	SH	SH	JL	KJM	KJM	
Chked	AP	AP	KM	KJM	<i>QZ</i>	
Rev.	4	5	6	7	8	

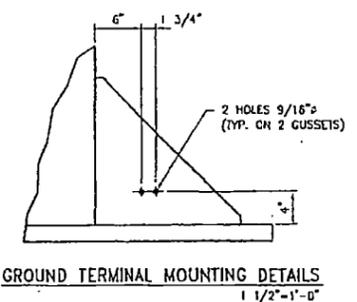




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NOZZLE No.	SERVICE	SIZE	PROJECTION
N1	STACK DRAIN	1" SCHED 10	4"
N2	VISUAL INSPECTION	4" SCHED 10	4"
N3	SAMPLE LINE	4" SCHED 10	4"
N4	SAMPLE LINE	4" SCHED 10	4"
N5	SAMPLE RETURN LINE	2" SCHED 10	4"
N6	SAMPLE RETURN LINE	2" SCHED 10	4"
N7	FLOW ELEMENT	2" SCHED 10	4"
N8	BYPASS LINE	12" SCHED 10	4"
N9	OFF-GAS INLET	20" SCHED 10	AS SHOWN
N10	OFF-GAS INLET	20" SCHED 10	AS SHOWN

- NOTES:
- DRAWING TO BE READ IN CONJUNCTION WITH DATA SHEET 145579-V-DS-005.1
  - ALL NOZZLES TO BE SUPPLIED WITH 150# R.F. S.O. FLANGES
  - N2 TO BE COVERED WITH CLEAR GLASS COVER c/w GASKET
  - SAMPLE LINES ARE NOT SHOWN. CONNECT SHROUDED PROBES TO ANALYZERS LOCATED BY STACK MONITOR VENDOR.
  - VENDOR TO DESIGN STACK ANCHORAGE ASSUMING DRILLED AND GROUTED ANCHORS. FOUNDATION DESIGN SHOWN ON DWG H-14-106796-FOUNDATION #10
  - UTILIZE MOBILE MANBASKET FOR PERIODIC ACCESS TO THE FLOW ELEMENT
  - STYLE, LOCATION AND SIZE OF NOZZLES TO BE CONFIRMED BY SELECTED ANALYZER VENDOR.
  - NOZZLE ELEVATION TO BE CONFIRMED BY BUYER.
  - SAMPLE LINE NOZZLE LOCATIONS SHALL BE LOCATED A MINIMUM OF 8 STACK DIAMETERS DOWN STREAM OF FLOW DISTURBANCE TRANSITIONS OR CONNECTIONS PER 40 CFR 60 METHOD 1 SECTION 11.0.
  - VENDOR SHALL PROVIDE DETAILS OF PENETRATIONS THROUGH 6" DIAMETER LOWER STACK ASSEMBLY.
  - EXHAUST STACK DESIGN, FABRICATION AND TESTING SHALL BE TO SPECIFICATION 145579-V-SP-005 AND DATA SHEET 145579-V-DS-005.1.



REV.	REVISION DESCRIPTION	DATE	BY	CHK'D	APP'D
H	REVISED PER ENGINEERING INJECTION	1-21-05	CBT	KLM	N/A
G	REVISED PER ENGINEERING INJECTION	11 JAN 05	SHM	KLM	N/A
F	REVISED PER ENGINEERING INJECTION	11-3-05	CBT	JL	N/A
E	ISSUED FOR CH2M HILL REVIEW/SIZE REPORT (AREA 36 ONLY)	13 APR 05	JCH	PCF	FWS
D	ISSUED FOR CH2M HILL REVIEW/SIZE REPORT (AREA 36 ONLY)	15 MAR 05	RDB	PCF	FWS
C	ISSUED FOR INFORMATION	01 FEB 05	RDB	AP	FWS
B	ISSUED FOR INTERNAL APPROVAL	15 DEC 04	RDB	AP	FWS
A	ISSUED FOR REVIEW	13/OCT/04	RDB	AP	FWS

AMEC Drawing No. F-145579-36-V-0021

145579-FINAL DBVS DESIGN

amec

U.S. DEPARTMENT OF ENERGY  
Office of River Protection

BULK VITRIFICATION  
OFF-GAS EXHAUST STACK  
DETAILS

DWG NO	TITLE	REF NUMBER	TITLE	REV	DATE	BY	CHK'D	APP'D

DRAWING TRACEABILITY LIST

REV	DATE	BY	DESCRIPTION

REVISIONS