Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

0093672

11-EMD-0022

DEC 30 2010

Mr. E. R. Skinnarland
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Boulevard
Richland, Washington 99354

Dear Mr. Skinnarland:

CLASS 1 MODIFICATIONS TO THE HANFORD FACILITY RESOURCE CONSERVATION AND RECOVERY ACT PERMIT, QUARTER ENDING DECEMBER 31, 2010

In accordance with the Hanford Facility Resource Conservation and Recovery Act Permit (Permit) Condition I.C.3, enclosed for your notification are the Class 1 modifications for the quarter ending December 30, 2010. Enclosure 1 includes the Class 1 modifications for the quarter ending December 30, 2010. Enclosure 2 includes the Class 1 modifications for the quarter ending December 30, 2010, containing Official Use Only information that is not for public distribution. The enclosed information has been reviewed with Rick Bond, Ecology Project Manager, and is available in the Hanford Facility Operating Record, Liquid Effluent Retention Facility (LERF) and 200 Area Effluent Treatment Facility (ETF) File for Ecology's viewing.

These modifications update information in Part III of Permit Revision 8C. The modifications to Part III pertain to the LERF and 200 Area ETF, and Waste Treatment and Immobilization Plant. The Class 1 modifications are being made to ensure that activities are conducted in compliance with the Permit. A record of these modifications is maintained in the Hanford Facility Operating Record.

If you have any questions, please contact me, or your staff may contact Ray J. Corey, Assistant Manager for Safety and Environment, on (509) 376-0108.

Sincerely,

Nichols Ard for

Matt McCormick
Manager

EMD:ACM

Enclosures

cc w/encls: See page 2

Document transmitted contains OUO information
When separated from Enclosure 2
handle this document as non-sensitive information

letter and enclosure 1 are together Enclosure 2 is OUO under A990067

cc w/encls:
J. A. Dowell, ORP (CD ROM)
Ecology NWP Library (Hardcopy) (Enclosure 1)
Environmental Portal, LMSI, A3-95 (CD ROM)
HF Operating Record (S. Thompson, MSA, H7-28) (CD ROM)
HF Operating Record, LERF & 200 Area ETF File (H. Boynton, S5-31) (CD ROM)
Administrative Record, TSD: H-0-1, H-0-8, S-2-8, H6-08 (Hard Copy & CD ROM)

cc w/o encls:
J. M. Colby, URS
S. L. Dahl, Ecology
L. L. Fritz, MSA
J. A. Hedges, Ecology
J. G. Lehew, CHPRC
D. L. McDonald, Ecology
S. Nichols, Ecology
F. R. Russo, BNI

ENCLOSURE 1

CLASS 1 MODIFICATIONS FOR QUARTER ENDING DECEMBER 31, 2010

Mr. E. R. Skinnarland, Ecology
Consisting of 522 pages, including cover sheet

This page intentionally left blank.

Hanford Facility RCRA Permit Modification Notification Forms
Part III, Operating Unit 3
Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility

Index

Submitted by Co-Operator:

Leonard T. Blackford 11/15/10
Date

Reviewed by DOE Program Office:

Richard A. Holten 11/30/2010
Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility**	Permit Part **Part III, Operating Unit 3**

Description of Modification:
Part III, OU-3, Permit Conditions:

OPERATING UNIT GROUP 3 PERMIT CONDITIONS

Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility

UNIT DESCRIPTION:

The Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility (LERF and 200 Area ETF) consists of an aqueous waste treatment system that provides storage and treatment for a variety of aqueous mixed waste located in the 200 East Area.

This document sets forth the operating conditions for the LERF and 200 Area ETF.

Operating Unit Group 3:

Chapter 1.0	Part A Form, dated October 1, 2008
Chapter 3.0	Waste Analysis Plan, dated June 30, 2007
Chapter 4.0	Process Information, dated December 31, 2007
Chapter 5.0	Groundwater Monitoring (PNNL-11620 & WHC-SD-EN-AP-024), dated June 30, 2008
Chapter 6.0	Procedures to Prevent Hazards, dated June 30, 2007 (also refer to Permit Attachment 3~~3, §6.1~~)
Addendum J	Contingency Plan, dated ~~September 30, 2010~~December 31, 2010
Chapter 8.0	Personnel Training, dated June 30, 2008
Chapter 11.0	Closure and Post Closure Requirements, dated October 2006
~~Chapter 12.0~~	~~Reporting and Recordkeeping (refer to Permit Attachment 33, Table 12.1)~~
Permit Attachment 6	Reports and Records, dated September 30, 2010

III.3.A COMPLIANCE WITH UNIT SPECIFIC PERMIT CONDITIONS

III.3.A.1 The Permittees shall comply with all requirements set forth in the Hanford Facility RCRA Permit (Permit) as specified in Permit Attachment ~~3~~9, Permit Applicability Matrix, including all approved modifications. All chapters, subsections, figures, tables, and appendices included in the following unit specific Permit Conditions are enforceable in their entirety.

III.3.A.2 In the event that the Part III, Operating Unit Group 3 Permit Conditions conflict with the Part I, Standard Conditions and/or Part II, General Facility Conditions of the Permit, the unit specific conditions for Operating Unit 3, LERF and 200 Area ETF prevail.

WAC 173-303-830 Modification Class	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1.
Enter wording of WAC 173-303-830, Appendix I Modification citation:
A.1. General Permit Provisions, Administrative and informational changes

Modification Approved/Concur ☒ Yes ☐ Denied (state reason below)
Reason for denial:

Reviewed by Ecology:
F. W. Bond 11-23-10
Date

Hanford Facility RCRA Permit Modification Notification Form

Unit: **Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility**	Permit Part **Part III, Operating Unit 3**

Description of Modification:
Addendum J, §J.4.3:

J.4.3 Communications Equipment/Warning Systems

TYPE	LOCATION	CAPABILITY
Fire alarms (ETF only)	Corridors, locker rooms, process area, drum storage, and truck bay	Audible throughout ETF
Take cover/evacuation	Throughout the ETF	Audible outside buildings and inside administrative buildings
Public address system (ETF Only)	Throughout the ETF	Audible throughout ETF
Portable radios	Operations and maintenance personnel	Communication to control room
Telephone	**ETF–** control room, 2025E, 2025EA offices, MO-148, MO-269, 2025EC71. **LERF–** MO-727 and 242AL71 instrument building, LERF Garage 242AL11 **TEDF–** 225E(pump house 1), 225W (pump house 2), 6653 (sample building), 6653A (pump house 3)	Internal and external communications. Allows notification of outside resources (POC, HFD, Hanford Patrol, etc.

Note: Sitewide communications and warning systems are identified in Permit Attachment 4, *Hanford Emergency Management Plan*, (DOE/RL-94-02), Table 5.1.

WAC 173-303-830 Modification Class	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: B.6.d
Enter wording of WAC 173-303-830, Appendix I Modification citation:
B.6.d. Contingency plan, Changes in name, address, or phone number of coordinators or other persons or agencies identified in the plan

Modification Approved/Concur ☒ Yes ☐ Denied (state reason below)
Reason for denial:

Reviewed by Ecology:
F. W. Bond 11-23-10
Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility**	Permit Part **Part III, Operating Unit 3**

Description of Modification:
Addendum J, §J.4.4:

J.4.4 Personal Protective Equipment

SPILL KITS AND SPILL CONTROL EQUIPMENT		
TYPE	**LOCATION**	**CAPABILITY**
Acid suits	In the spill response cabinets in 2025E	Chemical protection for personnel during containment and isolation
Respirators	2025E, 1st Floor~~Rm. 201~~	Filtered air for recovery of known hazards

WAC 173-303-830 Modification Class	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: B.6.d
Enter wording of WAC 173-303-830, Appendix I Modification citation:
B.6.d. Contingency plan, Changes in name, address, or phone number of coordinators or other persons or agencies identified in the plan

Modification Approved/Concur ☒ Yes ☐ Denied (state reason below) Reason for denial:	Reviewed by Ecology: F. W. Bond 11-23-10 Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility**	Permit Part **Part III, Operating Unit 3**

Description of Modification:
Addendum J, §J.4.6:

J.4.6 Incident Command Post

The ICPs for the ETF/LERF are in ETF control room or 2025 EA~~-101~~. Emergency resource materials are stored at each location. The IC could activate the Hanford Fire Department Mobile Command Unit if necessary.

WAC 173-303-830 Modification Class	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: B.6.d
Enter wording of WAC 173-303-830, Appendix I Modification citation:
B.6.d. Contingency plan, Changes in name, address, or phone number of coordinators or other persons or agencies identified in the plan

Modification Approved/Concur ☒ Yes ☐ Denied (state reason below)
Reason for denial:

Reviewed by Ecology:

F. W. Bond 11-23-10
Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility**	Permit Part **Part III, Operating Unit 3**

Description of Modification:
Addendum J, §J.6:

J.6 Plan Location and Amendments

Copies of this plan are maintained at the following locations:

- ETF control room
- Operations Managers office (Building 2025EA~~, Room 101~~)

This plan will be reviewed and immediately amended as necessary, in accordance with Permit Attachment 4, *Hanford Emergency Management Plan*, (DOE/RL-94-02), Section 14.3.1.1.

WAC 173-303-830 Modification Class	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: B.6.d
Enter wording of WAC 173-303-830, Appendix I Modification citation:
B.6.d. Contingency plan, Changes in name, address, or phone number of coordinators or other persons or agencies identified in the plan

Modification Approved/Concur [X] Yes [ ] Denied (state reason below)
Reason for denial:

Reviewed by Ecology:
Fred W Bond 11-23-10
F. W. Bond Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility**	Permit Part **Part III, Operating Unit 3**

Description of Modification:
Addendum J, Figure J.1: updated figure

Figure J.1 Evacuation Routes from 2025E

WAC 173-303-830 Modification Class	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: B.6.d
Enter wording of WAC 173-303-830, Appendix I Modification citation:
B.6.d. Contingency plan, Changes in name, address, or phone number of coordinators or other persons or agencies identified in the plan

Modification Approved/Concur ☒ Yes ☐ Denied (state reason below)
Reason for denial:

Reviewed by Ecology:
F. W. Bond 11-23-10
Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility**	Permit Part **Part III, Operating Unit 3**

Description of Modification:
Addendum J, Figure J.2: updated figure

Figure J.2. LERF and 200 Area ETF Site Plan

WAC 173-303-830 Modification Class	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: B.6.d
Enter wording of WAC 173-303-830, Appendix I Modification citation:
B.6.d. Contingency plan, Changes in name, address, or phone number of coordinators or other persons or agencies identified in the plan

Modification Approved/Concur ☒ Yes ☐ Denied (state reason below)
Reason for denial:

Reviewed by Ecology:
[signature] 11-23-10
F. W. Bond — Date

Hanford Facility RCRA Permit Modification
Part III, Operating Unit 11
Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility

Remove and replace the following sections for Part III, Operating Unit 3:

- Remove Permit Conditions dated September 30, 2010 and replace with Permit Conditions dated December 31, 2010

This page intentionally left blank.

PART III, OPERATING UNIT GROUP 3 PERMIT CONDITIONS

Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility

UNIT DESCRIPTION

The Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility (LERF and 200 Area ETF) consists of an aqueous waste treatment system that provides storage and treatment for a variety of aqueous mixed waste located in the 200 East Area.

This document sets forth the operating conditions for the LERF and 200 Area ETF.

Operating Unit Group 3:

Chapter 1.0	Part A Form, dated October 1, 2008
Chapter 3.0	Waste Analysis Plan, dated June 30, 2007
Chapter 4.0	Process Information, dated December 31, 2007
Chapter 5.0	Groundwater Monitoring (PNNL-11620 & WHC-SD-EN-AP-024), dated June 30, 2008
Chapter 6.0	Procedures to Prevent Hazards, dated June 30, 2007 (also refer to Permit Attachment 3)
Addendum J	Contingency Plan, dated December 31, 2010
Chapter 8.0	Personnel Training, dated June 30, 2008
Chapter 11.0	Closure and Post Closure Requirements, dated October 2006
Permit Attachment 6	Reports and Records, dated September 30, 2010

III.3.A COMPLIANCE WITH UNIT SPECIFIC PERMIT CONDITIONS

III.3.A.1 The Permittees shall comply with all requirements set forth in the Hanford Facility RCRA Permit (Permit) as specified in Permit Attachment 9, Permit Applicability Matrix, including all approved modifications. All chapters, subsections, figures, tables, and appendices included in the following unit specific Permit Conditions are enforceable in their entirety.

III.3.A.2 In the event that the Part III, Operating Unit Group 3 Permit Conditions conflict with the Part I, Standard Conditions and/or Part II, General Facility Conditions of the Permit, the unit specific conditions for Operating Unit 3, LERF and 200 Area ETF prevail.

III.3.B UNIT SPECIFIC CONDITIONS

III.3.B.1 Portions of Permit Attachment 4, *Hanford Emergency Management Plan,* (DOE/RL-94-02) that are not made enforceable by inclusion in the applicability matrix for that document are not made enforceable by reference in this document.

This page intentionally left blank.

Hanford Facility RCRA Permit Modification Notification Forms

Part III, Operating Unit 10
Waste Treatment and Immobilization Plant (WTP)

PCNs for quarter ending December 31, 2010:

PCN Number	Form Approval Date	Facility
24590-HLW-PCN-ENV-08-003	12/20/10	HLW
24590-HLW-PCN-ENV-10-004	12/17/10	HLW
24590-HLW-PCN-ENV-10-006	12/20/10	HLW
24590-HLW-PCN-ENV-10-008	12/17/10	HLW
24590-HLW-PCN-ENV-10-009	12/17/10	HLW
24590-HLW-PCN-ENV-10-010	12/17/10	HLW
24590-WTP-PCN-ENV-08-011	11/4/10	WTP

This page intentionally left blank.

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-08-003

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant

Replace Mechanical Data Sheets 24590-HLW-MVD-HOP-00015 and 24590-HLW-MVD-HOP-00016 (Activated Carbon Adsorbers) in Appendix 10.6 of the Dangerous Waste Permit (DWP).

Replace Engineering Specification 24590-WTP-3PS-MWK0-T0001 (Activated Carbon Bed Adsorbers) in Appendix 7.7 of the DWP.

Submitted by Co-Operator:

D. M. Busche — Date: 11/9/10

Reviewed by ORP Program Office:

D. L. Noyes — Date: 11/24/10

Quarter Ending 12/31/10

24590-HLW-PCN-ENV-08-003

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part:
Waste Treatment and Immobilization Plant	**Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 modification is to update the following Mechanical System Data Sheets (24590-HLW-MVD-HOP-00015 and 24590-HLW-MVD-HOP-00016) and Engineering Specification (24590-WTP-3PS-MWK0-T0001) for the Activated Carbon Bed Adsorbers.

The following are being submitted to replace those currently in Appendix 10.6 and Appendix 7.7:

Appendix 10.6			
Replace:	24590-HLW-MVD-HOP-00015, Rev. 1	With:	24590-HLW-MVD-HOP-00015, Rev. 3
	24590-HLW-MVD-HOP-00016, Rev. 1		24590-HLW-MVD-HOP-00016, Rev. 3
Appendix 7.7			
Replace:	24590-WTP-3PS-MWK0-T0001, Rev. 3	With:	24590-WTP-3PS-MWK0-T0001, Rev. 4

This modification requests Ecology approval and incorporation into the permit the specific changes to the data sheets and specification that are identified by revision bars that have been issued since the last revision of the permitted versions. Revisions are the result of ongoing design (changes from vendor preliminary data to vendor detailed design) and incorporate general criteria from a design verification review. The following identifies the significant changes that have been revised on the attached data sheets and specification:

Mechanical System Data Sheets

- Incorporated Technical Change Notice 24590-QL-MRA-MWK0-00001-T0003
- Updated process data, material data, nozzle loads, thermal information and connecting pipe details and general notes
- Updated fire suppression system data
- Updated activated carbon data
- Added equipment qualification data
- Incorporated SDDR 24590-WTP-SDDR-M-06-00287 by reference
- Updated process calculation and P&ID references

There are no outstanding change documents associated with the material selection data sheets.

Engineering Specification

- Changed Appendices B & C testing scope from Seller to Buyer
- Deleted Figures 1 & 2 and replaced with P&ID reference
- Renamed Tables 1 and 2
- Added instructions for including WTP piping and supports into Supplier Analysis
- Added carbon media loading requirements
- Changed LAW instrumentation scope from supplier to WTP

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-08-003

The following outstanding change documents have not been incorporated into the specification:

- 24590-QL-MRA-MWK0-00001-T0001
- 24590-QL-MRA-MWK0-00001-T0003
- 24590-QL-MRA-MWK0-00001-T0004
- 24590-QL-MRA-MWK0-00001-T0005
- 24590-WTP-3PN-MWK0-00006
- 24590-WTP-3PN-MWK0-00007

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: NA

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: ☑ Yes ☐ Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

Joanne J Wallace 12/20/10

J. J. Wallace Date

R11188506

MECHANICAL DATA SHEET

ACTIVATED CARBON ADSORBER

River Protection Project
Waste Treatment Plant

ISSUED BY
RPP-WTP PDC

PLANT ITEM No.	
24590-HLW-MV-HOP-ADBR-00001A 24590-HLW-MV-HOP-ADBR-00001B	
Data Sheet No.	Rev.
24590-HLW-MVD-HOP-00015	3

Project:	RPP-WTP	Description:	Activated Carbon Adsorber for Mercury Abatement
Project No:	24590	Mech. Drawing:*	
Site:	Hanford	P&ID:	24590-HLW-M6-HOP-00011, Rev 0
System:	HOP (Melter 1)	Process Calculations:	24590-HLW-M4C-HOP-00011, Rev 1 24590-HLW-MKC-HOP-00013, Rev 1
Process flow diagram:	24590-HLW-M5-V17T-00004, Rev 5	Specification:	24590-WTP-3PS-MWK0-T0001, Rev 4

General Data

Quality Level	Q	Code Stamp	N/A
Seismic Category	SC-III	NB Registration	N/A
Design Code	General Note 2	Design Life	40 yrs *(Process Note 3)*

Process Data *(General Note 4)*

Offgas Conditions (Inlet):

Parameter		Nominal	Maximum	Design
		***Actual** Conditions (Process Note 7)*		
Volume Flow	SCFM ACFM	1,403 1,807	1,646 2,219	2,000 2,633
Mass Flow	lb/hr	6,127	7,001	N/A
Temperature	°F	197	230	250
Pressure	in-w.g.	-5.2	-4	*(Process Note 4)* -62
Density	lb/ft³	0.0565	0.0526	N/A
Relative Humidity Operating Abnormal	%	*(Process Note 8)* 11.7 100	10.7 100	N/A
Allowable Pressure Drop *(Process Note 2)*	in-w.g.			12

Offgas Composition (Inlet):

Major Offgas Components	*Actual **Composition** (Process Note 7)* Nominal, Volume %	Maximum, Volume %
N_2	70.9	65.7
O_2	19.0	17.6
H_2O	8.89	15.5
CO_2	0.375	0.40
Ar	0.85	0.79

Minor Offgas Components	Nominal *(Process Note 3)* kg/hour	Maximum *(Process Note 5)* kg/hour
NH_3	2.96E-03	3.19E-02
NO	4.17E-01	1.88E+00
N_2O	7.27E-03	1.50E-01
NO_2	6.24E-02	2.25E+00
CO	8.80E-03	1.70E-02
H_2	2.49E-03	8.79E-02
HCl	3.31E-03	6.58E-03
HF	1.98E-03	3.99E-03
I_2	1.11E-03	1.11E-03
SO_2	4.24E-03	6.70E-03
HNO_2	9.69E-03	4.31E-02
HNO_3	9.53E-03	2.85E-02
VOC	2.40E-03	3.20E-03
Particulate	1.20E-12	2.11E-10

Mercury Concentration

Parameter	Nominal (μg/dscm)	Nominal kg/hour	Maximum *(Process Note 5)* (μg/dscm)	Maximum kg/hour
Hg Mass Flow	7,660	1.66E-02	52,600	1.25E-01

Required Decontamination Factor (DF) for Hg to comply with <45 ug/dscm	≥ 1000
Removal Efficiency for I_2	>90%

Process Notes:

1. Carbon adsorbers shall be operated in series during normal operation.
2. Allowable pressure drop is for both carbon adsorbers HOP-ADBR-00001A and B operating in series (12 in-w.g. total) **and shall be based on end of bed life.**
3. Design life **for each** of the activated carbon **adsorber primary beds**, at a minimum, shall be for one year at Nominal **condition** of Mercury with the adsorbers operating in series. **Design life for the activated carbon adsorber guard beds (combined for two adsorbers) shall be for one year at Nominal conditions based on specified HCl, HF, I_2, SO_2, HNO_2 and HNO_3 loading with the adsorbers operating in series.**
4. Equipment design pressure (Positive) shall be determined by Seller based on pressures generated during a carbon bed fire and activation of the fire suppression water.
5. **Maximum** component rates are based on the Bounding Condition, except CO, Hg, **HCl**, **HF**, **I_2**, **SO_2**, **HNO_2 and HNO_3**, which are based on the Maximum Condition. **Bounding/ maximum conditions are used to assess the maximum credible impact on bed life due to competitive effects during Appendix B and C testing (refer to Engineering Specifications, 24590-WTP-3PS-MWK0-T0001).**
6. Personnel Protection insulation is required for surfaces with temperature of 140 °F and above.
7. Values listed are representative of specific offgas conditions as a whole and not as individual parameters. For example, the Nominal Relative Humidity is dependent upon the Nominal Temperature. For this reason,

some values in the Maximum Condition column may actually be less than those listed in the Nominal Condition.

8. The abnormal operating condition is isolation of the carbon bed adsorbers without purge of moisture from the interior gas spaces. As the offgas cools the relative humidity increases to 100%. Further cooling of the offgas results in * levels of adsorption within the primary and guard beds and * condensation on the internal walls of the adsorbers.

Removal Efficiency for HCl or HF	>90%
Removal Efficiency for SO_2	>90%
Minimum time between Carbon Media change-out:	*(Process Note 3)*
Primary Bed	12 months
Guard Bed	12 months

Material Data

Process Pipe and Housing Fabrication -			
Pipe Class	**S11V**	Valve Material	**316 / 316L SS**
Inlet Piping Size	**14 inches**	Valve Trim	**TRIM 12, API 600**
Outlet Piping Size	**14 inches**	Flange Material	**316L SS**
Housing	**316L SS**	Gasket Material	**Spiral-Wound/Flat, Graphite**
Activated Carbon Beds Screens	**316L SS**	Flange Rating	**CL 150 RF B16.5**
Pipe schedule	**TBD**	Housing Insulation / Jacket	**Calcium Silicate ASTM C533, Type I / 0.024" thk. SST ASTM A240**
Pipe Material	**316 / 316L SS**	Pipe Insulation / Jacket	**Calcium Silicate ASTM C533, Type I / 0.024" thk. SST ASTM A240**

Fire Protection Pipe -			
Pipe Class	**S11V**	Valve Trim	**Trim 12, API 600**
Inlet Piping Size	*** 2 inch**	Flange Material	**316L SS**
Pipe Schedule	**40S**	Gasket Material	**316L SS SP-WND / Graphite Filled**
Pipe Material	**316 / 316L SS**	Flange Rating	**CL150 RF B16.5**
Valve Material	**316L SS**		

Appurtenances and Other items -			
Support Frames	**Carbon Steel**	Drain Line Flange Material	**316L SS**
Pipe Supports	**Carbon Steel**	Drain Line Flange Rating	**CL150 RF B16.5**
Maintenance Platforms	**Carbon Steel**	**Radar Guide Design**	***(General Note 7)***
Flange Bolts / Nuts	**ASTM F593 / ASTM F594**	**Radar Guide Pipe/Flange Material**	*
Fire Suppression Drain Pipe Material	**316 / 316L SS**	**Radar Guide Pipe Size**	*
Fire Suppression Drain Pipe Schedule	**40S**	**Radar Guide Pipe Schedule**	*
Drain Line on/off valve	*** 2 inch Manual Ball Valve**	**Radar Guide Pipe Flange**	*

Bed Fire Suppression System

		Information on Fire Suppression by Flooding Carbon Beds	
Fire Detection Method:	**Differential CO_x Monitor**		
Fire Suppression Activation Method:	**Automatic Bed Isolation**	Flowrate:	*** 22 gpm per unit**
Primary Fire Suppression Method:	**Isolate Carbon Beds**	Pressure:	*** 50 psig**
Secondary Fire Suppression Method:	**Flood Carbon Beds**	Total Volume of Water:	*** 5400 gal**
Fluid Type for Carbon Bed Flooding:	**Fire Service Water**	Total Time to Fill Vessel:	*** 240 minutes**
Liquid Level Control Method:	**Radar Liquid Level Indication**	Drain Pipe Line Size:	*** 2 inch**
Liquid Level Control Logic:	**Connection of a hose and opening of a supply valve (by others) will be required to initiate the flow of Fire Protection Water to a carbon bed. The Fire Protection Water supply valve will be manually closed at a pre-determined liquid level.**		

River Protection Project Waste Treatment Plant	MECHANICAL DATA SHEET ACTIVATED CARBON ADSORBER	PLANT ITEM No. 24590-HLW-MV-HOP-ADBR-00001A 24590-HLW-MV-HOP-ADBR-00001B
		Data Sheet No. 24590-HLW-MVD-HOP-00015 — Rev. 3

Design Data

Nozzle Loads at Buyer Interface *(General Note 5)*

Outlet Nozzle:

Nozzle #	Nozzle Size	Orientation	Load Case	F_X(lbs)	F_Y(lbs)	F_Z(lbs)	M_X (ft-lbs)	M_Y (ft-lbs)	M_Z (ft-lbs)
N01	14 in	Horizontal	*Weight*	500	1,500	500	2,100	1,000	1,000
			Seismic	2,700	2,000	9,400	5,600	12,300	5,000
			Thermal	1,000	1,000	2,700	2,500	2,500	3,000

Outlet Nozzle:

Nozzle #	Nozzle Size	Orientation	Load Case	F_X(lbs)	F_Y(lbs)	F_Z(lbs)	M_X (ft-lbs)	M_Y (ft-lbs)	M_Z (ft-lbs)
N02	14 in	Horizontal	*Weight*	500	1,500	500	1,600	1,000	1,000
			Seismic	1,100	2,400	1,200	3,500	2,100	2,200
			Thermal	2,300	2,400	1,000	7,100	2,200	16,300

Note: Values are x = North/South, y = vertical, z = East/West. **Note: Forces and moments are +/- and in Global x, y, z direction.**

Thermal Information:				
Room #	H-A123		Maximum Heat Loss	**5 kw (per unit)**
Room Temperature	59 - 83	°F	Thermal Cycling Frequency:	**For design purposes use a thermal cycle frequency of once every two (2) months for the life of the plant (40 years).**
Earth Temperature Beneath Slab	70	°F (Fixed)		
Concrete Slab Base Thickness	72	Inches		
Thermal Conductivity of Concrete Slab	1.8	W / m / K		

Activated Carbon Data:	Primary Bed	Guard Bed
Manufacturer	* **Donau Carbon**	* **Donau Carbon**
Model	* **Kombisorb BAT37**	*
Description	* **A mixed product composed by inert material and impregnated, cylindrically shaped activated carbon (ratio of mixture 30:70).**	*
Activation element/ % Loading	* **Sulfur compounds/** *	* / *
Media form (granular, pellet, etc.)	* **Extruded & Granular**	*
Size of carbon media (mm)	* **3-5**	*
Bulk density	* **0.5 g/cc (31.2 lb/ft^3)**	*
Total Bed Loading, Lbs/ Lb Media	* **(Mercury)**	* **(Iodine)** * **(Acid Gases)**
Number of beds per vessel	* **Two**	* **Two**
Arrangement	* **Rectangular parallel beds**	* **Rectangular parallel beds**
Residence time, sec	* **(at design flow rate in ACFM)**	* **(at design flow rate in ACFM)**
Thickness of bed, in	* **20**	* **10**
Total media volume, ft^3 per vessel	* **220**	* **110**
Total media weight, lbs per vessel	* **6860**	*
Spacing between beds, in	* **4**	* **4 and 8**
Face velocity thru carbon, fpm	* **(at design flow rate in ACFM)**	* **(at design flow rate in ACFM)**
Max. allowable temp. °F	*	*
Min. allowable temp. °F	* **Ambient**	* **Ambient**

House/vessel -	
Material/Thickness	* **0.375" 316L SS with external stiffeners**
Vessel dimensions, (L x W x H)	* **138" x 112" x 156"**
Total weight of vessel	* **est. lbs per vessel**
Weight of vessel with carbon, lbs	* **lbs**
Design pressure, in-w.g.	* **in-w.g (Refer to Process Note 4. Positive design pressure is 126 in-Wg)**
Operating pressure, in-w.g.	* **in-w.g.**
Design temperature, °F	*
Recommended housing insulation:	* **Calcium silicate and/or foam glass**
Material/Thickness, in	* **7 inches on sides, 1 inch over stiffeners**
Thermal Cond. Btu-in/hr ft^2 °F	* **0.39**
Method of Attachment	* **Mechanical support via outer jacket and/or straps**
Unloading on/off valve	* **8 each per vessel, each 8" size (4 ea. for Primary Bed)**

Discharge Filter -	
Manufacturer	* **American Air filter**
Type of filter	* **Extended surface mini-pleat with metal sides**
Filter material	* **microglass paper**
Filter frame material	* **stainless steel type 316**
Dimensions of filter, (L x W x H)	* **23-3/8" x 23-3/8" x 3-3/4"**
Weight of filter, lbs	* **15 lbs**
Number of filters per vessel	* **2**
Filter rating (efficiency, particle size)	* **99% on 5 micron particles**
Flow rate capacity, scfm	* **2000 per filter**
Max. allowable temp, °F	* **250**
Min. allowable temp, °F	* **Ambient**

Connecting Pipe -	
Pipe size, in	* **14**
Material/Thickness, in	*
Total length of piping, ft	*
Valve type, (gate, butterfly, etc.)- **General Note 8**	* **butterfly**
Weight of valve, lbs	*
Valve manufacturer	*
Total number of valves	*
Actuators (air operated, rack and pinion, FC)	*
Actuator manufacture	*
Weight of actuator	*
Actuator operating pressure (min. and max.)	*
Opening time, seconds	*
Total number of Actuators	*
Required instrument air supply, scfm	*
Recommended piping insulation:	* **Calcium silicate or foam glass**
Material/Thickness, in	* **1 inches**
Thermal Cond, Btu-in/hr ft² °F	* **0.39**
Method of Attachment	* **straps**

Pneumatic Loading Equipment:	
Manufacturer	* **N/A**
Blower size, horsepower	* **N/A**
Blower electrical load, watts	* **N/A**
Required voltage for blower	* **N/A**
Skid envelope size, (L x W x H)	* **N/A**
Skid weight, lbs	* **N/A**
Skid transportation/mobility	* **N/A**
Estimated time to load the vessel	* **N/A**

Note:
System designed to permit loading directly from bulk bags or drums into beds without the need for pneumatic loading devices.

Optional Electric Pre-Heater:	
Manufacturer	* **N/A**
Heater element electric load, watts	* **N/A**
Required voltage for heater elements, V	* **N/A**
an electric load, watts	* **N/A**
Required voltage for fan, V	* **N/A**
Fan size, horsepower	* **N/A**
Skid envelope size, (L x W x H)	* **N/A**
Skid weight, lbs	* **N/A**
Skid transportation/mobility	* **N/A**
Estimated time to preheat the carbon, hrs	* **N/A**
Total electric load for skid, watts	* **N/A**
Total required voltage	* **N/A**

Note:
Electrical Pre-Heater no longer proposed - considered unnecessary.

River Protection Project Waste Treatment Plant	**MECHANICAL DATA SHEET** **ACTIVATED CARBON ADSORBER**	**PLANT ITEM No.** **24590-HLW-MV-HOP-ADBR-00001A** **24590-HLW-MV-HOP-ADBR-00001B**
		Data Sheet No. 24590-HLW-MVD-HOP-00015 — **Rev.** 3

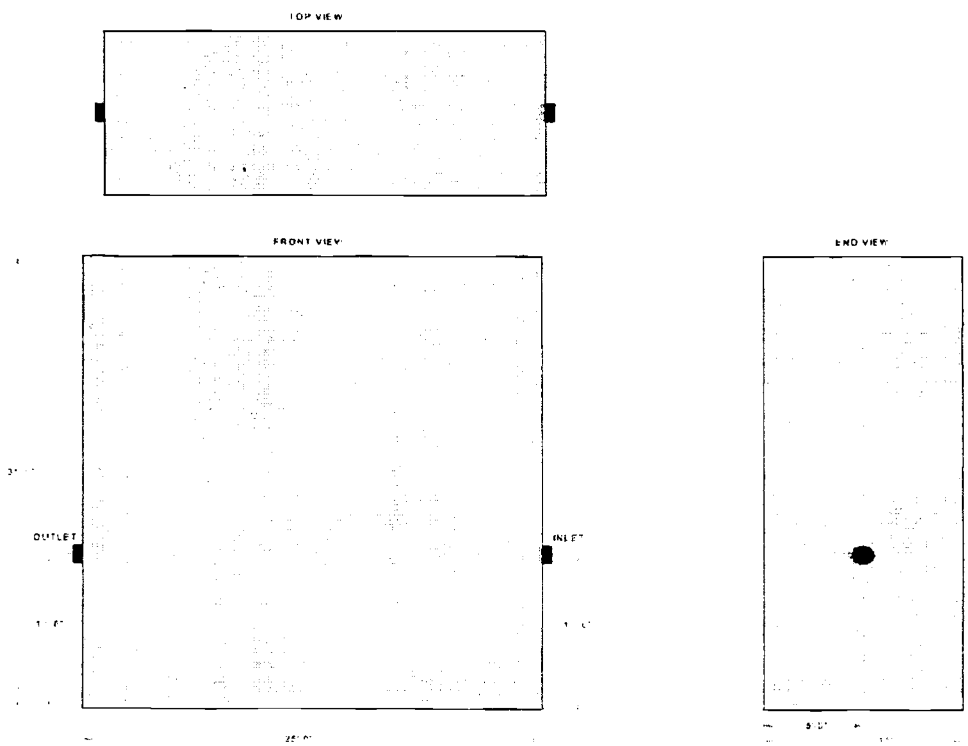
Construction Data: (To be determined by the supplier when not specified by the buyer)					
Envelope Dimensions (L x W x H)	ft	(25' x 11' x 31')	Shipping Dimensions (L x W x H)	ft	* 3 trailers Each Load 15' x 10' x 9'
Operating Weight of unit (two vessels)	lbs	*	Shipping Weight	lbs	* 71,500
Full Water Flood Weight of unit (two vessels)	lbs	*			

Corrosion Data:	
Corrosion Allowance, in	0.010 *(General Note 6)*

General Notes:

1. Data marked with an asterisk (*) to be provided by Vendor.
2. The adsorber housing pressure boundary is designed and fabricated to ASME BPVC, Sec VIII, Div 1, the adsorbers and fire protection system are designed and fabricated to applicable ASME AG-1 requirements and the interconnect piping and valves are designed and fabricated to ASME B31.3 - 1996. The packaged unit is tested to ASME AG-1 with ASME AG-1a-2000 Addenda, and the pressure boundary pneumatically tested per ASME BPVC, Sec VIII, Div I.
3. Contents of this document are Dangerous Waste Permit affecting.
4. Ref. 24590-HLW-M4C-HOP-00011, *HLW Melter Offgas System Design Basis Flowsheets*. Unless otherwise noted, Nominal values represent Nominal Offgas Conditions and Maximum values represent Maximum Offgas Conditions.
   Ref. 24590-HLW-MKC-HOP-00013, *HLW Activated Carbon Bed Operating Conditions and Process Design Requirements*.
5. Ref. CCN 204114 for nozzle design loads for HOP-ADBR-00001A/B.
6. **Ref. 24590-HLW-N1D-HOP-00003, Corrosion Evaluation. A value of 0.010 is used for conservatism.**
7. **Ref. 24590-WTP-J8-50-00001, Radar Installation Wave Guide Spool Joining Details (Detail 2).**
8. **Ref. 24590-HLW-M6-HOP-00011 and -20011 Note 6- Valves shall be triple offset disk with a leak tightness better than FCI 70-2 Class VI. Valves shall be fire resistant and composed of metal or metal-graphite seats.**

HLW Adsorber Layout:

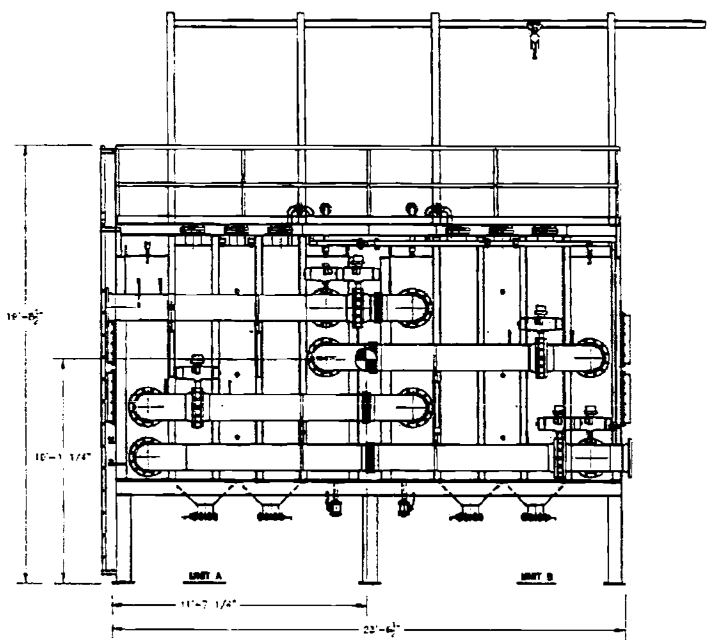


Layout Notes:

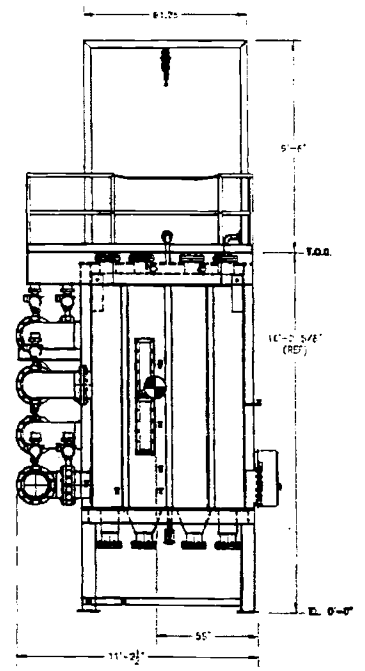
- Process Inlet and Outlet nozzles are shown for clarity. Other nozzle locations will be per Seller.
- Carbon bed, piping, support frame, and maintenance platform layout shall be per Seller meeting the requirements of engineering specification 24590-WTP-3PS-MWK0-T0001.
- Pneumatic loading system shall be located per Seller's design.

HLW Adsorber Sketch:

Note: Dimensions provided below are for reference only. See supplier detail drawings for actual dimensions.



FRONT ELEVATION VIEW



END ELEVATION VIEW

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification			
Full Component Tag Number or BNI Stock Code Number	24590-HLW-MV-HOP-ADBR-00001A 24590-HLW-MV-HOP-ADBR-00001B		Safety Classification ☐ SC ☒ SS ☐ APC-PAM
Equipment Datasheet Number	24590-HLW-MVD-HOP-00015		
Description	Activated Carbon Adsorber		Seismic Category ☐ SC-I ☐ SC-II ☒ SC-III ☐ SC-IV ☐ SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	Located in HLW Room H-A123 at 0'-0" Elevation.		
Safety Function(s)	The following are credited safety functions of the Activated Carbon Bed Adsorbers for either a Seismic or Fire DBE. (P&ID 24590-HLW-M6-HOP-00011 identifies equipment/ instruments/ interlocks that are not within Seller's scope). • Activated Carbon Adsorber Skid: Primary Confinement of Offgas during and after either a Seismic or Fire DBE. • CO Gas Analyzers & Interlocks (by others): The carbon monoxide detector(s) and analysis devices must be sufficiently sensitive to register an increase in carbon monoxide across the bed under the full range of melter operations and offgas flows and actuate the fire suppression system isolation valves. • Carbon Bed Isolation Valves (Seller's scope): The carbon bed isolation valves must seal sufficiently tight to limit the amount of offgas that enters the bed to a level that starves the fire of oxygen and causes it to self-extinguish. • Carbon Bed Bypass Valves (by others): The bypass valve shall automatically fail open once the carbon bed isolation valves have been activated. The bypass valves in the secondary offgas system are designed to open when a portion of the secondary offgas train is isolated in order to prevent blockage of the offgas system. (Reference 24590-WTP-PSAR-ESH-01-002-04)		
Equipment Safety Function Type	☒ Passive Mechanical 24590-HLW-MV-HOP-ADBR-00001A/B	☒ Active Mechanical Operation of Carbon Bed Isolation Valves- Fire DBE only	☐ Electrical
Seismic Safety Function ☒ Yes ☐ No	Seismic Operability Requirements ☐ During Seismic Event	☐ After Seismic Event	☒ None

Equipment Environmental Qualification (EEQ) (Parameter values stated in this section do not include process conditions or operation induced conditions)				
Classification of Environment ☒ Mild ☐ Harsh C3/R2		Qualified Life (years) ☒ 40 ☐ Other EQ Note 5		
Parameter Type/Units	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
Normal Ambients				
High Temperature (°F)	83	Note A	Years	24590-HLW-U0D-W16T-00001

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
Low Temperature (°F)	59	Note B	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	Note C	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	10	Note C	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g.)	0	Note D	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	-0.4	Note D	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	10	40	Years (Note E-1)	24590-HLW-U0D-W16T-00001
Plant/Process Induced Vibration	☐ Yes ☒ No			
Additional Normal Ambient Information:	EQ Notes 1 & 2			
Abnormal Ambients				
High Temperature (°F)	153	8	hours / year	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	40	Note B	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	Note C	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	3	Note C	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g)	4	Note D	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g)	-6.7	Note D	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mR/hr)	10	0	Years (Note E-1)	24590-HLW-U0D-W16T-00001
Exposure to Wet Sprinkler System	☒ Yes ☐ No	2	hours	24590-HLW-U0D-W16T-00001
Additional Abnormal Ambient Information	EQ Notes 1 & 2			
Design Basis Events (DBE) Ambients				
High Temperature (°F)	184	2	hours	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	40	Note B	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	2	hours	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	2	2	hours	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g)	4	8	hours	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g)	-6.7	8	hours	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mR/hr)	10	N/A	hours	24590-HLW-U0D-W16T-00001
Submergence	☐ Yes ☒ No EQ Note 3	N/A	hours	24590-HLW-U0D-W16T-00001
Chemical/Spray Exposure	☐ Yes ☒ No	N/A	hours	24590-HLW-U0D-W16T-00001 (EQ Note 4)
Additional DBE Information				

DBE Chemical Exposure Details

DBE Chemical Exposure Details	
DBE Chemical Types / Concentrations	N/A (EQ Note 4)

Electrical Interfaces Supporting the Safety Function	
Power Supply Voltage (VAC, VDC)	(SELLER) 120VAC
Power Supply Frequency (Hz)	(SELLER) 60 Hz
Power Connection Method	(SELLER) Terminal Blocks
I/O Signals to/from Equipment	(SELLER)
I/O Connection Method	(SELLER) Terminal Blocks

Mechanical Interfaces	
Mounting Configuration (orientation)	See 24590-HLW-P1-P01T-00002 for WTP General Arrangement Drawing.
Mounting Method (bolts, welds, etc.)	12" x 12" x 1" steel base plate welded (3/8" fillet weld) to WTP embedded steel plate (6 PL). See 24590-HLW-DD-S13T-00067 for embed quantity and location. See 24590-PTF-DD-S13T-00201 for embed detail. See 24590-QL-POA-MWK0-00001-05-00001 for supplier General Arrangement Drawing.
Auxiliary Devices	Carbon Monoxide Gas Analyzer, Mercury Monitor, 14" Isolation Valves and Actuators, Interlocks.

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	
Specified Seismic Load Parameters	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	

Equipment Qualification (EQ) Notes and Additional Information

A. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

B. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per item a) above. Therefore, no duration is assigned for the low temperatures.

C. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and the low normal and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

D. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

E. 1) If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

(2) If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

F. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

G. Spray due to fire sprinkler actuation shall be taken to occur once over the entire qualified life duration for a period of 2 hours, even if the qualified life is a period less than 40 years. If spray qualification is provided for DBE conditions (whether for water or chemical spray), then separate qualification for the fire sprinkler spray need not be provided.

H. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

I. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

ADDITIONAL EQ NOTES:

1) Ambient conditions shown for equipment qualification are not to be misinterpreted to represent process conditions for melter offgas.

2) Where pressure is given in inches of water column (in-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in-w.g.).

3) SELLER's equipment design to preclude submergence of sensitive components of the skids.

4) Ammonia and nitric acid listed in the HLW Room Environment Data sheet, 24590-HLW-U0D-W16T-00001, Rev 1 are N/A for DBE Exposure as follows:

- The nitric acid pipe line identified in CCN 156336 is not located in room H-A123.
- Confinement of ammonia is achieved by designation of the ammonia lines in HLW as SS, seismic category SC-III.

5) If qualified life is other than 40 years, SELLER shall submit the maintenance frequency for components not meeting the 40- year requirement.

River Protection Project
Waste Treatment Plant

MECHANICAL DATA SHEET

ACTIVATED CARBON ADSORBER

PLANT ITEM No.	
24590-HLW-MV-HOP-ADBR-00001A 24590-HLW-MV-HOP-ADBR-00001B	
Data Sheet No.	Rev.
24590-HLW-MVD-HOP-00015	3

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

Safety Screening required?: Yes X No ___ (If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below.)

Rev.	Reason for Revision	System Engineer	Equipment Engineer	Checked	Reviewed	E&NS	Approved	Date
3	Incorporated TCN 24590-~~TCN~~ QL-MRA-MWKO-00001-T0003 (TJV 4/9/10) **Major revision. Revision triangles not used.**	M. O'Neill	R. Jablonski	T. Valenti	G. Goolsby	C. Meng	for J. Roth	4/9/10
2	Updated Quality Level, Process Data, Material Data, Bed Fire Suppression System Data, Design Data, and Activated Carbon Data. Added Equipment Qualification Data. Incorporated SDDR 24590-WTP-SDDR-M-06-00287 by reference.	M. O'Neil	R. Jablonski	C. Knauss	G. Goolsby	C. Menc	J. Julyk	4/08/08
1	Revised to comply with Code 1 PO submittal # 24590-QL-POA-MWK0-00001-09-00001 in accordance with CAR # 24590-WTP-CAR-QA-05-120. Added Environmental Qualification.	J. Rouse	D.Pease	A. Benamou C. Morley	-	-	J.Julyk	12-06-05
0	Issued for Purchase	J. Rouse	D. Pease	C. Morley	-	-	M. Hoffmann	9-20-04

R11188507

MECHANICAL DATA SHEET

ACTIVATED CARBON ADSORBER

River Protection Project
Waste Treatment Plant

ISSUED BY
RPP-WTP PDC

PLANT ITEM No.	
24590-HLW-MV-HOP-ADBR-00002A	
24590-HLW-MV-HOP-ADBR-00002B	
Data Sheet No.	Rev.
24590-HLW-MVD-HOP-00016	3

Project:	RPP-WTP	Description:	Activated Carbon Adsorber for Mercury Abatement
Project No:	24590	Mech. Drawing:*	
Site:	Hanford	P&ID:	24590-HLW-M6-HOP-20011, Rev 0
System:	HOP (Melter 2)	Process Calculations:	24590-HLW-M4C-HOP-00011, Rev 1 24590-HLW-MKC-HOP-00013, Rev 1
Process flow diagram:	24590-HLW-M5-V17T-20004, Rev 1	Specification:	24590-WTP-3PS-MWK0-T0001, Rev 4

General Data

Quality Level	Q	Code Stamp	N/A
Seismic Category	SC-III	NB Registration	N/A
Design Code	General Note 2	Design Life	40 yrs *(Process Note 3)*

Process Data *(General Note 4)*

Offgas Conditions (Inlet):

Parameter		Actual Conditions (Process Note 7) Nominal	Maximum	Design
Vol. Flow	SCFM ACFM	1,403 1,807	1,646 2,219	2,000 2,633
Mass Flow	lb/hr	6,127	7,001	N/A
Temperature	°F	197	230	250
Pressure	in-w.g.	-5.2	-4	*(Process Note 4)* -82
Density	lb/ft³	0.0565	0.0526	N/A
Relative Humidity Operating Abnormal	%	*(Process Note 8)* 11.7 100	10.7 100	N/A
Allowable Pressure Drop *(Process Note 2)*		in-w.g.	12	

Offgas Composition (Inlet):

Major Offgas Components	Actual Composition (Process Note 7) Nominal, Volume %	Maximum, Volume %
N_2	70.9	65.7
O_2	19.0	17.6
H_2O	8.89	15.5
CO_2	0.375	0.40
Ar	0.85	0.79

Minor Offgas Components	Nominal *(Process Note 3)* kg/hour	Maximum *(Process Note 5)* kg/hour
NH_3	2.96E-03	3.19E-02
NO	4.17E-01	1.88E+00
N_2O	7.27E-03	1.50E-01
NO_2	6.24E-02	2.25E+00
CO	8.80E-03	1.70E-02
H_2	2.49E-03	8.79E-02
HCl	3.31E-03	6.58E-03
HF	1.98E-03	3.99E-03
I_2	1.11E-03	1.11E-03
SO_2	4.24E-03	6.70E-03
HNO_2	9.69E-03	4.31E-02
HNO_3	9.53E-03	2.85E-02
VOC	2.40E-03	3.20E-03
Particulate	1.20E-12	2.11E-10

Mercury Concentration:

Parameter	Condition: Nominal (μg/dscm)	Nominal (kg/hour)	Maximum *(Process Note 5)* (μg/dscm)	Maximum (kg/hour)
Hg Mass Flow	7,660	1.66E-02	52,600	1.25E-01

Required Decontamination Factor (DF) for Hg to comply with <45 ug/dscm	≥ 1000
Removal Efficiency for I_2	>90%

Process Notes:

1. Carbon adsorbers shall be operated in series during normal operation.
2. Allowable pressure drop is for both carbon adsorbers HOP-ADBR-00002A and B operating in series (12 in-w.g. total) and shall be based on end of bed life.
3. Design life for each of the activated carbon adsorber primary beds, at a minimum, shall be for one year at Nominal condition of Mercury with the adsorbers operating in series. **Design life for the activated carbon adsorber guard beds (combined for two adsorbers) shall be for one year at Nominal conditions based on specified HCl, HF, I_2, SO_2, HNO_2 & HNO_3 loading with the adsorbers operating in series.**
4. Equipment design pressure (Positive) shall be determined by Seller based on pressures generated during a carbon bed fire and activation of the fire suppression water.
5. **Maximum** component rates are based on the Bounding Condition, except CO, Hg, HCl, HF, I_2, SO_2, HNO_2 and HNO_3, which are based on the Maximum Condition. **Bounding/ maximum conditions are used to assess the maximum credible impact on bed life due to competitive effects during Appendix B and C testing (refer to Engineering Specifications, 24590-WTP-3PS-MWK0-T0001).**
6. Personnel Protection insulation is required for surfaces with temperature of 140 °F and above.
7. Values listed are representative of specific offgas conditions as a whole and not as individual parameters. For example, the Nominal Relative Humidity is dependent upon the Nominal Temperature. For this reason

some values in the Maximum Condition column may actually be less than those listed in the Nominal Condition. 8. **The abnormal operating condition is isolation of the carbon bed adsorbers without purge of moisture from the interior gas spaces. As the offgas cools the relative humidity increases to 100%. Further cooling of the offgas results in * levels of adsorption within the primary and guard beds and * condensation on the internal walls of the adsorbers.**	Removal Efficiency for HCl or HF	>90%
	Removal Efficiency for SO_2	>90%
	Minimum time between Carbon Media change-out: Primary Bed Guard Bed	*(Process Note 3)* 12 months 12 months

Material Data

Process Pipe and Housing Fabrication -			
Pipe Class	S11V	Valve Material	316 / 316L SS
Inlet Piping Size	14 inches	Valve Trim	TRIM 12, API 600
Outlet Piping Size	14 inches	Flange Material	316L SS
Housing	316L SS	Gasket Material	Spiral-Wound/Flat, Graphite
Activated Carbon Beds Screens	316L SS	Flange Rating	CL 150 RF B16.5
Pipe schedule	TBD	Housing Insulation / Jacket	Calcium Silicate ASTM C533, Type I / 0.024" thk. SST ASTM A240
Pipe Material	316 / 316L SS	Pipe Insulation / Jacket	Calcium Silicate ASTM C533, Type I / 0.024" thk. SST ASTM A240

Fire Protection Pipe -			
Pipe Class	S11V	Valve Trim	Trim 12, API 600
Inlet Piping Size	* 2 inch	Flange Material	316L SS
Pipe Schedule	40S	Gasket Material	316L SS SP-WND / Graphite Filled
Pipe Material	316 / 316L SS	Flange Rating	CL150 RF B16.5
Valve Material	316L SS		

Appurtenances and Other items -			
Support Frames	Carbon Steel	Drain Line Flange Material	316L SS
Pipe Supports	Carbon Steel	Drain Line Flange Rating	CL150 RF B16.5
Maintenance Platforms	Carbon Steel	Radar Guide Design	*(General Note 7)*
Flange Bolts / Nuts	ASTM F593 / ASTM F594	Radar Guide Pipe/Flange Material	*
Fire Suppression Drain Pipe Material	316 / 316L SS	Radar Guide Pipe Size	*
Fire Suppression Drain Pipe Schedule	40S	Radar Guide Pipe Schedule	*
Drain Line on/off valve	* 2 inch Manual Ball Valve	Radar Guide Pipe Flange	*

Bed Fire Suppression System

Fire Detection Method:	**Differential CO_x Monitor**	Information on Fire Suppression by Flooding Carbon Beds	
Fire Suppression Activation Method:	**Automatic Bed Isolation**	Flowrate:	* 22 gpm per unit
Primary Fire Suppression Method:	**Isolate Carbon Beds**	Pressure:	* 50 psig
Secondary Fire Suppression Method:	**Flood Carbon Beds**	Total Volume of Water:	* 5400 gal
Fluid Type for Carbon Bed Flooding:	**Fire Service Water**	Total Time to Fill Vessel:	* 240 minutes
Liquid Level Control Method:	**Radar Liquid Level Indication**	Drain Pipe Line Size:	* 2 inch
Liquid Level Control Logic:	**Connection of a hose and opening of a supply valve (by others) will be required to initiate the flow of Fire Protection Water to a carbon bed. The Fire Protection Water supply will be closed at a pre-determined liquid level.**		

MECHANICAL DATA SHEET
ACTIVATED CARBON ADSORBER

PLANT ITEM No.
24590-HLW-MV-HOP-ADBR-00002A
24590-HLW-MV-HOP-ADBR-00002B

Data Sheet No.	Rev.
24590-HLW-MVD-HOP-00016	3

Design Data

Nozzle Loads at Buyer Interface *(General Note 5)*

Outlet Nozzle:

Nozzle #	Nozzle Size	Orientation	Load Case	F_X(lbs)	F_Y(lbs)	F_Z(lbs)	M_X(ft-lbs)	M_Y(ft-lbs)	M_Z(ft-lbs)
N01	14 in	Horizontal	*Weight*	500	1,500	500	2,100	1,000	1,000
			Seismic	2,700	2,000	9,400	5,600	12,300	5,000
			Thermal	1,000	1,000	2,700	2,500	2,500	3,000

Outlet Nozzle:

Nozzle #	Nozzle Size	Orientation	Load Case	F_X(lbs)	F_Y(lbs)	F_Z(lbs)	M_X(ft-lbs)	M_Y(ft-lbs)	M_Z(ft-lbs)
N02	14 in	Horizontal	*Weight*	500	1,500	500	1,600	1,000	1,000
			Seismic	1,100	2,400	1,200	3,500	2,100	2,200
			Thermal	2,300	2,400	1,000	7,100	2,200	16,300

Note: Values are x = North/South, y = vertical, z = East/West. **Note: Forces and moments are +/- and in Global x, y, z direction.**

Thermal Information:

Room #	H-A123		Maximum Heat Loss	**5 kw (per unit)**
Room Temperature	59 - 83	°F	Thermal Cycling Frequency:	**For design purposes use a thermal cycle frequency of once every two (2) months for the life of the plant (40 years).**
Earth Temperature Beneath Slab	70	°F (Fixed)		
Concrete Slab Base Thickness	72	Inches		
Thermal Conductivity of Concrete Slab	1.8	W / m / K		

Activated Carbon Data:	Primary Bed	Guard Bed
Manufacturer	* **Donau Carbon**	* **Donau Carbon**
Model	* **Kombisorb BAT 37**	*
Description	* **A mixed product composed by inert material and impregnated, cylindrically shaped activated carbon (ratio of mixture 30:70).**	*
Activation element/ % Loading	* **Sulfur compounds/ ***	* / *
Media form (granular, pellet, etc.)	* **Extruded & Granular**	*
Size of carbon media (mm)	* **3-5**	*
Bulk density	* **0.5 g/cc (31.2 lb/ft³)**	*
Total Bed Loading, Lbs/ Lb Media	* **(Mercury)**	* **(Iodine)** * **(Acid Gases)**
Number of beds per vessel	* **Two**	* **Two**
Arrangement	* **Rectangular parallel beds**	* **Rectangular parallel beds**
Residence time, sec	* **(at design flow rate in ACFM)**	* **(at design flow rate in ACFM)**
Thickness of bed, in	* **20**	* **10**
Total media volume, ft³ per vessel	* **220**	* **110**
Total media weight, lbs per vessel	* **6860**	*
Spacing between beds, in	* **4**	* **4 and 8**
Face velocity thru carbon, fpm	* **(at design flow rate in ACFM)**	* **(at design flow rate in ACFM)**
Max. allowable temp. °F	*	*
Min. allowable temp. °F	* **Ambient**	* **Ambient**

House/vessel -	
Material/Thickness	* **0.375" 316L SS with external stiffeners**
Vessel dimensions, (L x W x H)	* **138" x 112" x 156"**
Total weight of vessel	* **est. lbs per vessel**
Weight of vessel with carbon, lbs	* **lbs**
Design pressure, in-w.g.	* **in-w.g (Refer to Process Note 4. Positive design pressure is 126 in-Wg)**
Operating pressure, in-w.g.	* **in-w.g.**
Design temperature, °F	*
Recommended housing insulation:	* **Calcium silicate and/or foam glass**
Material/Thickness, in	* **7 inches on sides, 1 inch over stiffeners**
Thermal Cond, Btu-in/hr ft² °F	* **0.39**
Method of Attachment	* **Mechanical support via outer jacket and/or straps**
Unloading on/off valve	* **8 each per vessel, each 8" size (4 ea. for Primary Bed)**

River Protection Project Waste Treatment Plant	**MECHANICAL DATA SHEET** **ACTIVATED CARBON ADSORBER**	**PLANT ITEM No.** **24590-HLW-MV-HOP-ADBR-00002A** **24590-HLW-MV-HOP-ADBR-00002B**
		Data Sheet No. 24590-HLW-MVD-HOP-00016 / **Rev.** 3

Discharge Filter -	
Manufacturer	* **American Air filter**
Type of filter	* **Extended surface mini-pleat with metal sides**
Filter material	* **microglass paper**
Filter frame material	* **stainless steel type 316**
Dimensions of filter, (L x W x H)	* **23-3/8" x 23-3/8" x 3-3/4"**
Weight of filter, lbs	* **15 lbs**
Number of filters per vessel	* **2**
Filter rating (efficiency, particle size)	* **99% on 5 micron particles**
Flow rate capacity, scfm	* **2000 per filter**
Max. allowable temp. °F	* **250**
Min. allowable temp. °F	* **Ambient**

Connecting Pipe -	
Pipe size, in	* **14**
Material/Thickness, in	*
Total length of piping, ft	*
Valve type, (gate, butterfly, etc.)- General Note 8	* **butterfly**
Weight of valve, lbs	*
Valve manufacturer	*
Total number of valves	*
Actuators (air operated, rack and pinion, FC)	*
Actuator manufacture	*
Weight of actuator	*
Actuator operating pressure (min. and max.)	*
Opening time, seconds	*
Total number of Actuators	*
Required instrument air supply, scfm	*
Recommended piping insulation:	* **Calcium silicate or foam glass**
Material/Thickness, in	* **1 inches**
Thermal Cond. Btu-in/hr ft^2 °F	* **0.39**
Method of Attachment	* **straps**

Pneumatic Loading Equipment:	
Manufacturer	* **N/A**
Blower size, horsepower	* **N/A**
Blower electrical load, watts	* **N/A**
Required voltage for blower	* **N/A**
Skid envelope size, (L x W x H)	* **N/A**
Skid weight, lbs	* **N/A**
Skid transportation/mobility	* **N/A**
Estimated time to load the vessel	* **N/A**

Note:
System designed to permit loading directly from bulk bags or drums into beds without the need for pneumatic loading devices.

Optional Electric Pre-Heater:	
Manufacturer	* **N/A**
Heater element electric load, watts	* **N/A**
Required voltage for heater elements, V	* **N/A**
an electric load, watts	* **N/A**
Required voltage for fan, V	* **N/A**
Fan size, horsepower	* **N/A**
Skid envelope size, (L x W x H)	* **N/A**
Skid weight, lbs	* **N/A**
Skid transportation/mobility	* **N/A**
Estimated time to preheat the carbon, hrs	* **N/A**
Total electric load for skid, watts	* **N/A**
Total required voltage	* **N/A**

Note:
Electrical Pre-Heater no longer proposed - considered unnecessary.

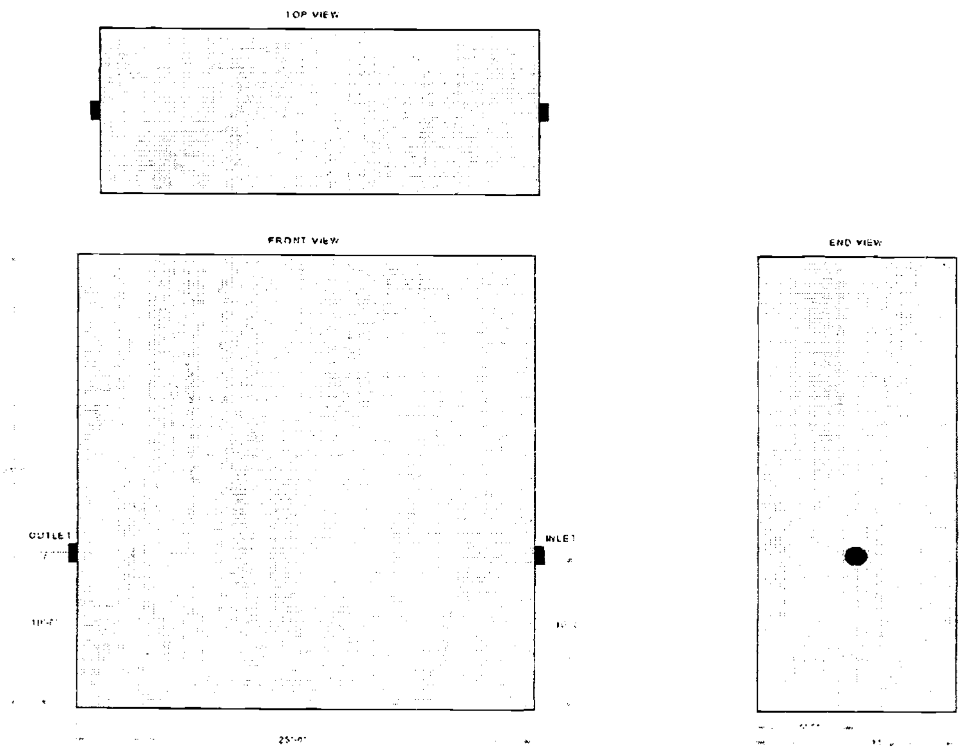
Construction Data: (To be determined by the supplier when not specified by the buyer)					
Envelope Dimensions (L x W x H)	ft	(25' x 11' x 31')	Shipping Dimensions (L x W x H)	ft	* 3 trailers Each Load 15' x 10' x 9'
Operating Weight of unit (two vessels)	lbs	*	Shipping Weight	lbs	* 71,500
Full Water Flood Weight of unit (two vessels)	lbs	*			

Corrosion Data:	
Corrosion Allowance, in	0.010 *(General Note 6)*

General Notes:

1. Data marked with an asterisk (*) to be provided by Vendor.
2. The adsorber housing pressure boundary is designed and fabricated to ASME BPVC, Sec VIII, Div 1, the adsorbers and fire protection system are designed and fabricated to applicable ASME AG-1 requirements and the interconnect piping and valves are designed and fabricated to ASME B31.3 - 1996. The packaged unit is tested to ASME AG-1 with ASME AG-1a-2000 Addenda, and the pressure boundary pneumatically tested per ASME BPVC, Sec VIII, Div I.
3. Contents of this document are Dangerous Waste Permit affecting.
4. Ref. 24590-HLW-M4C-HOP-00011, *HLW Melter Offgas System Design Basis Flowsheets*. Unless otherwise noted, Nominal values represent Nominal Offgas Conditions and Maximum values represent Maximum Offgas Conditions.
   Ref. 24590-HLW-MKC-HOP-**00013**, *HLW Activated Carbon Bed Operating Conditions and Process Design Requirements*.
5. Ref. CCN **204114 for nozzle design loads for HOP-ADBR-00001A/B.**
6. **Ref. 24590-HLW-N1D-HOP-00003, Corrosion Evaluation. A value of 0.010 is used for conservatism.**
7. **Ref. 24590-WTP-**J8-**50-00001, Radar Installation Wave Guide Spool Joining Details (Detail 2).**
8. **Ref. 24590-HLW-M6-HOP-00011 and -20011 Note 6- Valves shall be triple offset disk with a leak tightness better than FCI 70-2 Class VI. Valves shall be fire resistant and composed of metal or metal-graphite seats.**

HLW Adsorber Layout:

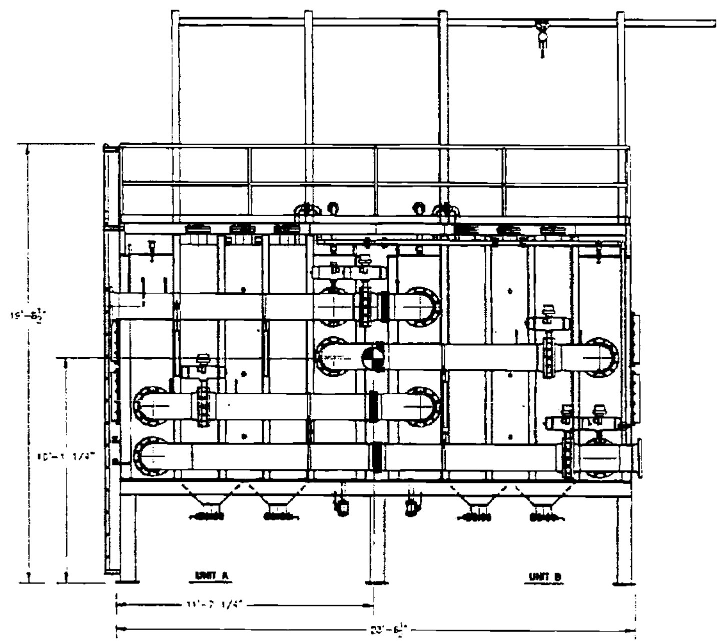


Layout Notes:

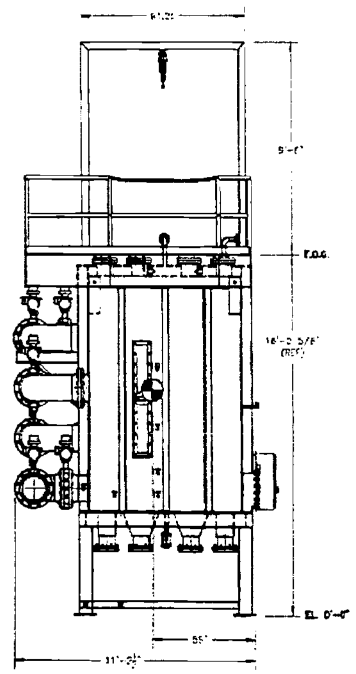
- Process Inlet and Outlet nozzles are shown for clarity. Other nozzle locations will be per Seller.
- Carbon bed, piping, support frame, and maintenance platform layout shall be per Seller meeting the requirements of engineering specification 24590-WTP-3PS-MWKC-T0001.
- Pneumatic loading system shall be located per Seller's design

HLW Adsorber Sketch:

Note: Dimensions provided below are for reference only. See supplier detail drawings for actual dimensions.



FRONT ELEVATION VIEW



END ELEVATION VIEW

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification			
Full Component Tag Number or BNI Stock Code Number	24590-HLW-MV-HOP-ADBR-00002A 24590-HLW-MV-HOP-ADBR-00002B		Safety Classification ☐ SC ☒ SS ☐ APC-PAM
Equipment Datasheet Number	24590-HLW-MVD-HOP-00016		
Description	Activated Carbon Adsorber		Seismic Category ☐ SC-I ☐ SC-II ☒ SC-III ☐ SC-IV ☐ SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	Located in HLW Room H-A123 at 0'-0" Elevation.		
Safety Function(s)	The following are credited safety functions of the Activated Carbon Bed Adsorbers for either a Seismic or Fire DBE. (P&ID 24590-HLW-M6-HOP-00011 identifies equipment/ instruments/ interlocks that are not within Seller's scope). • Activated Carbon Adsorber Skid: Primary Confinement of Offgas during and after either a Seismic or Fire DBE. • CO Gas Analyzers & Interlocks (by others): The carbon monoxide detector(s) and analysis devices must be sufficiently sensitive to register an increase in carbon monoxide across the bed under the full range of melter operations and offgas flows and actuate the fire suppression system isolation valves. • Carbon Bed Isolation Valves (Seller's scope): The carbon bed isolation valves must seal sufficiently tight to limit the amount of offgas that enters the bed to a level that starves the fire of oxygen and causes it to self-extinguish. • Carbon Bed Bypass Valves (by others): The bypass valve shall automatically fail open once the carbon bed isolation valves have been activated. The bypass valves in the secondary offgas system are designed to open when a portion of the secondary offgas train is isolated in order to prevent blockage of the offgas system. (Reference 24590-WTP-PSAR-ESH-01-002-04)		
Equipment Safety Function Type	☒ Passive Mechanical 24590-HLW-MV-HOP-ADBR-00002A/B	☒ Active Mechanical Operation of Carbon Bed Isolation Valves- Fire DBE only	☐ Electrical
Seismic Safety Function ☒ Yes ☐ No	Seismic Operability Requirements ☐ During Seismic Event	☐ After Seismic Event	☒ None

Equipment Environmental Qualification (EEQ)

(Parameter values stated in this section do not include process conditions or operation induced conditions)

Classification of Environment ☒ Mild ☐ Harsh	Qualified Life (years) ☒ 40 ☐ Other
C3/R2	EQ Note 5

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	83	Note A	Years	24590-HLW-U0D-W16T-00001

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
Low Temperature (°F)	59	Note B	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	Note C	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	10	Note C	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g.)	0	Note D	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	-0.4	Note D	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	10	40	Years (Note E-1)	24590-HLW-U0D-W16T-00001
Plant/Process Induced Vibration	☐ Yes ☒ No			
Additional Normal Ambient Information:	EQ Notes 1 & 2			
Abnormal Ambients				
High Temperature (°F)	153	8	hours / year	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	40	Note B	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	Note C	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	3	Note C	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g)	4	Note D	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g)	-6.7	Note D	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mR/hr)	10	0	Years (Note E-1)	24590-HLW-U0D-W16T-00001
Exposure to Wet Sprinkler System	☒ Yes ☐ No	2	hours	24590-HLW-U0D-W16T-00001
Additional Abnormal Ambient Information	EQ Notes 1 & 2			
Design Basis Events (DBE) Ambients				
High Temperature (°F)	184	2	hours	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	40	Note B	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	2	hours	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	2	2	hours	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g)	4	8	hours	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g)	-6.7	8	hours	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mR/hr)	10	N/A	hours	24590-HLW-U0D-W16T-00001
Submergence	☐ Yes ☒ No EQ Note 3	N/A	hours	24590-HLW-U0D-W16T-00001
Chemical/Spray Exposure	☐ Yes ☒ No	N/A	hours	24590-HLW-U0D-W16T-00001 (EQ Note 4)
Additional DBE Information				

DBE Chemical Exposure Details

DBE Chemical Exposure Details	
DBE Chemical Types / Concentrations	N/A (EQ Note 4)

Electrical Interfaces Supporting the Safety Function	
Power Supply Voltage (VAC, VDC)	(SELLER) 120VAC
Power Supply Frequency (Hz)	(SELLER) 60 Hz
Power Connection Method	(SELLER) Terminal Blocks
I/O Signals to/from Equipment	(SELLER)
I/O Connection Method	(SELLER) Terminal Blocks

Mechanical Interfaces	
Mounting Configuration (orientation)	See 24590-HLW-P1-P01T-00002 for WTP General Arrangement Drawing.
Mounting Method (bolts, welds, etc.)	12" x 12" x 1" steel base plate welded (3/8" fillet weld) to WTP embedded steel plate (6 PL). See 24590-HLW-DD-S13T-00067 for embed quantity and location. See 24590-PTF-DD-S13T-00201 for embed detail. See 24590-QL-POA-MWK0-00001-05-00001 for supplier General Arrangement Drawing.
Auxiliary Devices	Carbon Monoxide Gas Analyzer, Mercury Monitor, 14" Isolation Valves and Actuators, Interlocks.

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	
Specified Seismic Load Parameters	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	

Equipment Qualification (EQ) Notes and Additional Information

A. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

B. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per item a) above. Therefore, no duration is assigned for the low temperatures.

C. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and the low normal and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

D. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

E. 1) If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

(2) If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

F. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

G. Spray due to fire sprinkler actuation shall be taken to occur once over the entire qualified life duration for a period of 2 hours, even if the qualified life is a period less than 40 years. If spray qualification is provided for DBE conditions (whether for water or chemical spray), then separate qualification for the fire sprinkler spray need not be provided.

H. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

I. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

ADDITIONAL EQ NOTES:

1) Ambient conditions shown for equipment qualification are not to be misinterpreted to represent process conditions for melter offgas.

2) Where pressure is given in inches of water column (in-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in-w.g.).

3) SELLER's equipment design to preclude submergence of sensitive components of the skids.

4) Ammonia and nitric acid listed in the HLW Room Environment Data sheet, 24590-HLW-U0D-W16T-00001, Rev 1 are N/A for DBE Exposure as follows:

- The nitric acid pipe line identified in CCN 156336 is not located in room H-A123.
- Confinement of ammonia is achieved by designation of the ammonia lines in HLW as SS, seismic category SC-III.

5) If qualified life is other than 40 years, SELLER shall submit the maintenance frequency for components not meeting the 40- year requirement.

River Protection Project Waste Treatment Plant	**MECHANICAL DATA SHEET** **ACTIVATED CARBON ADSORBER**	**PLANT ITEM No.** **24590-HLW-MV-HOP-ADBR-00002A** **24590-HLW-MV-HOP-ADBR-00002B** **Data Sheet No.** 24590-HLW-MVD-HOP-00016 **Rev.** 3

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

Safety Screening required?: Yes _X_ No ___ (If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below.)

Rev.	Reason for Revision	System Engineer	Equipment Engineer	Checked	Reviewed	E&NS	Approved	Date
3	Incorporate TCN 24598-QL-MRA-MWKO-00001-T0003. TJV 4/9/10 **Major revision. Revision triangles not used.**	M. O'Neill	R. Jablonski	T. Valenti	G. Goolsby	C. Meng	for J. Roth	4/9/10
2	Updated Quality Level, Process Data, Material Data, Bed Fire Suppression System Data, Design Data, and Activated Carbon Data. Added Equipment Qualification Data. Incorporated SDDR 24590-WTP-SDDR-M-06-00287 by reference.	M. O'Neil	R. Jablonski	C. Knauss	G. Goolsby	C. Meng	J. Julyk	04-08-08
1	Revised to comply with Code 1 PO submittal # 24590-QL-POA-MWK0-00001-09-00001 in accordance with CAR # 24590-WTP-CAR-QA-05-120. Added Environmental Qualification.	J. Rouse	D.Pease	A. Benamou C. Morley	-	-	J.Julyk	12-06-05
0	Issued for Purchase	J. Rouse	D. Pease	C. Morley	-	-	M. Hoffmann	9-20-04

ISSUED BY
RPP-WTP PDC

R10958409

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Activated Carbon Bed Adsorbers

Some information on pages 48 thru 68 may appear to be illegible, however, the information for assuring adequate design is legible.
Approver Initial:
Approver Date: 9/17/08

Content applicable to ALARA? ☒ **Yes** ☐ **No**

ADR No. 24590-WTP-ADR-M-04-0004 **Rev** 0

Quality Level: Q

DOE Contract No. DE-AC27-01RV14136

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

REV	DATE	BY	CHECK	REVIEW	E&NS	QA	DPEM
4	9/17/08	R. Jablonski	N. Whitcomb	G. Goolsby	D. Carlstrom	M. Cochrane for ~~M. Ehlinger~~ 9/17/08	J. ROTH ~~J. Julyk~~ 9/17/08
3	08-Apr-08	R. Jablonski	C. Knauss	G. Goolsby	M. Rosenthal	M. Ehlinger	J. Julyk
2	18-May-05	D. Pease	K. Chin	C. Morley	S. Woolfolk/ Todd Allen	G. Warner	M. Hoffmann
1	02-Nov-04	D. Pease	S. Ngakan	C. Morley	S. Woolfolk/ M. Medsker	G. Warner	M. Hoffman
0	06-Aug-04	D. Pease	S. Ngakan	C. Morley	B. Spezialetti	G. Warner	M. Hoffmann

SPECIFICATION No. 24590-WTP-3PS-MWK0-T0001 **Rev** 004

Revision History

Revision	Reason for Revision
0	Issued for Purchase of HLW adsorbers. LAW adsorbers are on hold pending approval of ABAR 24590-WTP-SE-ENS-03-1261 Rev 0.
1	Issued for Purchase based on DTD number 24590-LAW-DTD-ENS-04-0002, with LAW adsorber ITS equipment for carbon bed fire mitigation on hold. This includes: Isolation valves, high temperature switch and interlock, and COx monitor and interlocks.
2	Incorporated SCN number 24590-WTP-3PN-MWK0-00001 and SDDRs 24590-WTP-SDDR-PROC-04-01020, 24590-WTP-SDDR-PROC-04-01040, 24590-WTP-SDDR-PROC-05-00392, 24590-WTP-SDDR-PROC-05-00602, 24590-WTP-SDDR-PROC-05-00652, 24590-WTP-SDDR-PROC-05-00701, and 24590-WTP-SDDR-M-05-00018. Revised LAW instrumentation requirements for remote mounting of analyzers and transmitters. Revised Figures 1 and 2 to clarify instrumentation requirements. Added appendix B and C to clarify testing requirements for carbon media. LAW adsorber ITS equipment for carbon bed fire mitigation is still on hold. This includes: Isolation valves, high temperature switch and interlock, and COx monitors and interlocks.
3	Incorporated SCN 24590-WTP-3PN-MWK0-00002 and SDDRs 24590-WTP-SDDR-M-06-00286, 24590-WTP-SDDR-M-06-00287, and 24590-WTP-SDDR-MS-07-00051. Revised Appendix B and C testing requirements. Added WTP specific tailoring of codes (appendix D-J). Updated HLW ITS List. Updated Environmental Requirements based on EQ Room Data Sheets. Changed CO and COx analyzers from supplier's scope to buyer's. Added Hg Monitor Probe connection detail (Fig 3).
4	Changed Appendix B & C testing scope from Seller to Buyer. Deleted Figure 1 and 2 (replaced with P&ID drawing reference). Renamed Table 1 and Table 2. Added information to Table 2. Added instruction for including WTP piping and supports into Supplier Analysis. Added Monorail and Hoist Carbon media loading requirements and necessary codes. Changed LAW instrumentation scope from supplier to WTP. Renamed Table 1 and 2. Added revisions to Tailored Codes in Appendix section.

Notice

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

Contents

Figures

Tables

Appendices

1 Scope

1.1 Project Description and Location

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

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

1.2 Equipment, Material, and Services Required

This specification provides the requirements for the design, analysis, fabrication, project management, quality assurance, inspection, testing, qualification, and labeling of the Activated Carbon Bed Adsorbers, associated filters, gaskets, insulation, piping, fasteners, shims, and special tools for use in the High Level Waste (HLW) and Low Activity Waste (LAW) facilities. This specification also provides the requirements for the conception, demonstration, design, fabrication, quality assurance, inspection, testing, qualification, and supply of activated carbon, testing equipment, testing apparatus, testing materials, manuals, instructions, and procedures.

The scope of work for the Seller includes all work specifically defined in this specification. Work shall include, but is not limited to, the following:

1.2.1 Provide fully detailed designs, drawings, supporting calculations, supporting analysis, supporting models, procedures, and all labor, materials, fasteners, tooling, equipment, apparatus, required instrumentation, shop drawings, and services necessary to manufacture, test, inspect, label, and package Activated Carbon Bed Adsorbers in accordance with this specification and the Mechanical Data Sheets in Section 2 of the purchasing documents.

1.2.2 Provide Buyer with a breakdown (by paragraph) of the following codes, industry standards, and referenced documents to be applied to each aspect of the Activated Carbon Bed Adsorbers detailed design, drawings, analysis, fabrication, quality assurance, inspection, testing, qualification, labeling, packaging, handling, and shipment for review prior to beginning detailed design:

- ASME AG-1-1997, including WTP specific tailoring
- ASME AG-1a-2000
- ASME N509-1989
- ASME B&PVC, Section VIII, Div 1

If an entire section or part of the above listed codes and standards applies, a breakdown by paragraph is not required. Only the part or section shall be listed.

1.2.3 Provide design calculations in accordance with this specification and applicable codes. Calculations shall include, but not be limited to:

- Code calculations
- Seismic calculations
- Support calculations (Include tabulated resultant reactions at support locations, by load case)
- Calculations associated with lifting and erection of the vessel
- Nozzle loads and movements per thermal and seismic calculations
- Thermal and discontinuity stresses as applicable
- Fatigue analysis as applicable for pressure vessels in fatigue services

1.2.4 Provide a three-dimensional (3-D) computational fluid dynamics (CFD) model and analysis of the Activated Carbon Bed Adsorbers. CFD model and analysis shall include necessary Buyer supplied inlet piping to model the velocity profile of the offgas air stream entering the adsorber.

1.2.5 Provide thermal calculations for the Activated Carbon Bed Adsorber units and support frames in accordance with the requirements of this specification and Mechanical Data Sheets (MDSs) in section 2 of the purchasing documents. Select insulation material (i.e. calcium silicate, mineral wool, etc.) to meet thermal requirements of this specification.

1.2.6 Provide an analysis of the Activated Carbon Bed Adsorber design to determine expected adsorber changeout frequency.

1.2.7 Delete.

1.2.8 Provide connecting piping and actuated on/off control valves to configure two (2) Activated Carbon Bed Adsorber units in a single offgas stream to be operated in either series or parallel with the ability to isolate one unit for maintenance and still operate. Activated Carbon Bed Adsorber units shall be configured for automatic (remote) operation from Buyer's integrated control network.

1.2.9 Provide internal water deluge fire suppression system to allow flooding of the Activated Carbon Beds. Fire detection shall include a combination of carbon monoxide (CO/COx) monitors, temperature monitors, and isolation valves. CO/COx monitors shall be interlocked to isolation valves. Process water for carbon bed flooding is a backup to bed isolation. Provide liquid level interlocks operated from radar level indicators.

1.2.10 Provide fire detection and suppression system acceptance tests.

1.2.11 Provide control logic and I/O mapping for automatic configuration and fire suppression system.

1.2.12 In addition to the field testing requirements set forth in ASME AG-1, Section TA, and/or ASME N509, Section 9, conduct the following acceptance tests in the shop, on each Activated Carbon Bed Adsorber unit prior to shipment:

- Visual Inspection
- Structural Capability Test

- System Bypass Test
- Mechanical Test
- Differential Pressure Test
- Airflow Distribution Test
- Electrical Air Heater Performance Test (per design)

1.2.13 Provide challenge gas and challenge gas injection and sampling ports/manifolds.

1.2.14 Provide detailed bag-in/bag-out procedure for removal and replacement of adsorbent and any other filter(s) required.

1.2.15 Provide all personnel, equipment, apparatus, labor, personal protection equipment (PPE), materials, glovebags, bags, HEPA filters, etc. to simulate field conditions, demonstrate, and videotape the bag-in/bag-out procedure using fully assembled Activated Carbon Bed Adsorber equipment in shop.

1.2.16 Provide material certified test reports, welding procedures, insulation installation procedures, testing procedures, testing results, quality assurance procedures, quality assurance inspection results, and all other procedures and documentation required per this specification.

1.2.17 Provide transportation, storage, and installation instructions for the Activated Carbon Bed Adsorber units per the Seller's recommendations and the requirements of this specification.

1.2.18 Package and prepare the Activated Carbon Bed Adsorber units for shipment to the WTP site. Packaging shall be sufficient to allow outdoor storage for a period of up to one year at the WTP site, without Buyer action except routine inspection. Environmental conditions for storage are found in section 3.6 of this specification.

1.2.19 Provide all equipment, instrumentation, labor, and materials to perform a shop lifting test, demonstrating that the lifting lugs or attachment points are adequate to support the Activated Carbon Bed Adsorber units without distortion. Lifting lugs or attachment points shall be placed such that the equipment remains essentially level during the lift without tilting or swaying. Seller shall provide shop test report on lifting points provided on the Activated Carbon Bed Adsorber equipment.

1.2.20 Provide Material Safety Data Sheets (MSDSs) for loaded Activated Carbon Bed Adsorber and all other materials used in the construction of the Activated Carbon Bed Adsorber units.

1.2.21 Provide operation and maintenance manuals, with sequence of operations, and recommended spare parts list.

1.2.22 Provide a set of special tools for each Activated Carbon Bed Adsorber required for operation, bag-in/bag-out, sampling, and maintenance.

1.2.23 Provide design for structural attachment to the Buyer's provided embeds.

1.2.24 Delete.

1.3 Work by Others

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

1.3.1 Shipping to jobsite.

1.3.2 Unloading and storage of all materials and equipment at jobsite.

1.3.3 Activated Carbon Bed Adsorber installation labor at jobsite.

1.3.4 Foundation, embeds, and anchor bolts.

1.3.5 Electric power supply.

1.3.6 External wiring.

1.3.7 External connection to Buyer's instrumentation and controls.

1.3.8 Control system.

1.3.9 Piping external to the Activated Carbon Bed Adsorber unit package.

1.3.10 Pressure drop indicators for pressure drop piping connections.

1.3.11 Installation of insulation.

1.3.12 Instrument racks.

1.3.13 Appendix B (Warranty) & C (Permit) testing.

1.3.14 LAW instrumentation.

1.4 Acronyms

AGS	American Glovebox Society
AISC	American Institute of Steel Construction
ASD	Adjustable Speed Drive
ASME	American Society of Mechanical Engineers
ASTM	International Society for Testing and Materials
AWS	American Welding Society
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
3-D	Three-Dimensional

DBE	Design Basis Event
DF	Decontamination Factor
DOE	US Department of Energy
ESF	Engineered Safety Feature
ERDA	Energy Research and Development Administration
FMEA	Failure Mode and Effect Analysis
HEPA	High Efficiency Particulate Air
HCl	Hydrogen Chloride
HLW	High Level Waste
HF	Hydrogen Fluoride
HVAC	Heating, Ventilation, and Air-Conditioning
HOP	High Level Waste Secondary Offgas Treatment System
FFB	Foundation Field Bus
ICN	Integrated Control Network
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Service Air
ITS	Important to Safety
LAW	Low Activity Waste
LVP	Low Activity Waste Secondary Offgas System
MR	Material Requisition
MDS	Mechanical Data Sheet
MSDS	Material Safety Data Sheet
NDE	Nondestructive Evaluation/Examination
NRTL	Nationally Recognized Testing Laboratory
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
P&ID	Piping and Instrumentation Diagram
PMI	Positive Material Identification
PPE	Personal Protection Equipment
ppm	Parts per million
psf	pounds per square foot (lb/ft^2)
PSV	Pressure Safety Valve
QA	Quality Assurance
QAP	Quality Assurance Program

QL	Quality Level
SC	Seismic Category
scfm	Standard Cubic Feet per Minute
SDDR	Supplier Deviation Disposition Request
SS	Stainless Steel
SS	Safety Significant
TBD	To Be Determined
UL	Underwriters Laboratories, Inc.
VSL	Vitreous State Laboratory of The Catholic University of America
WAC	Washington Administrative Code
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.5 Definitions

Activated Carbon Bed Adsorber Unit: Refers to complete Carbon Bed equipment assembly. This includes two (2) full capacity Carbon Bed Adsorbers, connecting pipe work, valves, instrumentation, and support frame for Carbon Bed Adsorbers and piping.

Activated Carbon Bed Adsorber expert: One who has extensive knowledge regarding the characteristics and application of Activated Carbon Bed Adsorbers. Must have a minimum of five (5) years experience.

Adsorbent Media: A solid having the ability to concentrate and hold other substances.

Adsorber: A device or vessel containing adsorbent (e.g., an adsorber cell filled with adsorbent).

Bag-in/Bag-out: A method of introducing and removing items from a contaminated enclosure where a bag provides a physical barrier at all times during the operation that prevents the spread of contamination.

Buyer's Representative(s): The Buyer's designee(s), who shall witness onsite operations at the seller and sub-seller sites and perform onsite inspections and surveillance.

Bypass, Leakage: A pathway through which contaminated air can escape treatment by the installed HEPA and/or adsorber banks. Examples are leaks in filters and filter mounting frames, defective or inefficient isolation dampers that result in the uncontrolled flow through adjacent plenums, and unsealed penetrations for electrical conduits, pipes, floor drains, etc.

Challenge Gas: A gas of known characteristics, under specified conditions, used for the purpose of testing. For in-shop and in-place/field testing of adsorbers required by this specification. The challenge gas to be used shall depend on what is recommended by the Activated Carbon Bed Adsorber manufacturer. Challenge gas shall be an environmentally safe non-ozone depleting substance, if possible.

Engineered Safety Feature (ESF): A nuclear air treatment system, HVAC system, gas processing system, or a component that serves to control and limit the consequences of releases of energy and radioactivity.

Glovebag: A temporary barrier to contain or prevent the spread of contamination generally during system maintenance or production. The area or component is surrounded by the portable glovebox boundary material, usually a flexible plastic film. Personnel perform work inside the glovebag through glovesleeves and gloves while remaining outside the containment area. Other access ports are provided to allow for equipment and service penetrations as necessary. Additional openings can be provided through the use of zippers, velcro closures, and bag-out ports.

HEPA Filter: A high efficiency particulate air filter having a fibrous medium with a particle removal efficiency of at least 99.97 % when tested with essentially monodispersed 0.3 µm test aerosol particles.

Mounting Frame: A structure against which adsorbers may be snugly mounted and supported in a position that permits the passage of air or gas and provides a surface to hold the sealing gasket, thereby avoiding a potential bypass or leakage path for the non-filtered air or gas.

Paragraph: When a paragraph of this specification, referenced documents, referenced codes, or referenced standards is referenced in this specification, the paragraph referenced <u>and</u> all subparagraphs and sub-subparagraphs of the paragraph referenced shall be considered inclusive.

Quality Level: The quality level identifies the quality requirements to be applied to the equipment. The identified quality levels are Q and CM (Commercial). Quality requirements are specifically defined on the associated mechanical data sheets (MDSs) and supplier quality assurance program (QAP) requirements data sheets.

Safety Significant (SS): The structures, systems, and components which are not designated as safety-class structures, systems, and components, but whose preventative or mitigative function is a major contributor to defense and/or worker safety as determined from safety analyses.

Seismic Category: Specific requirements for each seismic category are defined in reference documents listed in section 2.4 of this specification.

Special Tools: Any tooling required to perform maintenance on the Activated Carbon Bed Adsorber unit or for Activated Carbon Bed Adsorber and discharge filter removal and replacement. Includes tools that must be specially designed and fabricated and tools that are readily available in the commercial market.

1.6 Safety/Quality Classifications

1.6.1 Activated Carbon Bed Adsorber units for HLW shall meet the quality level requirements of Q as shown on the associated MDSs and supplier quality assurance program requirements data sheet. Seismic category shall be SC-III as shown on the associated MDSs and defined in reference documents listed in section 2.4 of this specification. Safety clasification is Safety Significant (SS).

1.6.2 Activated Carbon Bed Adsorber units for LAW shall meet the quality level requirements of Q as shown on the associated MDSs and supplier quality assurance program requirements data sheet. Seismic category shall be SC-III as shown on the associated MDSs and defined in reference documents listed in section 2.4 of this specification. Safety clasification is Safety Significant (SS).

2 Applicable Documents

2.1 General

2.1.1 Work shall be done in accordance with the referenced codes, standards, and documents listed below, which are an integral part of this specification.

2.1.2 When specific chapters, sections, parts, or paragraphs are listed following a code, industry standard, or reference document, only those chapters, sections, parts, or paragraphs of the document are applicable and shall be applied. For the codes and standards listed in section 2, the specific revision or effective date identified, as well as the specific revision or effective date of codes and standards that they incorporate by reference (daughter codes and standards), shall be followed. If a date or revision is not identified, the latest issue, including addenda, at the time of quotation, shall apply. The effective dates and revisions listed in section 2 shall apply to subsequent references to the codes and standards within this specification. When more than one code, standard, or referenced document covers the same topic, the requirements for all must be met with the most stringent governing. The use of any other edition, revision, or issue requires buyer's approval.

2.1.3 Unless specified otherwise, requirements apply to both HLW and LAW design, fabrication, testing, storage, and handling.

2.2 Codes

2.2.1 ASME AG-1-1997, Code on Nuclear Air and Gas Treatment, Sections AA, FE, FF, and TA. See Appendix D for WTP specific tailoring.

2.2.2 ASME AG-1a-2000, Addenda to ASME AG-1-1997 Code on Nuclear Air and Gas Treatment, Section HA.

2.2.3 ASME B31.3-1996, Process Piping. See Appendix E for WTP specific tailoring.

2.2.4 ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1, Rules for Construction of Pressure Vessels.

2.2.5 DOE-RL-92-36, Hanford Site Hoisting and Rigging Manual.

2.2.6 AWS D1.6, Structural Welding Code-Stainless Steel.

2.2.7 Delete.

2.2.8 AISC (ASD), 9th Edition, American Institute of Steel Construction. See Appendix F for WTP specific tailoring.

2.2.9 29 CFR 1910, Occupational Safety and Health Standards (OSHA).

2.2.10 UBC-1997, *Uniform Building Code*.

2.2.11 ASME Boiler and Pressure Vessel Code, Section V, Nondestructive Examination.

2.3 Industry Standards

2.3.1 AGS-G001 ©1998, Guideline for Gloveboxes, Second Edition.

2.3.2 ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components, Sections 1, 2, 3, 4 – (Paragraphs 4.3, 4.4, 4.6.1 through 4.6.7.2, 4.11, 4.12, 4.13(a)), 5 – (Paragraphs 5.5, 5.6.5.5 and 5.6.5.6), 7 – (Paragraph 7.2), 8 – (Paragraph 8.2), 9, Appendix C, and Appendix D.

2.3.3 ASME N510-1989, (Rev.1995), Testing of Nuclear Air Treatment Systems, Sections 1 through 8, 11, 13, 14, 15, and appendices.

2.3.4 ASME NQA-1-1989, Quality Assurance Program Requirements for Nuclear Facilities. See Appendix G for WTP specific tailoring.

2.3.5 ASME Y14.100, Engineering Drawing Practices.

2.3.6 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

2.3.7 ASTM F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

2.3.8 ASTM F594, Standard Specification for Stainless Steel Nuts.

2.3.9 ERDA 76-21, Nuclear Air Cleaning Handbook, Chapter 1 (All), Chapter 2 (Paragraphs 2.1 through 2.4.16), Chapter 3 (Paragraphs 3.1, 3.4.1, 3.4.2, 3.4.5, 3.4.6), Chapter 4 (Paragraphs 4.3 through 4.3.5, 4.5.9), Chapter 7 (All), Chapter 8 (All), Chapter 9 (Paragraph 9.4.1).

2.3.10 NACE Standard RP0198, The Control of Corrosion Under Thermal Insulation and Fireproofing Materials-A Systems Approach.

2.3.11 PIP INIH1000, Hot Insulation Installation Details.

2.3.12 RR-C-271D, Federal Specification for chains and attachments, welded and weldless.

2.3.13 NEMA 4, Enclosures for Electrical Equipment.

2.3.14 IEEE Std. 384, Standard Criteria for Independence of Class 1E Equipment and Circuits. See Appendix H for WTP specific tailoring.

2.3.15 IEEE Std. 323, Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations. See Appendix I for WTP specific tailoring.

2.3.16 IEEE Std. 344, Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations. See Appendix J for WTP specific tailoring.

2.3.17 ASME B320.20-1999, Below-The-Hook Lifting Devices.

2.3.18 ASME B30.11, Monorails and Underhung Cranes.

2.4 Reference Documents/Drawings

2.4.1 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*

2.4.2 24590-WTP-3PS-G000-T0002, *Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication*

2.4.3 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling, and Storage Requirements*

2.4.4 24590-WTP-3PS-NWP0-T0001, *Engineering Specification for General Welding and NDE Requirements for Supplier Fabricated Piping*

2.4.5 24590-WTP-3PS-MVB2-T0001, *Engineering Specification for Welding of Pressure Vessels, Heat Exchangers and Boilers*

2.4.6 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems*

2.4.7 24590-WTP-3PS-SS00-T0001, *Engineering Specification for Welding of Carbon Structural Steel*

2.4.8 24590-WTP-3PS-SS00-T0002, *Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*

2.4.9 24590-WTP-3PS-FB01-T0001, *Engineering Specification for Structural Design Loads for Seismic Category III and IV Equipment and Tanks*

2.4.10 24590-WTP-3PS-NN00-T0001, *Engineering Specification for Thermal Insulation for Mechanical Systems*

2.4.11 Deleted.

2.4.12 24590-WTP-3PB-P000-TS11V, *Piping Material Classification, Pipe Class S11V*

2.4.13 24590-WTP-3PB-P000-TS11N, *Piping Material Classification, Pipe Class S11N*

2.4.14 24590-WTP-3PS-PV00-T0001, *Engineering Specification for Technical Supply Conditions for Valves*

2.4.15 24590-WTP-3PS-JV15-T0001, *Engineering Specification for Actuators for On/Off Valves*

2.4.16 24590-WTP-3PS-EKP0-T0001, *Engineering Specification for Electrical Requirements for Packaged Equipment*

2.4.17 24590-WTP-3PS-MUMI-T0002, *Engineering Specification for Low Voltage Induction Motors*

2.4.18 24590-WTP-3PS-PS02-T0001, *Engineering Specification for Shop Fabrication of Piping*

2.4.19 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*

2.4.20 24590-WTP-3PS-JQ06-T0005, *Environmental Qualification of Control and Electrical Systems and Components*

2.4.21 24590-WTP-J8-50-00001, *Controls and Instrumentation Radar Installation Wave Guide Spool Joining Details.*

2.4.22 24590-WTP-MV-M59T-00016002, *Vessel Connections Standard Details Sheet 2 of 3*

2.4.23 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*

2.4.24 24590-WTP-3PS-G000-T0015, *Engineering Specification for Environmental Qualification of Mechanical Equipment*

2.4.25 24590-WTP-3PS-G000-T0014, *Engineering Specification for Supplier Design Analyses*

2.4.26 24590-HLW-M6-HOP-00011, *P&ID - HLW Melter Offgas System Melter 1 Secondary Offgas Treatment Sheet 3 of 3.*

2.4.27 24590-HLW-M6-HOP-20011, *P&ID - HLW Melter Offgas System Melter 2 Secondary Offgas Treatment Sheet 3 of 3.*

2.4.28 24590-LAW-M6-LVP-00004, *P&ID - LAW Melters Secondary Offgas Vessel Vent Process System Mercury Mitigation Equipment.*

2.4.29 24590-WTP-LIST-CON-08-0001, *Restricted Materials List.*

3 Design Requirements

3.1 General Requirements

3.1.1 The Activated Carbon Bed Adsorbers and support frame shall be designed per this specification, the applicable documents listed in section 2 of this specification, and the MDSs in section 2 of the purchasing documents.

3.1.2 The detailed design of the Activated Carbon Bed Adsorbers shall be performed by personnel who have past experience in the design, fabrication, and testing of Activated Carbon Bed

Adsorber banks or HEPA filter banks to meet the requirements set forth in ASME AG-1, ASME AG-1a, and NQA-1. Qualifications for personnel conducting the detailed design of the Activated Carbon Bed Adsorber shall be provided to the Buyer for review.

3.1.3 All calculations, modeling, analyses, drawings, and documentation shall be performed and/or completed using U.S. customary units.

3.1.4 The design of the Activated Carbon Bed Adsorber pressure boundary shall be per the requirements of ASME Boiler and Pressure Vessel Code, Section VIII, Div.1. (Code stamp is not required) Design pressure used shall be as specified on the MDSs. Design temperature shall be determined by Seller based on thermal analysis specified in section 3.13.5 for conditions generated during a carbon bed fire.

3.1.5 The design of the Activated Carbon Bed Adsorbers shall be per Seller and shall meet the performance requirements of this specification, appendices, and MDSs in section 2 of the purchasing documents.

3.1.6 Each Activated Carbon Bed Adsorber shall be equipped with a fire suppression system. Fire detection shall include a combination of CO monitors and carbon bed temperature monitors for fire detection. Refer to P&ID drawings in Section 2 of the MR for additional information related to CO/COx monitors and temperature monitors specific to each HLW and LAW Activated Carbon Bed Adsorber.

For HLW, each fire detection system shall allow the isolation of one carbon bed upon detection of a fire, such that one Activated Carbon Bed Adsorber will not affect the fire detection capability in the other unit. Refer to 24590-HLW-M6-HOP-00011 and 24590-HLW-M6-HOP-20011 for HLW CO monitor and isolation valve configuration requirements.

For LAW, COx monitors shall be located on the inlet and outlet of the Activated Carbon Bed Adsorber unit. LAW Activated Carbon Bed Adsorber unit shall be isolated with pneumatic valves on the inlet as shown on P&ID 24590-LAW-M6-LVP-00004.

3.1.7 The Activated Carbon Bed Adsorbers shall be designed for carbon bed isolation as the primary means of fire suppression. Seller shall also design a water flood fire suppression system in accordance with applicable requirements of ASME AG-1, subarticle FE-4620, and MDSs in section 2 of the purchasing documents. Pressure Relief shall be treated as an ITS function of the Carbon Bed Adsorbers. Seller shall account for increased pressure inside the carbon bed vessel caused by activation of the fire suppression system and flooding of the carbon bed with water by providing the proper sized PSV for each HLW housing and specifying the required size Rupture Disk for each LAW housing. Seller shall work closely with Buyer in determining required flow-rates for fire suppression water.

3.1.8 The Activated Carbon Bed Adsorber units and all permanently attached appurtenances (i.e. piping manifold, insulation, valves, and maintenance platforms) shall be designed to fit within the space envelope specified on the MDSs in section 2 of the purchasing documents.

3.1.9 Piping including supports shall be designed per the requirements of ASME B31.3 (Process Piping). Flanges used for connection to Buyer's piping shall be class 150 and meet the requirements of ASME B31.3.

3.1.10 The CFD model and analysis, thermal analysis, Activated Carbon Bed Adsorber analysis, and seismic analysis to be provided per this specification must verify that the final detailed design of the Activated Carbon Bed Adsorber and support frame meets the requirements set forth in this specification.

3.1.11 Each Activated Carbon Bed Adsorber Bed unit shall include all items listed or implied including, but not limited to, the following:

- Housing with inlet, outlet, support frame with anchorage provisions, platform supports, discharge filter receiver, piping connections and manifolds for testing and sampling, piping connections for pressure drop indication, insulation supports and hold-downs, lifting lugs, internal baffles, and mixing vanes (if mixing vanes required).
- Fire suppression system, inlet and drain piping, shall be piped to equipment edge with flange.
- Activated Carbon Bed Adsorbers, with pneumatic loading and gravity unloading of activated carbon.
- Platform with grating and guardrails
- (Optional) Monorail and Hoist system in lieu of activated carbon pneumatic loading.

3.1.12 All testing and sampling piping, connections, ports, and manifolds shall be permanently attached to the Activated Carbon Bed Adsorbers and easily accessible for shop and field testing. If required pipe length is not feasible within the space envelope or down stream of carbon bed isolation valves, the Seller shall supply mixing vanes/diffusers to adequately mix test gases in accordance with applicable code requirements. Refer to P&ID drawings in Section 2 of the MR for additional clarification on test port locations. The Seller shall work closely with the Buyer to determine best locations for testing and sampling piping, connections, ports, and manifolds.

3.1.13 The Activated Carbon Bed Adsorbers shall be designed for use with a bag-in/bag-out procedure to be developed by the Seller to facilitate adsorber removal and replacement operations. The Seller shall work closely with the Buyer on developing the bag-in/bag-out procedure.

3.1.14 The Activated Carbon Bed Adsorber shall be designed to attach insulation to the exterior of the pressure boundary. The design shall ensure the insulation is installed per the requirements of Buyer Specification 24590-WTP-3PS-NN00-T0001, *Thermal Insulation for Mechanical Systems* and section 4.3 of this specification.

3.1.15 Confinement of melter offgas is an ITS function of the activated carbon bed adsorber units for both HLW and LAW. Design of the pressure boundary and support frame shall ensure confinement of melter offgas during nominal, maximum, design conditions, and a carbon bed fire DBE. Pressure boundary must be maintained during and post an SC-III DBE.

3.2 Basic Function

3.2.1 General

3.2.1.1 Each offgas stream consists of two (2) Activated Carbon Bed Adsorbers that can be operated in either series or parallel with the ability to isolate one unit for maintenance during operation. During normal operation, the Activated Carbon Bed Adsorbers will operate in a lead/lag series arrangement.

3.2.1.2 The Activated Carbon Bed Adsorber units are located downstream of HEPA filter banks operating with a minimum particulate removal efficiency of 99%.

3.2.1.3 Each Activated Carbon Bed Adsorber unit shall consist of a vessel, connecting piping, air actuated on/off control valves, adsorber bed(s), insulation, water fire suppression system, and a discharge filter.

3.2.2 HLW Activated Carbon Bed Adsorber

3.2.2.1 HLW Activated Carbon Bed Adsorbers shall be used to remove mercury (Hg) from the HLW melter secondary offgas HOP system.

3.2.2.2 Each Activated Carbon Bed Adsorber vessel shall be designed with a Seller specified activated carbon media and number of beds to meet performance criteria specified in section 3.4 of this specification and the MDSs in section 2 of the purchasing documents.

3.2.3 LAW Activated Carbon Bed Adsorber

3.2.3.1 LAW Activated Carbon Bed Adsorber shall be used to remove mercury (Hg), iodine (I_2), HCl, and HF from the LAW melter secondary offgas LVP system.

3.2.3.2 Each Activated Carbon Bed Adsorber vessel shall be designed with a Seller specified activated carbon media and beds to meet performance criteria specified in section 3.4 of this specification and the MDSs in section 2 of the purchasing documents. The Seller may supply separate or mixed beds for acid gas removal.

3.3 Optional Electric Preheater

3.3.1 If determined necessary by Seller, to prevent condensate from forming in the activated carbon media during startup or after replacement, the Seller shall propose an electric preheater.

3.3.2 Electric preheater shall use an electric element and fan to preheat the carbon bed upon start-up or after media replacement.

3.3.3 The preheater shall be mounted on a 4 ft by 4 ft skid frame that must be located within the space envelope specified in the MDSs in section 2 of the purchasing documents.

3.3.4 Seller shall submit proposed control system and instrumentation for the preheater in accordance with Buyer specification 24590-WTP-3PS-JQ07-T0001 *Instrumentation for Package Systems*, and with the requirements of this specification.

3.4 Performance

3.4.1 General

3.4.1.1 The Activated Carbon Bed Adsorber units shall be designed for a minimum service life of 40 years. Where specific components cannot meet the specified service requirement, they shall be identified, and a mechanism for their replacement and/or maintenance shall be incorporated into the design. Refer to section 10.1.12 of this specification for additional component design reliability requirements.

3.4.1.2 The Activated Carbon Bed Adsorbers shall be designed for a minimum adsorbent life expectancy as required by the MDSs when operating 8,760 hours per year.

3.4.1.3 As applicable to design, the root mean square of the velocities in a traverse shall be within ± 20 % of the average velocity across the front face of the Activated Carbon Beds. If required, ports shall be provided on one foot intervals to confirm velocity distribution.

3.4.1.4 Instrumentation, valves, and related appurtenances shall meet the performance requirements of Buyer specification 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems*.

3.4.1.5 Actuators for On/Off valves shall meet the performance requirements of Buyer specification 24590-WTP-3PS-JV15-T0001, *Actuators for On/Off Valves*.

3.4.2 HLW

3.4.2.1 Refer to MDSs in Section 2 of the purchasing documents for specified mercury decontamination factors (DF)/removal efficiencies and carbon media design life requirements.

3.4.2.2 Carbon media performance shall be affirmed by Buyer performed Warranty Testing specified in Appendix B of this specification.

3.4.3 LAW

3.4.3.1 Refer to MDS in Section 2 of the purchasing documents for specified mercury, iodine, HCl, and HF decontamination factors (DFs)/removal efficiencies and carbon media design life requirements.

3.4.3.2 Carbon media performance shall be affirmed by Buyer performed Warranty Testing specified in Appendix B of this specification.

3.5 Design Conditions

3.5.1 The Activated Carbon Bed Adsorber units shall be designed to meet design conditions specified in the MDSs in Section 2 of the purchasing documents.

3.5.2 The Activated Carbon Bed Adsorber units shall be considered non-ESF as defined in ASME AG-1, Article AA-1000.

3.5.3 The Activated Carbon Bed Adsorber units shall be designed to meet Level C service limits as defined in ASME AG-1, Paragraph AA-4214.

3.6 Environmental Conditions

3.6.1 The HLW and LAW Activated Carbon Bed Adsorber units will be installed indoors. See Equipment Environmental Qualification data, located in the MDSs, for additional room environmental conditions.

3.6.2 Prior to installation, the Activated Carbon Bed Adsorber units may be stored outdoors at ambient temperature extremes ranging from (-)35 °F dry-bulb to 118 °F dry-bulb and a relative humidity of 0 to 100%.

3.6.3 Control and electrical equipment required to meet ITS functions of confinement of melter offgas, bed isolation for fire suppression, and prevention of flooding of secondary offgas system on introduction of liquids (LAW only) shall be designed and fabricated to meet environmental qualifications in accordance with engineering specification 24590-WTP-3PS-JQ06-T0005, *Engineering Specification for Environmental Qualification of Control and Electrical Systems and Components*, for a harsh environment.

3.6.4 Control and electrical equipment shall be exposed to the room environment conditions listed on the Equipment Environmental Qualification data, located in the MDSs.

3.6.5 Mechanical equipment/components required to meet ITS functions of confinement of melter offgas, bed isolation for fire suppression, and prevention of flooding of secondary offgas system on introduction of liquids (LAW only) shall be designed and fabricated to meet environmental qualifications in accordance with engineering specification 24590-WTP-3PS-G000-T0015, *Engineering Specification for Environmental Qualification of Mechanical Equipment*, for a harsh environment.

3.7 Mechanical Requirements

3.7.1 General

3.7.1.1 Sample ports shall be provided downstream of each bed for monitoring HCl and HF.

3.7.1.2 Each carbon bed shall be equipped with three (3) vertical and three (3) horizontal ports to obtain physical samples at three locations within the bed. The Seller shall provide special tools to physically retrieve samples. Seller may also propose the use of cylindrical media samples located external to the housing.

3.7.1.3 Valves and actuators shall meet the requirements of Buyer specification 24590-WTP-3PS-PV00-T0001, *Technical Supply Conditions for Valves*, and 24590-WTP-3PS-JV15-T0001, *Actuators for On/Off Valves*. Valve type, fail position, material, and flange requirements shall be as specified on the MDSs in section 2 of the purchasing documents. Refer to P&ID 24590-HLW-M6-HOP-00011 and 24590-HLW-M6-HOP-20011 for HLW and P&ID 24590-LAW-M6-LVP-00004 for LAW.

3.7.2 Loading System

3.7.2.1 Pneumatic loading shall lift activated carbon media to the fill chute. The carbon media shall be gravity loaded through the fill chute.

3.7.2.2 Pneumatic loading system shall be complete with hopper, piping, vacuum blower, mounting equipment, and air filters necessary to safely lift the activated carbon adsorbent media. If determined necessary by Seller, vibration equipment shall be designed and supplied for loading of the carbon media into the Activated Carbon Bed Adsorbers.

3.7.2.3 The loading equipment shall be transferable to other Activated Carbon Bed Adsorber units within that facility. Rate of loading shall be specified by the Seller to minimize possible damage or degradation of the Activated Carbon Media.

3.7.2.4 Transferable loading equipment may be located in maintenance aisle ways as shown in the MDSs in section 2 of the purchasing documents. Location shall be specified by the Seller. Seller shall work closely with the Buyer with respect to equipment size.

3.7.2.5 If permissible in the equipment space envelope required on the MDSs, Seller may propose an alternative loading system using a monorail and hoist to lift carbon media super sacks for bulk loading. Monorail and hoist system shall be designed and tested in accordance with the applicable requirements of ASME B30.11, Monorails and Underhung Cranes and DOE-RL-92-36, Hanford Site Hoisting and Rigging Manual. Testing shall include the following at a minimum:

- Operational Test
- Load Test

3.7.3 Unloading System

3.7.3.1 Spent carbon media shall be gravity unloaded directly into 55 gal drums for disposal. Seller shall allow for clearance of the 55 gal drum and bag-in/bag-out operations in accordance with applicable code requirements. If required to meet the space envelope specified in the MDSs, the Seller may propose the use an unloading system to elevate the carbon media into a 55 gal drum. Buyer prefers to use loading equipment for unloading.

3.7.3.2 If determined necessary by Seller, vibration equipment shall be designed and supplied for unloading of the carbon media.

3.7.3.3 Spent carbon is considered hazardous and potentially radioactive and must be contained during unloading through the use of a bag-out procedure as required in section 3.11 of this specification.

3.8 Discharge Filter Requirements

3.8.1 The discharge filters for the Activated Carbon Bed Adsorber units shall be rated for at least 300 °F with an efficiency of 99% at 5 microns and have a minimum capacity of two (2) times the design flowrate. Each discharge filter shall also be equipped with a differential pressure gage to measure pressure drop across the filter.

3.9 Lifting Requirements

3.9.1 Lifting lugs shall be installed on each Activated Carbon Bed Adsorber unit for balanced lifting and handling. Seller shall identify the weight and center of gravity of each unit and submit a report for Buyer review.

3.9.2 All lifting points shall be designed and tested in accordance with the requirements of Buyer specification 24590-WTP-3PS-G000-T0003, *Packaging, Handling, and Storage Requirements*. The allowable design stress shall equal the applicable code allowable design stress at ambient temperature.

3.9.3 The lifting lugs shall be designed in accordance with ASME B30.20 - 1999 Below-The-Hook Lifting Devices, to permit lifting of the Activated Carbon Bed Adsorber units without distortion or damage to the components or lifting lugs.

3.9.4 Lifting lugs shall be accessible without removal of covers and guardrails.

3.9.5 The lifting lugs must accept standard lifting equipment. Chain blocks or braiding shall not be permitted. If applicable, the lifting lugs shall be designed to accept Crosby shackles or equivalent meeting Federal Specification RR-C-271D.

3.9.6 Sampling and testing connections and ports shall not be used for lifting.

3.9.7 Seller shall provide any special designed equipment that is required to handle the component and is not available from a commercial source. Such equipment may include but is not limited to rigging devices such as spreader beams, structural lifting devices, strongbacks, and yokes. Rigging devices shall be designed, tested, and tagged in accordance with the applicable requirements of DOE-RL-92-36, Hanford Site Hoisting and Rigging Manual.

3.9.8 All lifting points on the Activated Carbon Bed Adsorber units shall be proof tested in shop. Test and examination certificates shall be provided to the Buyer for review.

3.10 Loadings

3.10.1 The Activated Carbon Bed Adsorber and support frames shall be self-supporting, capable of carrying the static loads of components, thermal expansion loads (including Carbon bed fire), seismic loads, full flood fire suppression water loads, and capable of handling the stresses imposed during shipment, installation, and operation. Full flood fire suppression water loads are not required to be included in combination with the seismic loads.

3.10.2 Loads to be considered for the structural design of the Activated Carbon Bed Adsorbers and support frame shall be in accordance with applicable codes, standards, and reference documents listed in section 2 of this specification. As a minimum, loadings and stresses to be imposed shall meet Level C service limits as described in ASME AG-1, Paragraph AA-4214 and be in accordance with Buyer specification 24590-WTP-3PS-FB01-T0001, *Engineering*

Specification for Structural Design Loads for Seismic Category III and IV Equipment and Tanks.

3.10.3 Loads and stresses imposed for design of the vessel housings shall be in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1.

3.10.4 Nozzle design shall consider seismic, thermal, and combination loads. Loads shall be in accordance with the requirements of the MDSs in section 2 of the purchasing documents.

3.11 Bag-in/Bag-out Procedure Requirements

3.11.1 Seller shall provide a detailed bag-in/bag-out procedure using a pneumatic loading system and gravity unloading of the Activated Carbon Bed Adsorber media and discharge filters using PPE, bags, a glovebag (if required), and special tools. Procedure shall assume carbon bed is isolated and not in operation. If unloading system is used, Seller's bag-out procedure shall include this additional equipment.

3.11.2 Bag-in/bag-out procedure shall note the necessary steps needed to safely bag-out media after a water deluge (i.e. additional drying of media, vibration, etc.).

3.11.3 Procedure shall include proposed means of activated carbon adsorbent media delivery (i.e. 40 lb bags, 55 gal drums, etc.).

3.11.4 Seller shall work with Buyer to determine PPE requirements to be included in the procedure for personnel conducting adsorbent and filter removal and replacement.

3.11.5 If a glovebag is required to perform the bag-in/ bag-out procedure, it shall conform to AGS-G001, and ERDA 76-21, Paragraph 2.2.1 and Chapter 7. Seller shall work with Buyer to determine whether or not a glovebag will be necessary.

3.11.6 Drawings of bags and glovebag (if glovebag is required) to be used shall be included in the bag-in/bag-out procedure. Drawings shall show configuration with dimensions and identify any equipment, filters, either/or apparatus to be an integral part of the bags and glovebag. Drawings shall also identify material, manufacturer, either/or model numbers of all bag and glovebag components.

3.11.7 The bag-in/bag-out procedure shall be written to ensure that confinement is not broken at any time.

3.11.8 Personnel shall not need to break the plane of the pressure boundary or discharge filter access openings at any time to perform the bag-in/bag-out procedure.

3.12 CFD Model and Analysis Requirements

3.12.1 The 3-D CFD model, required per section 1 of this specification, shall demonstrate the effects of internal structures and components on offgas flow distribution through the Activated Carbon Bed Adsorbers.

3.12.2 The 3-D CFD model shall include the following components of the Activated Carbon Bed Adsorber units:

- Housing including inlet (with transition fittings and necessary inlet piping to model turbulent flow entering the unit), outlet, inlet plenum, outlet plenum, discharge filter, manifolds for testing and sampling, and any required internal baffles, mixing vanes, and/or cross-venting holes.
- Activated carbon bed(s).

3.12.3 The 3-D graphical results from the CFD model shall include:

- Analysis of changes to the Activated Carbon Bed Adsorber units to enhance offgas flow effectiveness.
- Analysis of the effect of including additional baffles, mixing vanes, and/or cross-venting holes as required to study local offgas flow effects to achieve uniform offgas flow distribution through the adsorbers.
- Analysis of changes to the Activated Carbon Bed Adsorber units to minimize the overall dimensions.

3.12.4 The 3-D graphical results from the CFD model shall demonstrate uniform offgas distribution through the adsorber beds at 75% of the design flowrate with ± 10 % variation in flowrate.

3.12.5 Provide pressure drop to velocity relationship per adsorber bed(s) as part of the CFD analysis based on carbon media testing.

3.12.6 The Seller shall provide the documented results from the 3-D CFD analysis in report form to the Buyer. The CFD report shall provide a complete offgas flow analysis and shall include 3-D graphical results of the model and any calculations performed. The reports shall, at minimum, include:

- Definition of analysis objective
- Identification of equipment for analysis
- General description of equipment supplemented by drawings and sketches
- Functional requirements per this specification
- Purpose of analysis
- Definition of design criteria and inputs with corresponding sources
- Results of literature searches and other applicable background data
- Applicable codes, standards, and reference documents per section 2 of this specification broken down by chapter, section, and paragraph, as applicable
- Analysis methodology
- Description of computer(s) used to conduct analysis
- Description of software/computer programs used for modeling and any calculations and limitations, justification for choice of program, and evidence and description of program validation method.
- Assumptions (indicate those that must be verified as the design proceeds)
- Analyses conducted with results
- Summary of analysis results
- Conclusions
- Location for Buyer review signatures

All assumptions shall be plainly identified and data present (including their uncertainty) with precise logic. Actual accomplishments of the work shall be clearly stated.

3.12.7 The final CFD report shall convey information to several disciplines, many of whom may be less familiar with the general subject than the authors. Care shall be taken to use simple statements and expressions and to make statements as concise as possible. If highly technical terms are necessary, they shall be adequately explained and defined.

3.13 Thermal Requirements

3.13.1 Refer to MDSs in section 2 of the purchasing documents for mechanical design data pertaining to thermal design information.

3.13.2 Thermal analyses shall include the effects of stresses resulting from potential variations in temperatures due to startup, normal operation, shutdowns, carbon bed fire, and thermal cycling of the Activated Carbon Bed Adsorber units. Analyses shall determine nozzle deflections in all directions per thermal expansion or other approved method. The calculations shall consider that the maintenance platforms shall be connected together with mechanical fasteners during normal operation.

3.13.3 Thermal analyses shall confirm the insulation temperature of Seller selected insulation and all exterior uninsulated portions of the Activated Carbon Bed Adsorber units with potential for personnel exposure, do not exceed 140 °F at maximum design temperature, in accordance with the requirements of Buyer specification 24590-WTP-3PS-NN00-T0001, *Thermal Insulation for Mechanical Systems*. Thermal calculations shall also confirm heat loss to the room is within the requirements of the MDSs. Refer to section 4.3 of this specification for addition insulation requirements.

3.13.4 The thermal analyses shall confirm the thickness and extent of insulation required on the bottom of the Activated Carbon Bed Adsorber units so that the average temperature of the Buyer's concrete foundation directly under and within three feet of the skid boundary does not exceed 100 °F.

3.13.5 Seller shall perform a thermal analysis to determine and define the thermal conditions generated during a carbon bed fire. This analysis shall define the maximum and design temperatures for the carbon bed pressure boundary and isolation valves. Seller shall determine equilibrium design temperature for a carbon bed fire based on Seller specified CO/COx analyzer set points and the carbon bed being isolated. This equilibrium design temperature shall be used in ASME Boiler and Pressure Vessel Code, Section VIII, Div.1 calculations for design of the Activated Carbon Bed Adsorber pressure boundary. If determined necessary, based on Seller operating procedures, operators shall have the option of activating the water deluge fire suppression system. Seller shall assume a minimum response time of one hour or any operator action. Design temperature determined by this thermal analysis shall confirm valve selection (valve material, seat material, leak tightness, etc.) for pressure boundary valves and process isolation valves.

3.14 Activated Carbon Bed Adsorber Design Analysis Requirements

3.14.1 The Seller shall conduct and submit separate Activated Carbon Bed Adsorber design analyses for LAW and HLW facilities. The design analysis of the Activated Carbon Bed Adsorber units shall be conducted by an Activated Carbon Bed Adsorber expert to determine the expected adsorbent changeout frequency for the final Activated Carbon Bed Adsorber design.

Seller shall provide personnel qualifications to the Buyer for review prior to beginning adsorber design.

3.14.2 Analysis shall be conducted considering operation of the Activated Carbon Bed Adsorber units at design conditions outlined in this specification and MDSs.

3.14.3 Analysis shall determine expected adsorbent changeout frequency based on the gas composition and load information specified in the MDSs in Section 2 of the purchasing documents.

3.14.4 Assume that the offgas flow through the Activated Carbon Bed Adsorbers may vary as much as ± 10 % from the design flowrate specified in the MDSs in section 2 of the purchasing documents.

3.14.5 Seller shall provide the documented results of the Activated Carbon Bed Adsorber analysis with any graphical results, as applicable, in report form to the Buyer prior to fabrication. Refer to section 3.12.6 and 3.12.7 for the minimum requirements of the report.

3.14.6 The final Activated Carbon Bed Adsorber design analysis report shall convey information to several disciplines, many of whom may be less familiar with the general subject than the authors. Care shall be taken to use simple statements and expressions and to make statements as concise as possible. If highly technical terms are necessary, they shall be adequately explained and defined.

3.14.7 LAW analysis shall include Buyer designed and installed Radar Guide Tube piping and supports as required per this specification and the MDS's.

3.15 Electrical Requirements

3.15.1 Electrical equipment necessary to meet the requirements of this specification and appendices shall be designed, fabricated, and tested in accordance with Buyer specification 24590-WTP-3PS-EKP0-T0001, *Electrical Requirements for Packaged Equipment*.

3.15.2 The Buyer will provide a single feed for each HLW Activated Carbon Bed Adsorber unit. The Seller shall be responsible for determining electrical load and for the distribution of power within the HLW Activated Carbon Bed Adsorber unit. The Seller shall provide a disconnect switch at the connection point for the Buyer's power feed for each Activated Carbon Bed Adsorber.

3.15.3 Delete

3.15.4 Motors shall operate continuously under running conditions at rated load and meet the requirements of Engineering Specification 24590-WTP-3PS-MUMI-T0002, *Low Voltage Induction Motors*.

3.15.5 The Buyer will provide a single feed for each LAW Activated Carbon Bed Adsorber unit to Buyer supplied electrical disconnect. The Buyer will be responsible for determining the electrical load and for the distribution of power within the LAW Activated Carbon Bed Adsorber unit.

3.16 Instrumentation and Control Requirements

3.16.1 General

3.16.1.1 Instrumentation included in the Seller's scope of work shall meet the requirements of Buyer specification 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems*. For general instrumentation scope refer to P&ID 24590-HLW-M6-HOP-00011 and 24590-HLW-M6-HOP-20011 for HLW and P&ID 24590-LAW-M6-LVP-00004 for LAW.

For the HLW Activated Carbon Bed Adsorber Unit, the Buyer shall provide the appropriate ABB control system components (i.e. I/O modules, power supplies) to the Seller for fabrication into the Seller's control panel. Seller shall provide non-ABB manufactured equipment (fiber optic converters, fiber optic patch cables and plates, terminals, circuit breaker, wiring, etc.), and panel fabrication. Seller shall design their control panel to utilize the ABB control system equipment and provide a General Arrangement drawing with a Bill of Materials identifying all parts to be provided by the Buyer. Seller shall provide I/O list for all instruments. Seller shall provide control narrative, logic drawings, and related items as specified in 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems*. Buyer shall provide programming according to Seller's specification of the monitoring and control requirements. Buyer shall provide controller, software, and attend and support the factory test of the equipment at the Seller's facility.

For the LAW Activated Carbon Bed Adsorber unit, the Buyer shall provide all appropriate ABB and non-ABB control system components, control wiring, control panels, instrumentation racks, software, and programming.

3.16.1.2 Delete.

3.16.2 Activated Carbon Bed Adsorber

3.16.2.1 The following instruments shall be included with the HLW Activated Carbon Bed Adsorber Units as a minimum, refer to section 1.6 of this specification for additional QA with subsequent testing requirements for these instruments:

- Inlet temperature elements, thermowell, and indicating transmitter on inlet to each Activated Carbon Bed.
- Inlet CO analyzer sample collection tap and return for Buyer supplied ITS CO analyzer.
- Differential pressure indicating transmitter on each Activated Carbon Bed Adsorber vessel.
- Carbon Bed temperature elements, thermowells, and indicating transmitter. (two for each guard media and two for each primary media).
- Radar level indicator for each Activated Carbon Bed Adsorber vessel.
- Differential pressure indicating transmitter on each discharge filter.
- Outlet CO analyzer sample collection tap and return for Buyer supplied ITS CO analyzer.

- Delete.
- Mercury monitor sample tap from each Activated Carbon Bed Adsorber with common return for Buyer supplied mercury analyzer. See Figure 3 for Mercury monitor sample tap requirements.

See P&ID 24590-HLW-M6-HOP-00011 and 24590-HLW-M6-HOP-20011 for additional Seller and Buyer instrumentation and control scope.

3.16.2.2 The following instruments shall be included with the LAW Activated Carbon Bed Adsorber Units as a minimum, refer to section 1.6 of this specification for additional QA with subsequent testing requirements for these instruments:

- Two (2) Thermowells for Buyer supplied inlet temperature elements (ITS) and indicating transmitters on inlet piping.
- Two (2) inlet COx analyzer sample collection taps and returns for Buyer supplied ITS COx analyzer.
- Tap and return for Buyer supplied differential pressure indicating transmitter on each Activated Carbon Bed Adsorber vessel.
- Thermowell for Buyer supplied Carbon Bed temperature elements and transmitters. (4 total for each housing - two for guard media, two for primary media).
- Taps for two (2) Buyer supplied radar level indicators for each Activated Carbon Bed Adsorber vessel (ITS).
- Tap and return for Buyer supplied differential pressure instrument on each discharge filter (with ISA purges on each pressure leg).
- Thermowell for One (1) Buyer supplied outlet temperature element and indicator.
- Two (2) outlet COx analyzer sample collection taps and returns for Buyer supplied ITS COx analyzer.
- Mercury monitor sample tap from each Activated Carbon Bed Adsorber with common return for Buyer supplied mercury analyzer. See Figure 3 for Mercury monitor sample tap requirements.
- HF/HCl monitor sample tap and return tap for Buyer supplied HF/HCl analyzer.

See P&ID 24590-LAW-M6-LVP-00004 for additional Seller and Buyer instrumentation and control scope.

3.16.2.3 Deleted.

3.16.2.4 As listed in 3.16.2.1 and 3.16.2.2, each Activated Carbon Bed shall have at least four (4) temperature instruments and transmitters. Temperature elements shall be provided with thermowells that meet the inspection and testing requirements per the specified Q quality level and the requirements of Buyer specification 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems*. Seller shall work closely with the Buyer in determining the location of the temperature instruments.

3.16.2.5 As listed in 3.16.2.1 and 3.16.2.2, each Activated Carbon Bed vessel shall have radar level indicator(s). Radar level indicators shall be Ohmart-Vega meeting Appendix B requirements of Buyer specification 24590-WTP-3PS-JQ07-T0001, *Instrumentation for*

Package Systems. Seller proposed substitutions shall be well documented as to the relative technical advantages and exclude commercial considerations.

3.16.2.6 Seller shall provide control logic required to operate the Activated Carbon Bed Adsorber Units including the fire suppression system in accordance with the performance requirements of this specification and MDSs.

3.16.2.7 The HLW Activated Carbon Bed Adsorber Unit shall be designed with a single instrumentation tie-in point for connection to Buyer's Integrated Control Network (ICN) in accordance with the requirements of Buyer specification 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems*. Design drawings shall show the location of instrumentation tie-in point. Instrumentation specified ITS shall have a separate tie-in point for connection to Buyer's Programmable Protection System (PPJ) in accordance with section 3.4.4 of Buyer specification 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems*, and the requirements of IEEE Std. 384.

3.16.2.8 The following instrumentation for LAW and HLW are specified ITS and shall have isolated hardwires to Buyer's programmable protection system (PPJ) in accordance with the requirements of section 3.4.4 of Buyer specification 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems for ITS instrumentation*, and the requirements of IEEE Std. 384.

- Inlet temperature elements for LAW Activated Carbon Bed Adsorbers
- Radar level indicators for LAW Activated Carbon Bed Adsorbers
- Control and electrical components related to HLW and LAW Activated Carbon Bed Adsorber pneumatic isolation valves. (Instrument air supply shall have two solenoid valves in series, one solenoid valve is independently hardwired for connection to Buyer's PPJ, the second solenoid valve is wired to the non-ITS control panel (HLW) or non-ITS instrumentation rack (LAW). All isolation valves are fail closed. (Refer to P&ID 24590-HLW-M6-HOP-00011 and 24590-HLW-M6-HOP-20011 for HLW and P&ID 24590-LAW-M6-LVP-00004 for LAW for additional information.
- Buyer supplied inlet and outlet CO analyzers for HLW. Buyer supplied inlet and outlet COx analyzers for LAW.

3.16.2.9 The following instrumentation shall meet the requirements of Buyer specification 24590-WTP-3PS-JQ06-T0005, *Environmental Qualification of Control and Electrical Systems and Components.*

- Inlet temperature elements for LAW Activated Carbon Bed Adsorbers
- Radar level indicators for LAW Activated Carbon Bed Adsorbers
- Control and electrical components related to HLW and LAW Activated Carbon Bed Adsorber pneumatic isolation valves
- Rupture Disks for LAW Activated Carbon Bed Adsorbers

3.16.2.10 LAW instrumentation shall be remote mounted in adjacent rooms.

3.16.2.11 Delete.

3.16.3 Optional Preheater

3.16.3.1 Seller shall propose control system for electric pre-heater with over heat protection in accordance with section 3.3 of this specification.

3.16.3.2 Proposed control system shall be in accordance with the requirements of Buyer specification 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems.*

3.17 Accessibility and Maintenance

3.17.1 General

3.17.1.1 Accessibility and maintenance requirements shall be per this specification.

3.17.1.2 Seller's recommended accessibility and maintenance requirements for each piece of equipment shall be included in the Seller's applicable submittals.

3.17.1.3 Frequency of inspection and maintenance intervals shall be in accordance with Seller's recommendations.

3.17.1.4 All valves shall be accessible for maintenance and operation. Maintenance and replacement of valves shall be outlined in Seller's operation and maintenance procedures.

3.17.1.5 Seller shall design and supply any special tools required to perform maintenance activities and describe its use in applicable procedures.

3.17.1.6 If the equipment weight (i.e. valves, actuators, loading/unloading equipment, etc.) is in excess of 50 pounds the Seller shall design and supply jib cranes, lifting beams, or rigs in accordance with the requirements of DOE-RL-92-36.

3.17.2 Platform Requirements

3.17.2.1 Equipment, instrumentation, and electrical components that are 6 feet and over from ground level shall be provided with permanent work platforms with fixed ladders/stairs to perform maintenance.

3.17.2.2 The Activated Carbon Bed Adsorber unit maintenance platforms and ladders shall be designed to meet the requirements set forth in 29 CFR 1910, Occupational Safety and Health Standards (OSHA), Subpart D, Walking-Working Surfaces, and AISC 9th Edition.

3.17.2.3 The Activated Carbon Bed Adsorber unit maintenance platforms shall include guardrails. The guardrails shall be made out of piping.

3.17.2.4 The guardrails shall be designed per 29 CFR 1910.23.

3.17.2.5 The minimum live load for the column platforms shall be 100 psf. If platforms are to be used for laydown during maintenance, use a minimum live load of 250 psf.

3.17.2.6 The fixed ladder to be installed on the maintenance platforms shall meet the requirements set forth in 29 CFR 1910.27.

3.17.2.7 The maintenance platforms must be able to be attached to the Activated Carbon Bed Adsorber units without welding after the adsorbers are placed in the HLW and LAW facilities.

3.17.2.8 All openings in guardrails of each Activated Carbon Bed Adsorber unit maintenance platform shall have a safety gate or chain designed per the requirements of 29 CFR 1910.23.

4 Materials

4.1 General

4.1.1 Material used for the pressure boundary including control instrumentation shall comply with Buyer specification 24590-WTP-3PS-G000-T0002, *Positive Material Identification* (PMI) *for Shop Fabrication*. In accordance with the requirements of the PMI specification the Cr, Ni, Mo, content of the pressure boundary materials including weld consumables must be verified before and after fabrication.

4.1.2 Seller shall submit manufacturer cut sheets and MSDSs for all gaskets used for the pressure boundary. All gaskets, seal pads, caulks, and adhesives used must be certified for contact with austenitic stainless steel.

4.1.3 The Activated Carbon Bed Media shall have impurities less than 0.1 weight percent carbonate, oxide, or nitrate. Seller shall provide written certification that the amount of impurities in the carbon media is less than 0.1 weight percent carbonate, oxide, or nitrate.

4.1.4 Performance of the Activated Carbon Bed for removal of HCl, HF, and radioactive iodine (I^{129}) associated with the LAW system is required, (an HCl, HF, and iodine guard bed is not required for the HLW offgas). The guard bed for HF, located upstream of the mercury removal bed, may contain adsorbent such as acid washed activated carbon or activated alumina. The activated alumina media is not required to be acid washed.

4.1.5 The Activated Carbon Bed Media shall meet applicable ASTM methods for particle size distribution.

4.2 Construction

4.2.1 Materials used in the construction of the Activated Carbon Bed Adsorber units shall conform to the requirements of ASME AG-1, Article AA-3000, ASME AG-1a, Article HA-3000, this specification, and the MDSs in section 2 of the purchasing documents. Material property and performance data for any materials not covered in ASME AG-1, ASME AG-1a or this specification shall be submitted to the Buyer for review prior to incorporation into the design of the Activated Carbon Bed Adsorber units. All materials in contact with the adsorber and process piping shall be 300 series stainless steel. Performance data shall indicate that material is acceptable for environmental and specific service conditions.

4.2.2 All materials used in the construction of the Activated Carbon Bed Adsorber units shall be resistant to radiation levels indicated in subsection 3.6 of this specification and be able to operate under environmental and design conditions described in ASME N509 (paragraph 4.4) and MDSs in section 2 of the purchasing documents.

4.2.3 Seller shall maintain a record of ASME or ASTM numbers, material test reports, and manufacturer material certifications for all materials used for construction of the Activated Carbon Bed Adsorber units. Seller shall provide copies to the Buyer.

4.2.4 All materials used in the manufacture of the Activated Carbon Bed Adsorber units, support frames, and shims shall be new and unused. Where specific criteria are not provided, material selection shall be determined by the Seller and have properties and composition suitable for the specific service conditions and consistent with this specification.

4.2.5 Dissimilar metal couples shall be avoided due to corrosion potential.

4.2.6 Activated Carbon Bed Adsorber housing material shall be in accordance with the requirement of the MDSs. Discharge filter covers shall be constructed of 316 L stainless steel.

4.2.7 The Activated Carbon Bed Adsorber support frames, pipe supports, and maintenance platforms shall be made of Carbon Steel. Special attention shall be placed on securing the stainless steel carbon bed adsorbers and piping to the carbon steel support structure to prevent galvanic corrosion.

4.2.8 The discharge filter frame shall be composed entirely of 316 L stainless steel.

4.2.9 Deleted.

4.3 Insulation

4.3.1 The Seller shall provide detailed insulation installation procedures complete with sketches showing methods and details for applying and securing external insulation, metal jacketing, etc., to the Activated Carbon Bed Adsorber Units and necessary piping. The insulation procedures shall be in accordance with PIP INIH 1000 and NACE Standard RP0198, Buyer specification 24590-WTP-3PS-NN00-T0001 *Thermal Insulation for Mechanical Systems*, and this specification.

4.3.2 Procedures for insulation thicknesses greater than three (3) inches shall be applied in multiple layers with staggered joints. Each layer of multiple layer and double insulation shall be held in place separately.

4.3.3 Procedures for insulation installation shall include jacketing the insulation with 304 L stainless steel following the requirements of Buyer specification 24590-WTP-3PS-NN00-T0001 *Thermal Insulation for Mechanical Systems*, and this specification. The stainless steel jacketing shall be 0.024 inches thick flat and smooth sheet. The jacketing shall be furnished in the annealed or soft condition with a regular 2B mill finish and have a factory applied moisture barrier.

4.3.4 Seller shall recommend cements, mastics, and adhesives that will be suitable for the maximum design temperature of the Activated Carbon Bed Adsorber units. The mixing of cements, mastics, etc., shall be done with deionized water. All recommended cements, mastics, adhesives must by certified for contact with austenitic stainless steel.

4.3.5 Procedures shall include cleaning instructions for surfaces to be insulated. Procedures should note that surfaces to be insulated must be dry and free of loose scale, dirt, and oil before the insulation is applied.

4.3.6 The design shall provide for removable/replaceable insulation on flanges, manholes, doors, and access openings.

4.3.7 All recommended insulation components, including facings, mastic, and adhesives, shall meet ASTM E84 fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed. Ratings used are determined by Underwriters Laboratories, Inc. (UL).

4.4 Piping

4.4.1 All applicable materials used for piping and related appurtenances shall be in accordance with the requirements of the MDSs and Buyer specification 24590-WTP-3PB-P000-TS11V *Piping Material Classification Pipe Class S11V*, for HLW, and Buyer specification 24590-WTP-3PB-P000-TS11N *Piping Material Classification Pipe Class S11N*, for LAW.

4.4.2 Special attention shall be placed on securing stainless steel piping to the carbon steel support structure to prevent galvanic corrosion.

4.5 Prohibited Materials

4.5.1 Mercury and other low melting point metals, their alloys, or materials containing such metals as their basic constituents shall not be used in the construction of the Activated Carbon Bed Adsorber units and shims.

4.5.2 Molybdenum and halides shall not be used in direct contact with stainless steel.

4.5.3 Asbestos shall not be included in any component of the Activated Carbon Bed Adsorber units.

4.5.4 Halide containing materials shall not be used in any component of the Activated Carbon Bed Adsorber units, unless otherwise noted in this specification.

4.5.5 Certain materials are restricted from use at WTP. Refer to 24590-WTP-LIST-CON-08-0001, *Restricted Materials List*, for the complete list of restricted materials. The use of any restricted materials requires authorization from WTP Safety Assurance.

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

4.6.1 Stainless steel is susceptible to corrosion caused by the contact and interaction with incompatible materials. All stainless steel material shall be stored in separate areas away from other materials.

4.6.2 Storage of activated carbon and testing media shall be per the manufacturer's instructions to prevent contamination and degradation. Activated carbon and testing media storage requirements and instructions shall be provided by the Seller to the Buyer for review prior to purchase.

5 Fabrication

5.1 General Requirements

5.1.1 The Activated Carbon Bed Adsorber units shall be fabricated per this specification and the applicable documents listed in section 2 of this specification.

5.1.2 ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1 shall only be applied to the fabrication of the housing pressure boundary of the Activated Carbon Bed Adsorber units. The housing pressure boundary shall be fabricated in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1. **U-stamp and National Board Registration for the Activated Carbon Bed Adsorbers are not required.**

5.1.3 Identification of fabrication methods shall be included in the detailed design of the Activated Carbon Bed Adsorber units.

5.1.4 All fabrication shall be performed by personnel qualified in accordance with this specification and applicable documents in section 2 of this specification.

5.1.5 Piping shall be fabricated in accordance with the requirements of ASME B31.3 and Buyer specification 24590-WTP-3PS-PS02-T0001, *Shop Fabrication of Piping*.

5.2 Assembly

5.2.1 Flatness of the completed Activated Carbon Bed Adsorbers and support frames shall be 1/8 inch per foot minimum, with no greater than 3/16 inch over the entire length, except for areas around cutouts. Areas around cutouts shall be flat within 1/16 inch per foot.

5.2.2 Cutout locations shall be within ± 1/8 inch and cutout size shall be within ± 1/16 inch.

5.2.3 The Activated Carbon Bed Adsorber units and shims shall have edges that are both smooth and not sharp to the touch.

5.2.4 The method of fabrication shall minimize the number and amount of seams, overlaps, or other discontinuities, which could trap radioactive contamination.

5.3 Tolerances

All tolerances, surface flatness, and finish requirements for assembly and fabrication shall be determined and specified by the Seller when completing the detailed design to meet performance requirements set forth in this specification. At a minimum, all tolerances, surface flatness, and finish requirements shall be per all applicable codes, standards, and reference documents in section 2 of this specification.

5.4 Welding

5.4.1 Seller shall develop detailed welding, weld inspection, NDE, and weld repair procedures for fabrication of the Activated Carbon Bed Adsorber units and submit them to the Buyer for review prior to fabrication. Procedures shall include acceptance criteria. The procedures shall conform to the following, as applicable:

- Buyer Specification 24590-WTP-3PS-SS00-T0001
- Buyer Specification 24590-WTP-3PS-SS00-T0002
- Buyer Specification 24590-WTP-3PS-NWP0-T0001
- Buyer Specification 24590-WTP-3PS-MVB2-T0001 (Pressure Boundary Only)
- ASME AG-1a, Article HA-6000
- ASME AG-1, Articles FE-6000
- ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1 (Pressure Boundary Only)
- ASME B31.3
- AWS D1.6

5.4.2 Activated Carbon Bed Adsorber welding, weld inspection, NDE, and weld repair shall be carried out in accordance with the applicable procedures developed per the previous paragraph.

5.4.3 Activated Carbon Bed Adsorber welder qualifications shall be performed in accordance with requirements of the referenced specifications and codes listed in section 5.4.1 of this specification.

5.4.4 Welding or material manipulation shall be carried out indoors and only when the ambient, piping, or plate temperature is above 41°F, or higher where elevated temperatures are called for by a process.

5.4.5 Personnel performing Activated Carbon Bed Adsorber weld inspections shall be qualified in accordance with ASME AG-1, Paragraph AA-6335, ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1, Buyer specification 24590-WTP-3PS-SS00-T0002, *Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel* and 24590-WTP-3PS-SS00-T0001, *Specification for Welding of Structural Carbon Steel.*

5.4.6 Repairs required as a result of weld rejection by either the Seller's or Buyer's inspection shall be fully documented in accordance with Seller's Quality Assurance Program (QAP). Activated Carbon Bed Adsorber weld repairs shall be performed in accordance with ASME AG-1, subsubarticle AA-6330 and ASME Boiler and Pressure Vessel Code, Section VIII (housing pressure boundary only). Weld repair records shall be included with Seller's quality verification document package to be submitted to Buyer.

5.4.7 Joints and seams shall be fabricated in accordance with ASME AG-1a, subsubarticle HA-4330 and ASME Boiler and Pressure Vessel Code, Section VIII (housing pressure boundary only).

5.4.8 Welding procedures and welder qualification records shall be submitted to Buyer for review and permission to proceed prior to start of fabrication. Each procedure shall be prepared and qualified in accordance with the requirements of the listed standards in section 5.4.1 of this specification.

5.4.9 Seller shall submit a weld verification report including a weld map which identifies the specific weld procedure and NDE procedure utilized for each weld joint.

5.5 Coating

5.5.1 Seller shall provide coating for carbon steel surfaces in accordance with 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*, Appendix D, Item # 8.20. System code D applies.

5.5.2 Coating finish color shall be in accordance with 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*, Appendix E, ANSI 70 Gray.

5.5.3 All carbon steel to stainless steel weld areas shall remain free of any zinc filled coatings, such as the P02 primer contained in system code D. Surfaces that were previously coated with zinc filled material, and subsequently ground off, are considered to be contaminated with zinc. Stainless steel shall not be welded to these surfaces.

5.5.4 Zinc filled coatings shall be held back from the carbon steel to stainless steel welds by 3 to 4 inches for shop welds and 4 to 5 inches for field welds. Coating hold back requirements are further defined in 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*, section 2.2.1.

5.5.5 The following coating materials may be applied directly to stainless steel surfaces:

- Sherwin Williams Macropoxy 646
- Carboline Carbogard 890

5.5.6 Insulated surfaces (applicable only to carbon steel in contact with stainless steel) with an operating temperature no greater than 200 °F shall be coated with system code H (see 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*, Appendix C, Table 2, limited to the coating materials listed in section 5.5.5 above). The coating shall be applied to all carbon steel surfaces overlapping 1 inch on to the stainless steel. Insulated surfaces (applicable only to carbon steel in contact with stainless steel) with an operating temperature from 200 °F to 300 °F shall be coated with system code G (see 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*, Appendix C, Table 2). The coating material specified for use in system code G is not acceptable for direct application over stainless steel surfaces or stainless steel to carbon steel welds. Coat carbon steel surfaces with system code G to within 1-2 inches of the carbon steel-stainless steel weld. Do not overlap coating onto weld area or onto stainless steel material. Zinc primers without top-coating and hot dip galvanizing are not acceptable on surfaces that will be insulated.

5.5.7 Carbon steel components of gratings, platform assemblies, ladder assemblies, crane rail, and supports shall be hot dip galvanized in accordance with 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*, Appendix D, Note 15.

5.5.8 Components that are coated to manufacturer's standard shall be in accordance with 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment,* section 6.2.1.2.

6 Tests and Inspections

6.1 General Requirements

6.1.1 The Activated Carbon Bed Adsorber units shall be tested and inspected per this specification, applicable documents listed in section 2 of this specification, and all appendices, addenda, and attachments. Seller shall submit shop and field test plans for Buyer review.

6.1.2 Seller shall conduct and be responsible for all testing and inspections required per this specification, applicable codes, applicable standards, and reference documents.

6.1.3 Seller shall submit a detailed test and inspection plan identifying all the inspections and tests planned, including recommended witness and hold points. Buyer's inspector will advise the Seller of witness and hold points and identify the shop tests that the Buyer intends to witness.

6.1.4 Seller shall develop and submit to Buyer detailed test procedures for conducting all shop and field acceptance testing required per this specification, applicable codes, standards, and reference documents for review by the Buyer prior to Activated Carbon Bed Adsorber fabrication. Procedures shall include acceptance criteria and detailed drawings of the shop and field testing configurations. Seller shall identify on drawings location of taps, ports, piping connections, and/or manifolds made on housing and ductwork in order to take measurements during shop and field tests. These taps, ports, piping connections, and/or manifolds shall be temporarily capped for use in the field during acceptance testing. Seller shall provide instructions on permanently sealing these taps after field acceptance testing. Drawings shall be scalable and shall include plan and elevation views of the following:

- Activated Carbon Bed Adsorber
- Any Seller furnished materials, fittings, and ductwork required to perform the tests
- Seller furnished discharge filter(s)
- All Seller furnished equipment, apparatus, and instrumentation

6.1.5 Seller shall develop and submit to Buyer detailed testing and inspection procedures for conducting all testing and inspections required per this specification, applicable codes, standards, and reference documents for review by the Buyer prior to Activated Carbon Bed Adsorber fabrication.

6.1.6 Seller shall complete reports of all testing and inspections and submit them to Buyer. Reports shall identify the component tested, date performed, applicable test procedure, acceptance criteria, person performing the test or inspection, test results, and conclusions. Drawings of test setups shall be included. All testing and inspection results shall be certified.

6.1.7 Control and calibration of measuring and test equipment shall be in accordance with ASME AG-1, subarticle AA-5130.

6.1.8 All shop testing and inspection instruments used to conduct testing on the Activated Carbon Bed Adsorber units shall meet the requirements set forth in ASME AG-1, Article TA-3000. All testing and inspection instruments shall be in calibration and traceable to the appropriate national standard.

6.1.9 Any non-conforming work, in accordance with Seller's acceptance criteria, shall be redone by the Seller at Seller's cost.

6.2 Weld Testing and Inspection

6.2.1 Activated Carbon Bed Adsorber welds shall be inspected, examined, and tested in accordance with ASME AG-1, subarticle AA-6330, ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1 (housing pressure boundary only), and Buyer specification 24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication*.

6.2.2 Activated Carbon Bed Adsorber support frame welds shall be inspected, examined, and tested in accordance with Buyer specification 24590-WTP-3PS-SS00-T0002, *Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel* and 24590-WTP-3PS-SS00-T0001, *Engineering Specification for Welding of Carbon Structural Steel*.

6.2.3 Piping shall be inspected, examined, and tested in accordance with ASME B31.3, Buyer specification 24590-WTP-3PS-PS02-T0001, *Shop Fabrication of Piping*, and Buyer specification 24590-WTP-3PS-NWP0-T0001, *General Welding and NDE Requirements for Supplier Fabricated Piping*.

6.2.4 As applicable, per code requirements, Seller shall submit Radiographic, Liquid Penetrant, and Ultrasonic Examination procedures for review, prior to fabrication.

6.2.5 Exposed radiograph film must be submitted along with technique and reader sheets. Film must be packaged in such a manner as to preclude moisture and handling damage.

6.3 Personnel Qualifications

6.3.1 All inspection and testing shall be performed by personnel qualified per the requirements set forth in this specification and all applicable documents in section 2 of this specification.

6.3.2 Seller shall submit personnel qualification documents, including years of experience for Seller's inspection and test personnel, for Buyer review.

6.4 Laboratory Tests

6.4.1 Seller shall conduct and be responsible for laboratory testing of Activated Carbon Media in accordance with appendix A of this specification. The laboratory test shall be conducted in accordance with the applicable sections of NQA-1. The test plan shall include a matrix cross-referencing the QA requirements to implementing procedures for the work and justifying elements that are not applicable.

6.4.2 Seller shall submit laboratory test plan and procedures for Buyer review prior to the start of testing in accordance with the requirements of the G-321-E in section 3 of the purchasing documents.

6.4.3 A final report shall be submitted for Buyer review in accordance with the requirements of section 10.7 of this engineering specification. The final report shall support the engineering design of the Activated Carbon Bed Adsorber Units. In addition to the requirements of section 10.7, the final report shall show conformance with required DFs as outlined in section 3.4 of this specification and specified in the MDSs. Any effects related to the design of the Activated Carbon Bed Adsorber Units shall be identified in the final report.

6.4.4 The Buyer shall be responsible for performing laboratory testing of the Activated Carbon Media in accordance with Appendix B & C of this specification. The Seller shall be responsible for the performance of the Activated Carbon Media in accordance with this specification and associated mechanical data sheet requirements. Seller shall review the Test Plan, Test Procedure, and Test Report and sign as a mandatory reviewer on these documents. Seller shall also be responsible for reviewing and signing as a mandatory reviewer on any revisions to the Test Plan, Test Procedure, and Test Report. For Appendix B testing, the Seller shall be responsible for participating in conference calls and meetings associated with testing progress reports and technical issues encountered during the test. Seller shall be available for an on site inspection and sign as a mandatory witness on a hold point pertaining to an equipment shakedown test of Appendix B test apparatus. The Seller shall provide a separate report, utilizing Appendix B & C laboratory report results, demonstrating that the equipment and carbon media delineated in this specification and associated mechanical data sheets, are met.

6.5 Shop Tests

6.5.1 Seller shall provide all materials, labor, tools, equipment, apparatus, instrumentation, testing media, and challenge gas to conduct all shop testing on the Activated Carbon Bed Adsorber units.

6.5.2 All shop tests requiring that adsorbent media be installed in the Activated Carbon Bed Adsorber units shall be conducted using activated carbon. The Seller shall ensure that the Activated Carbon Bed Adsorber does not become contaminated or degraded at any time before, during, or after completion of shop testing.

6.5.3 Testing media shall be loaded into adsorber cells and tested per applicable sections of ASME AG-1, Article FE-5000. Seller shall issue manufacturer's information for testing media to the Buyer for review prior to purchase.

6.5.4 Electrical and instrumentation tests shall be conducted in accordance with the requirements of Buyer specification 24590-WTP-3PS-EKP0-T0001, *Electrical Requirements for Packaged Equipment*, and 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems.* Electrical and instrumentation test reports shall be submitted for Buyer review.

6.5.5 Seller shall conduct the following acceptance tests in the shop on each unit using air at ambient temperature, prior to shipment:

- Visual Inspection
- Structural Capability Test
- System Bypass Test
- Mechanical Test
- Differential Pressure Test
- Airflow Distribution Test
- Electrical Air Heater Performance Test (per design)

All Activated Carbon Bed Adsorber shop acceptance testing procedures shall conform to ASME AG-1 (Section TA), N509 (Section 9), N510, and ERDA 76-21 (Chapter 8).

6.5.6 Deleted.

6.5.7 The Activated Carbon Bed Adsorber pressure boundary shall be Bubble Tested per ASME Boiler and Pressure Vessel Code, Section V, Nondestructive Examination, Appendix I - Direct Pressure Technique. Sensitivity of the test shall not be less than 10-3 atm-ml/sec under test conditions.

6.5.8 Structural Capability Test: Conduct at pressure and conditions specified in the MDSs.

6.5.9 System Bypass Test: At ± 10 % of design flowrate through the Activated Carbon Bed Adsorber, challenge gas leakage rate shall not exceed 0.1 % at 99.9 % efficiency.

6.5.10 All test results shall be documented, certified, and submitted to the Buyer for review.

6.6 Site Tests

All Activated Carbon Bed Adsorber field acceptance testing procedures shall conform to ASME AG-1 (Section TA), N509 (Section 9), N510, and ERDA 76-21 (Chapter 8).

6.7 Bag-in/Bag-out Procedure Demonstration

6.7.1 Demonstration shall be conducted in Seller's shop on one (1) of the fully assembled Activated Carbon Bed Adsorber units and witnessed by Buyer's Representatives. The Activated Carbon Bed Adsorber to be used for the demonstration shall be chosen by the Buyer.

6.7.2 Demonstration shall include removal and replacement of one (1) activated carbon adsorber bed adsorbent and the discharge filter(s) for one (1) Activated Carbon Bed Adsorber unit for each HLW and LAW facility. Actual adsorber bed adsorbent to be removed shall be chosen by the Buyer.

6.7.3 When conducting the demonstration, Seller personnel shall be wearing all PPE required per the final bag-in/bag-out procedure.

6.7.4 Field conditions shall be simulated in the shop when performing the bag-in/bag-out procedure demonstration, which will include pulling a vacuum on the Activated Carbon Bed Adsorber, room clearance, and lifting constraints.

7 Preparation for Shipment

7.1 General Requirements

7.1.1 The Activated Carbon Bed Adsorber units shall be packaged/prepared for shipment, handled, and stored in accordance with Buyer specification 24590-WTP-3PS-G000-T0003 *Engineering Specification for Packaging, Handling, and Storage Requirements*, and ASME AG-1a, Article HA-7000, (Level C).

7.1.2 The activated carbon media shall be packaged/prepared for shipment, handled, and stored in accordance with Buyer specification 24590-WTP-3PS-G000-T0003 *Engineering Specification for Packaging, Shipping, Handling and Storage Requirements*, ASME AG-1, Article FE-7000 and FF-7000, (Level B).

7.1.3 The Activated Carbon Bed Adsorber units, activated carbon media, and shims shall not be packaged for shipping until all shop tests and inspections have been performed and the Buyer's Representative reviews the results.

7.2 Cleanliness

7.2.1 Cleanliness shall be per the applicable documents in Paragraphs 7.1.1 and 7.1.2 of this specification.

7.2.2 Solvents and cleaning solutions used on stainless steel shall have a halogen content of less than 200 ppm.

7.3 Tagging

7.3.1 Tagging of the Activated Carbon Bed Adsorber units shall be as specified in ASME AG-1, Article FE-9000 and ASME AG-1a, Article HA-9000. Tagged information shall also include associated plant item number specified in the data sheets that are in Section 2 of the purchasing documents.

7.3.2 A stainless steel nameplate shall be rigidly attached to the Activated Carbon Bed Adsorber units in a prominent position for ease of visibility and include:

- manufacturer's name
- shop location
- date of manufacture
- serial number
- equipment ratings (pressure, flow, temperature)
- plant item number
- weight of assembly
- purchase order number

7.3.3 Nameplates shall be visible after the insulation is installed, or a duplicate nameplate shall be provided on the top of the insulation. Nameplate shall be located for easy access and reading.

7.3.4 All field testing materials and filters shall be tagged as required for field testing.

7.3.5 Seller shall use Buyer supplied tag numbers for valves, instrumentation, junction boxes, racks, and panels.

7.4 Documentation

7.4.1 Seller shall ensure that appropriate documentation is prepared and, if required, signed by the appropriate person(s). The shipping documentation shall accurately reflect specific traceability to the items being shipped.

7.4.2 Seller shall ensure that appropriate documentation is prepared for the Activated Carbon Bed Adsorber units, activated carbon, and shims. At a minimum, documentation shall include the following information, as applicable:

- Manufacturer name, model number, and serial number
- Plant Item Number

7.5 Shipment Preparation Instructions

7.5.1 Shipment of items shall be conducted in accordance with ASME AG-1a, Article HA-7300, Buyer specification 24590-WTP-3PS-G000-T0003 *Engineering Specification for Packaging, Handling, and Storage Requirements.*

7.5.2 The Activated Carbon Bed Adsorber units shall be shipped completely assembled except for activated carbon. Activated carbon shall be shipped separately.

7.5.3 Weatherproof shipping lists (two per packaged item) shall be prepared and submitted, and shall clearly identify the contents of each package sent to the Buyer. All submittals and shipping boxes shall be identified with the Buyer's purchase order number.

7.5.4 Seller shall provide a complete identification and location of temporary material contained within the equipment for shipment, handling, or storage that must be removed prior to commissioning (e.g., shipping blocks, desiccant bags, components shipped inside larger sections, etc.). In addition, the Seller shall provide instructions for removal of temporary materials, as required.

7.5.5 The Activated Carbon Bed Adsorber units and shims shall be mounted on skids, in crates, or in boxes as suited for the intended method of transport. Lifting weight and center of gravity shall be clearly marked on both the equipment and its shipping documents.

8 Quality Assurance

8.1 General Requirements

8.1.1 The Seller's QAP Requirements are included in Buyer specification 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.1.2 Seller's QAP Manual shall be submitted to Buyer for review in accordance with Buyer specification 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.1.3 Seller's QAP, as a minimum, shall contain the requirements detailed in the Supplier Quality Assurance Program Requirements Data Sheets listed in Section 2 of the purchasing documents.

8.2 Quality (Q) Related Components

8.2.1 Seller shall have in place a QAP meeting the requirements of ASME-NQA-1, marked as applicable in Supplier Quality Assurance Program Requirements Data Sheet attached to the purchasing documents, and Buyer specification 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.2.2 The successful bidder must pass a pre-award survey by the Buyer. Seller shall demonstrate that its quality program is in compliance with the procurement quality requirements listed in the Supplier Quality Assurance Program Requirements Data Sheet. The Seller shall allow the Buyer, its agent, and DOE access to their facility and records pertaining to this purchase order for the purpose of Quality Assurance (QA) Audits and Surveillance at mutually agreed times.

8.2.3 All items shall be manufactured in accordance with the Seller's QAP that meets the requirements of ASME NQA-1, and has been previously evaluated and accepted by the WTP Quality Organization.

8.2.4 Seller shall submit their QAP and work plan to Buyer for review prior to commencement of work. The plan shall include documents and procedures to implement the work and include a matrix of essential QA elements cross referenced with the documents/procedures.

8.3 Supplier Deviation

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

Supplier-proposed deviations from procurement documents shall be initiated by use of Supplier Deviation Disposition Request (SDDR) form in section 2 of the purchasing documents.

9 Configuration Management

Equipment and or components covered by this specification are identified with Plant Item numbers shown in the MDSs. Each item shall be identified in accordance with Tagging in section 7 of this specification.

10 Documentation and Submittals

10.1 General

10.1.1 Seller shall submit to Buyer all detailed designs, documentation, procedures, instructions, calculations, analyses, laboratory results, models, manufacturer data, inspection plans and reports, test plans and reports, certifications, certificates, qualification records, manuals, MSDSs, video tapes, and drawings required per this specification, the applicable codes, standards, and reference documents in section 2 of this specification, and the purchasing documents.

10.1.2 All detailed designs, drawings, shop drawings, supporting calculations, supporting analyses, support models, procedures, instructions, manufacturer data, operation manuals, and maintenance manuals shall be issued to the Buyer for review prior to manufacture of the Activated Carbon Bed Adsorber units, special tools, and/or the purchase of special tools, filters, and gaskets.

10.1.3 Seller shall submit storage requirements and instructions for Buyer's review.

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

10.1.5 Seller shall submit a report identifying any deviations and/or conflicts per Section 2 of the purchasing documents to the Buyer for review.

10.1.6 Each documentation transmittal package shall have a documentation inventory sheet attached listing all documents and the number of pages each.

10.1.7 MDSs in Section 2 of the purchasing documents and motor data sheets shall be marked-up by the Seller and submitted to the Buyer for review with the detailed design. Seller shall fill in all information that is marked with an asterisk (*) and mark-up actual overall Activated Carbon Bed Adsorber dimensions based on the detailed design.

10.1.8 Seller shall provide all operation manuals (include media changeout operations and any media conditioning requirements), maintenance manuals, initial setup and startup instructions, special tools, and spare parts lists for Activated Carbon Bed Adsorber components, as applicable.

10.1.9 Provide nominal and maximum inlet and outlet nozzle loadings, deflections, and moments in all directions for Activated Carbon Bed Adsorber units per thermal and seismic analysis results.

10.1.10 Provide Activated Carbon Bed Adsorber unit support and anchorage design load analyses including seismic, thermal, and combination loads.

10.1.11 Provide MSDS for Seller's recommended challenge gas.

10.1.12 The Seller shall provide equipment reliability figures for all major components and sub-components of the Carbon Bed Adsorber system. The definition of components and subcomponents is at the vendor's discretion. The reliability figures shall include, as a minimum, the following:

- Failure rate, or mean time between failure (whichever is available)
- Estimated modes of failure (example, Drive gear failure, motor burnout, brake failure, etc.). This may be delineated in a FMEA. The method used to perform the FMEA (example, MIL-STD-1629) and the year shall be specified. In addition, all assumptions used to perform the FMEA shall be stated.
- Recommended maintenance and frequency, as applicable
- Estimated time to perform the recommended maintenance, as applicable

The data above shall be based on the physical and environmental conditions delineated in this specification. Where possible, the seller shall compare the figures for the equipment in this specification to similar equipment sold and serviced by the vendor. The source for all estimates and any underlying assumptions shall be stated. If software is used to perform the FMEA, the seller shall specify the software used and the version (example software, Relex, Isogen, Reliasoft, etc.)

10.1.13 Provide installation manual per the requirements of engineering specification 24590-WTP-3PS-G000-T0003, *Packaging, Handling, and Storage Requirements.*

10.1.14 Provide site handling and storage instructions per the requirements of section 3.9 and engineering specification 24590-WTP-3PS-G000-T0003, *Packaging, Handling, and Storage Requirements.*

10.1.15 All analyses shall be submitted in accordance with the requirements of 24590-WTP-3PS-G000-T0014, *Engineering Specification for Supplier Design Analyses.*

10.2 Drawings

10.2.1 Seller shall provide all drawings required per this specification and the applicable documents in section 2 of this specification.

10.2.2 All drawings shall be produced per the drawing practices set forth in ASME Y14.100, Engineering Drawing Practices.

10.2.3 Seller shall submit drawings and diagrams for Buyer's review prior to fabrication, and/or purchase of appurtenance equipment. Drawing and diagram submittals shall include as a minimum, but are not limited to, the following:

- Outline drawings showing dimensions, services, insulation, and foundation and mounting details.
- Outline drawing showing electrical and instrumentation tie-in points.
- Outline drawing showing locations of piping connections with nozzle schedule, including sizes of piping connections with nominal and maximum nozzle loadings, deflections, and moments in all directions.
- Insulation detail drawing(s) mapping installation
- Overall piping and instrumentation diagram (P&ID) for the Activated Carbon Bed Adsorber Units using Buyers supplied instrumentation and equipment tag numbers.

- Interconnection diagram showing details of all internal connections and Buyer external connections, including required location and sizes of wiring connections (including other connections to Buyer's control system).
- Overall single line diagram (wiring diagram) showing all electrical equipment and wiring in the Activated Carbon Bed Adsorber Unit.
- Control logic diagrams showing input signal paths required to accomplish a response.
- Assembly drawings with sufficient information and detail to facilitate assembly of the component parts of an equipment item.
- Shop detail drawings that provide information and detail to facilitate fabrication, manufacture, or installation.

10.3 30% Design Review

10.3.1 Seller shall conduct a 30 % design review with the Buyer. Seller shall submit all drawings, procedures, calculations, laboratory testing results, analyses, and information necessary to conduct the 30 % design review to the Buyer for review.

10.3.2 Finalized outline dimensions of the Activated Carbon Bed Adsorber units shall be included in the 30 % design review. Finalized dimensions shall, at a minimum, include the following:

- Overall dimensions and size for Activated Carbon Bed Adsorber units
- P&IDs
- Control logic diagrams
- Activated Carbon Bed Adsorber unit inlet and outlet nozzle locations
- Discharge filter location and size
- Testing port and manifold locations and size
- Adsorber cell overall dimensions
- Mounting details (anchor size, location, layout, etc.)
- Preliminary bag-in/bag-out plan
- Fire water inlet and drain locations and sizes

10.4 90% Design Review

Seller shall conduct a 90 % design review with the Buyer. Seller shall submit all drawings, procedures, calculations, analyses, and information necessary to conduct the 90 % design review to the Buyer for review.

10.5 Calculations

All calculations to be provided shall be orderly, complete, and sufficiently clear to permit verification. The body of the calculations shall include:

- A concise statement of the purpose of the calculation
- Input data, applicable criteria, and stated assumptions
- A list of references used, including drawings, codes, standards, and computer programs (indicate the version or issue date)
- A discussion of rationale used for design assumption basis
- Equations used for all computations

- Numerical calculations including identification of units used
- A concise statement addressing the calculation results and/or recommendations
- A table of contents for complex calculations

10.6 Schedules

10.6.1 A detailed schedule of laboratory testing, engineering, document submittals, material purchases, fabrication, shop tests, and shipment shall be submitted.

10.6.2 All procedures and instructions shall be completed and submitted to the Buyer a minimum of eight (8) weeks prior to Activated Carbon Bed Adsorber shipment.

10.7 Reporting Appendix A Test Results

A test plan and supporting documentation (operating procedures, materials and testing equipment control lists, analytical procedures) must provide a full record of the testing requirements, testing equipment configuration, operating conditions, assumptions, and any other relevant information. In addition to, or consistent with, the test plan content required by the Quality Assurance Project Plan for RPP-WTP, current revision, the test plan shall include directly or by reference (as appropriate) the following information:

- **Document Number** – Test plan number in the document header.
- **Document Hierarchy** – Statement in the test plan text referencing the governing test specification.
- **Background** – Summary level discussion of past results and current data needs that provide context and relevancy of the testing to the WTP Project.
- **Test Prerequisites** – Definition and/or reference of laboratory testing, engineering analyses, small-scale testing needed to support testing.
- **Test Conditions** – Test variables and operating conditions (e.g., duration of operations at steady state conditions, range of equipment operating conditions, process flows, pressures, temperatures, differential pressures, etc.) identified in tables or other efficient formats.
- **Sample Data Requirements** – A table listing the sample type, location, frequency, number of replicates, and planned analyses to be performed. Minimum data accuracy requirements shall be addressed.
- **Test Modifications** – Test Plan shall contain a statement defining how changes or modifications in operations or testing will be documented in the "desk copy" or similar controlling documentation during the test and who has the authority to authorize changes or modifications depending on the significance of the change.
- **Equipment Configuration Record** – The equipment configuration for the test or document reference where the configuration can be found. Statement defining where any changes or modifications to the baseline equipment will be recorded, e.g., laboratory record book.
- **M&TE** – A list identifying measuring and test equipment (M&TE) used to collect data to meet Test Specification requirements, data reported to the project in the summary report or other data reporting formats, and M&TE relied upon for control or modeling purposes. Accuracy and sensitivity achievable for each instrument.

- **Supporting Procedures** – A list of applicable technical and operating procedures or a referenced document that contains the list of documents required for operating the test equipment and associated support systems, sample preparation and analytical procedures, etc.
- **Unique Sample Identification** – Description of or document reference defining method to label, store and maintain samples.
- **Reporting and Analyses Requirements** – Process data that will be obtained and reported, Rate versus time, average temperature versus time, and analyses are required to satisfy each test objective. Planned data analyses, e.g., comparison to theoretical or published predictions, empirical fitting, etc., required to meet objectives.
- **Personnel Qualification** – List of any special training needs.
- **Quality Assurance** – Statement identifying applicable quality assurance requirements. Any exceptions to the approved quality assurance plan shall be described.

A final report shall be submitted within 60 days of completing testing and sample analyses. Test report content shall include (compatible with the individual test objectives):

- Approval sheet signed by the principal investigator, data validation peer reviewer, and project manager,
- Summarize the tests performed, including the date of the tests, and applicable test specification and test plan,
- Provide a clear description of the purpose of the test and state how the completed test met that purpose,
- Describe the unit operations in which the tests were performed and contrast test conditions with planned operating conditions of the RPP-WTP, as appropriate,
- Present and discuss test results and compare against the "success" criteria. Discuss whether or not the findings of the test performed are consistent with previous test reports, whether the expected WTP design or operational conditions are appropriate for the system, or have implications for safety, permitting, or operability,
- Data collected and its acceptability,
- Actions taken in connection with any nonconformances noted,
- Identification of the measuring and test equipment used during the test,
- Describe deviations from the approved test plan, or expected configuration conditions, that occurred during the conduct of the test,
- Comprehensive list of all samples providing the date/time of sampling, sample type, and sample label,
- Data tables listing monitored parameter values.
- A discussion of how the test results validate equipment sizing and performance.

11 References

11.1 Incorporated Design Changes

- 24590-WTP-3PN-MWK0-00001

- 24590-WTP-SDDR-PROC-05-00701
- 24590-WTP-SDDR-M-05-00018
- 24590-WTP-SDDR-MS-07-00051

11.2 Design Changes Incorporated by Reference

- 24590-WTP-SDDR-M-06-00286
- 24590-WTP-SDDR-M-06-00287

Figure 1 Deleted

Deleted.

Figure 2 **Deleted**

Deleted.

Figure 3 Mercury Gas Monitor Probe Flange Connection

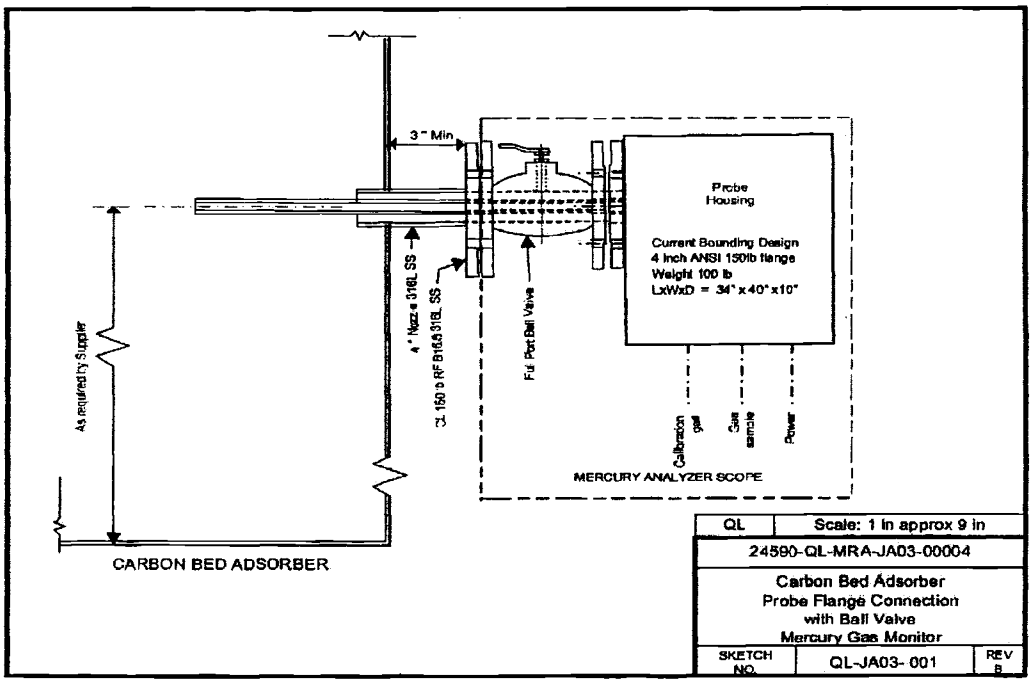


Table 1 Quality Level List (HLW)

QUALITY LEVEL

COMPONENT TAG NO:
24590-HLW-MV-HOP-ADBR-00001A/B
24590-HLW-MV-HOP-ADBR-00003A/B

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
D8169	D8169-1	Air Slot with Sample Holes	D8169-1	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
Inlet Air Slot	D8169-2	Air Slot without Sample Holes	D8169-2	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-3	Vertical Channel LH	12GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-4	Vertical Channel RH	12GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-5	Horizontal Channel	12GA SHT 316L SS	20	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-6	Lower Channel	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-7	Upper Channel	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-8	Vertical Flat Bar (118)	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-9	Vertical Flat Bar (123.53)	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-10	Racking Washer	12GA SHT 316L SS	3	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-11	Perforated Sheet (22.38)	20GA SHT 316L SS	10	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8169-12	Perforated Sheet (10.44)	20GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
D8170	D8170-1	Vertical Channel	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
Outlet Air Slot	D8170-2	Horizontal Channel	12GA SHT 316L SS	10	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8170-3	Lower Channel	12GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8170-4	Upper Channel	12GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8170-5	Vertical Flat Bar	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8170-6	Perforated Sheet (22.38)	20GA SHT 316L SS	10	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8170-7	Perforated Sheet (10.44)	20GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
D8171	D8171-1	Air Slot with Sample Holes	D8169-1	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
Bed Air Slot	D8171-2	Air Slot without Sample Holes	D8169-2	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8171-3	Vertical Channel	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8171-4	Horizontal Channel	12GA SHT 316L SS	20	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8171-5	Lower Channel	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8171-6	Upper Channel	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8317-5	Sling (11200#)	McMaster - Carr	4	CM	No	Does not function to contain melter offgas. External to the pressure boundary and is considered a none permanent piece of plant equipment. Used only for handling the equipment during transportation and installation.
	D8317-6	Name Plate (4.00 X 7.00)	11GA SHT 304L SS	2	CM	No	Does not function to contain melter offgas. External to the pressure boundary and is considered a none permanent piece of plant equipment. Used only for handling the equipment during transportation and installation.
D8574 Inlet Pipe Support Assy	D8574-1	I-Beam	6 X 12.5# HRS ASTM A-36	1	QL	Yes	
	D8574-2	Angle (34.62)	2 X 2 X 1/4 ANGLE ASTM A-36	1	QL	Yes	
	D8574-3	Plate (22.38)	1/4 PL 316L SS	1	QL	Yes	
	D8574-4	Plate (21.38)	1/4 PL 316L SS	1	QL	Yes	
	D8574-5	Plate (4.00)	1/4 PL 316L SS	4	QL	Yes	
	D8574-6	Plate (7.00)	1/4 PL 316L SS	2	QL	Yes	
	D8574-7	Plate (2.75)	1/4 PL 316L SS	2	QL	Yes	
	D8574-8	Hex HD Bolt (2.0)	1/2-13UNC 316 SS	4	QL	Yes	
	D8574-9	Lock Washer	1/2 I.D. 316 SS	4	QL	Yes	
	D8574-10	Hex Nut	1/2-13UNC 316 SS	4	QL	Yes	
C5982 VA-3000 CO ANALYZER	3	Drain Separator	Glass	6	QL	Yes	
	4	Mist Catcher		6	QL	Yes	
	5	Selector Valve	PVC	6	QL	Yes	
	6	Filter	304 SS	12	QL	Yes	
	7	Filter		6	QL	Yes	
	8	Pump		12	QL	Yes	
	9	Thermo-Electric Dehumidifier		6	QL	Yes	
	10	Needle Valve	PVC	12	QL	Yes	
	11	Flow Meter	Glass	12	QL	Yes	
	12	CO Analyzer Unit		6	QL	Yes	
	13	Capillary		6	QL	Yes	
	14	Filter		6	QL	Yes	
	15	Pump		6	QL	Yes	
	16	Solenoid Valve (2-way)		12	QL	Yes	
	17	Rotameter W / Valve		6	QL	Yes	
	18	Solenoid Valve (3-Way)		6	QL	Yes	
	19	Ball Valve (2-Way)		18	QL	Yes	
	20	Bulkhead Fitting (3/8 x 3/8)		20	QL	Yes	
	21	Needle Valve		6	QL	Yes	
	22	Flow Meter		6	QL	Yes	
	23	Bulkhead Fitting (1/4 x 1/4)		4	QL	Yes	
	24	3/8 inch Tee		6	QL	Yes	
	25	1/4 inch Tee		20	QL	Yes	
	26	Vacuum Switch		6	QL	Yes	
	27	VS-3001 Sample Sample System		6	QL	Yes	
	28	VA-3000 Analyzer		6	QL	Yes	
	29	1/2 inch Piping	PVC	A/R	QL	Yes	
	30	3/8 inch PTFE Teflon Tubing	PTFE	A/R	QL	Yes	
	31	1/4 inch PTFE Teflon Tubing	PTFE	A/R	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8183-19	Reinforcement Plate 8"	D8188-20	12	QL	Yes	
	D8183-20	Cylinder 16" I.D	D8188-21	2	QL	Yes	
	D8183-21	Discharge Filter MTG Plate	D8198	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
	D8183-22	Slide Gate Assembly	D8315-2	8	QL	Yes	
	D8183-23	Lifting Lug	B8216	4	CM	No	Does not function to contain melter offgas. Lifting lugs do not form part of the pressure boundary and are only used to handle the housings for transportation and installation.
	D8183-24	Plate (120.62)	1/4 PL 316L SS	8	QL	Yes	
	D8183-25	Plate (120)	1/4 PL 316L SS	6	QL	Yes	
	D8183-26	Plate (84)	1/4 PL 316L SS	2	QL	Yes	
	D8183-27	Plate (6.25)	3/8 PL 316L SS	5	QL	Yes	
	D8183-28	Plate (5.62)	3/8 PL 316L SS	20	QL	Yes	
	D8183-29	I-Beam (131.88)	6 X 12.5 # HRS	8	QL	Yes	
	D8183-30	I-Beam (120)	6 X 12.5 # HRS	6	QL	Yes	
	D8183-31	I-Beam (84.5)	6 X 12.5 # HRS	2	QL	Yes	
	D8183-32	Pipe T.O.E (4.5)	1/2 SCH 40 316L SS	1	QL	Yes	
	D8183-33	Pipe T.O.E. (12)	2 SCH 40 316L SS	1	QL	Yes	
	D8183-34	Pipe (23.62)	2 SCH 40 316L SS	1	QL	Yes	
	D8183-35	Pipe (18.00)	2 SCH 40 316L SS	1	QL	Yes	
	D8183-36	Pipe (3.00)	2 SCH 40 316L SS	1	QL	Yes	
	D8183-37	Pipe (8.88)	8 SCH 40 316L SS	12	QL	Yes	
	D8183-38	Pipe (6.38)	8 SCH 40 316L SS	6	QL	Yes	
	D8183-39	Pipe (6.38)	14 SCH 40 316L SS	1	QL	Yes	
	D8183-40	Weld Neck Flange	2 X 150# 316L SS	2	QL	Yes	
	D8183-41	Slip-on Flange	8 X 150# 316L SS	12	QL	Yes	
	D8183-42	Weld Neck Flange	14 X 150# 316L SS	4	QL	Yes	
	D8183-43	90° Elbow	2 SCH 40 316L SS	2	QL	Yes	
	D8183-44	Hex HD Bolt	HEX HD BOLT (1.75)	24	QL	Yes	
	D8183-45	Bag-out Flange	D8188-22	2	QL	Yes	
	D8183-46	Door Flange	D8188-23	2	QL	Yes	
	D8183-47	Re-Bar Flange	D8188-24	2	QL	Yes	
	D8183-48	Round Bar	1/4 DIA ROUND BAR 316L SS	A/R	CM	No	Does not function to contain melter offgas. The round bar is used to help hold a bag in place during a discharge filter bag-in/bag-out operation.
	D8183-49	Pipe Support Assy	D8229-1	1	QL	Yes	
	D8183-50	Pipe Support Assy	D8229-2	2	QL	Yes	
	D8183-51	Reinforcement PL (12.0 OD)	3/8 PL 316L SS	3	QL	Yes	
	D8183-52	Reinforcement PL (15.5 OD)	3/8 PL 316L SS	1	QL	Yes	
	D8183-53	Reinforcement PL (18 OD)	3/8 PL 316L SS	2	QL	Yes	
	D8183-54	Reinforcement PL (4.00 OD)	3/8 PL 316L SS	3	QL	Yes	
	D8183-55	Pipe Support Assy	D8674	1	QL	Yes	
	D8183-56	Plug	3/8 PL 316L SS	1	QL	Yes	
D8188 Housing WLDMT Details	D8188-1	Back Panel	3/8 PL 316L SS	1	QL	Yes	
	D8188-2	Front Panel	3/8 PL 316L SS	1	QL	Yes	
	D8188-3	Front Panel	3/8 PL 316L SS	2	QL	Yes	
	D8188-4	Bottom Panel	3/8 PL 316L SS	1	QL	Yes	
	D8188-5	Top Panel	3/8 PL 316L SS	1	QL	Yes	
	D8188-6	Top Panel w/ Hole	3/8 PL 316L SS	1	QL	Yes	
	D8188-7	Top Panel	3/8 PL 316L SS	1	QL	Yes	
	D8188-8	Top End Panel	3/8 PL 316L SS	2	QL	Yes	
	D8188-9	Inlet End Panel	3/8 PL 316L SS	1	QL	Yes	
	D8188-10	Outlet End Panel	3/8 PL 316L SS	1	QL	Yes	
	D8188-11	Hopper Side Main Bed	3/8 PL 316L SS	8	QL	Yes	
	D8188-12	Hopper Side Guard Bed Panel	3/8 PL 316L SS	8	QL	Yes	
	D8188-13	Hopper End Main Bed Panel	3/8 PL 316L SS	8	QL	Yes	
	D8188-14	Hopper End Guard Bed Panel	3/8 PL 316L SS	8	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8188-15	Hopper Bottom Panel	3/8 PL 316L SS	8	QL	Yes	
	D8188-16	Manway Flange	3/4 PL 316L SS	2	QL	Yes	
	D8188-17	Manway Cover	1/2 PL 316L SS	2	QL	Yes	
	D8188-18	Reinforcement Plate 16"	3/4 X 1 RECT BAR 316L SS	2	QL	Yes	
	D8188-19	Reinforcement Plate 14"	3/4 X 1 RECT BAR 316L SS	1	QL	Yes	
	D8188-20	Reinforcement Plate 8"	3/4 X 1 RECT BAR 316L SS	12	QL	Yes	
	D8188-21	Cylinder 10" I.D	3/16 PL 316L SS	2	QL	Yes	
	D8188-22	Bag-out Flange	3/16 PL 316L SS	2	QL	Yes	
	D8188-23	Door Flange	3/4 X 3 RECT BAR 316L SS	2	QL	Yes	
	D8188-24	Re-Bar Flange	1 X 3 RECT BAR 316L SS	2	QL	Yes	
D8196	D8196-1	Plate (32.88)	1/4 PL 316L SS	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
Discharge Filter MTG	D8196-2	Plate (33.38)	1/4 PL 316L SS	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
Plate	D8196-3	Plate (23.75)	1/4 PL 316L SS	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
	D8196-4	Plate (21.75)	1/4 PL 316L SS	4	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
	D8196-5	Z-Bar (5.19)	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
	D8196-6	Z-Bar (5.89)	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
	D8196-7	Strip	20GA SHT 316L SS	4	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
	D8196-8	Pull Rod	16GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This is used to help remove the discharge filters during the bag-in/bag-out operation
D8215 Slide Gate Assembly	D8215-1	Pipe	8 SCH 40 316L SS	1	QL	Yes	
	D8215-2	Flange	1 PLATE 316L SS	1	QL	Yes	
	D8215-3	Flange	1 PLATE 316L SS	1	QL	Yes	
	D8215-4	Slide	7GA SHT 316L SS	1	QL	Yes	
	D8215-5	U-Ring	1/4 DIA SOLID NEOPRENE	1	QL	Yes	
	D8215-6	Hex HD Bolt	3/4-10UNC 316 SS	8	QL	Yes	
	D8215-7	Hex Nut	3/4-10UNC 316 SS	8	QL	Yes	
	D8215-8	Lock Washer	3/4 I.D 316 SS	8	QL	Yes	
D8217	D8217-1	Adsorber Assembly	D8179	1	QL	Yes *	The pipe coupling called out as part of the assembly functions to contain melter offgas, therefore, this whole assembly is designated ITS. * For item# D8217-1 should refer to drawing D8179 for the safety / quality designation and CGD requirements
Housing Weldment	D8217-2	Back Panel	D8188-1	1	QL	Yes	
	D8217-3	Front Panel	D8188-2	1	QL	Yes	
	D8217-4	Bottom Panel	D8188-4	1	QL	Yes	
	D8217-5	Top Panel	D8188-5	1	QL	Yes	
	D8217-6	Top Panel W/Holes	D8188-6	1	QL	Yes	
	D8217-7	Top Panel	D8188-7	1	QL	Yes	
	D8217-8	Top End Panel	D8188-8	2	QL	Yes	
	D8217-9	Inlet End Panel	D8188-9	1	QL	Yes	
	D8217-10	Outlet End Panel	D8188-10	1	QL	Yes	
	D8217-11	Hopper Side Main Bed	D8188-11	8	QL	Yes	
	D8217-12	Hopper Side Guard Bed Panel	D8188-12	8	QL	Yes	
	D8217-13	Hopper End Main Bed Panel	D8188-13	8	QL	Yes	
	D8217-14	Hopper End Guard Bed Panel	D8188-14	8	QL	Yes	
	D8217-15	Hopper Bottom Panel	D8188-15	8	QL	Yes	
	D8217-16	Manway Flange	D8188-16	2	QL	Yes	
	D8217-17	Reinforcement Plate 16"	D8188-18	2	QL	Yes	
	D8217-18	Reinforcement Plate 14"	D8188-19	4	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8217-19	Reinforcement Plate 8"	D8188-20	12	QL	Yes	
	D8217-20	Cylinder 16" I.D.	D8188-21	2	QL	Yes	
	D8217-21	Discharge Filter MTG Plate	D8196	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters
	D8217-22	Slide Gate Assembly	D8215-2	8	QL	Yes	
	D8217-23	Lifting Lug	D8216	4	CM	No	Does not function to contain melter offgas. Lifting lugs do not form part of the pressure boundary and are only used to handle the housings for transportation and installation
	D8217-24	Plate (128.62)	1/4 PL 316L SS	8	QL	Yes	
	D8217-25	Plate (120)	1/4 PL 316L SS	8	QL	Yes	
	D8217-26	Plate (64)	1/4 PL 316L SS	2	QL	Yes	
	D8217-27	Plate (6.25)	3/8 PL 316L SS	8	QL	Yes	
	D8217-28	Plate (5.62)	3/8 PL 316L SS	20	QL	Yes	
	D8217-29	I-Beam (131.88)	6 X 12.5 # HRS	8	QL	Yes	
	D8217-30	I-Beam (120)	6 X 12.5 # HRS	8	QL	Yes	
	D8217-31	I-Beam (84.5)	6 X 12.5 # HRS	2	QL	Yes	
	D8217-32	Pipe T.O.E. (4.5)	1/2 SCH 40 316L SS	1	QL	Yes	
	D8217-33	Pipe T.O.E. (12)	2 SCH 40 316L SS	1	QL	Yes	
	D8217-34	Pipe (23.62)	2 SCH 40 316L SS	1	QL	Yes	
	D8217-35	Pipe (16.00)	2 SCH 40 316L SS	1	QL	Yes	
	D8217-36	Pipe (3.00)	2 SCH 40 316L SS	1	QL	Yes	
	D8217-37	Pipe (8.88)	8 SCH 40 316L SS	17	QL	Yes	
	D8217-38	Pipe (5.38)	8 SCH 40 316L SS	8	QL	Yes	
	D8217-39	Pipe (8.38)	14 SCH 40 316L SS	1	QL	Yes	
	D8217-40	Weld Neck Flange	2 X 150# 316L SS	2	QL	Yes	
	D8217-41	Slip-on Flange	8 X 150# 316L SS	12	QL	Yes	
	D8217-42	Weld Neck Flange	14 X 150# 316L SS	4	QL	Yes	
	D8217-43	90° Elbow	2 SCH 40 316L SS	2	QL	Yes	
	D8217-44	Hex HD Bolt	HEX HD BOLT (1.75)	24	QL	Yes	
	D8217-45	Bag-out Flange	D8188-22	2	QL	Yes	
	D8217-46	Door Flange	D8188-23	2	QL	Yes	
	D8217-47	Re-Bar Flange	D8188-24	2	QL	Yes	
	D8217-48	Round Bar	1/4 DIA ROUND BAR 316L SS	A/R	CM	No	Does not function to contain melter offgas. This round bar is used to help hold a bag in place during a discharge filter bag-in/bag-out operation
	D8217-49	Pipe Support Assy	D8220-1	1	QL	Yes	
	D8217-50	Pipe Support Assy	D8220-2	2	QL	Yes	
	D8217-51	Reinforcement PL (17.0 OD)	3/8 PL 316L SS	3	QL	Yes	
	D8217-52	Reinforcement PL (15.8 OD)	3/8 PL 316L SS	1	QL	Yes	
	D8217-53	Reinforcement PL (18 OD)	3/8 PL 316L SS	2	QL	Yes	
	D8217-54	Reinforcement PL (4.00 OD)	3/8 PL 316L SS	3	QL	Yes	
	D8217-55	Plug	3/8 PL 316L SS	1	QL	Yes	
D8218 Base Frame Assembly	D8218-1	W-Beam (278.50)	8 X 31# HRS ASTM A-36	2	QL	Yes	
	D8218-2	W-Beam (88.96)	8 X 31# HRS ASTM A-36	4	QL	Yes	
	D8218-3	W-Beam (49.50)	10 X 31# HRS ASTM A-36	8	QL	Yes	
	D8218-4	Plate	1.0 PL HRS ASTM A-36	6	QL	Yes	
	D8218-5	Channel (7.12)	4 X 5.4# HRS ASTM A-36	2	QL	Yes	
	D8218-6	Channel (81.25)	4 X 5.4# HRS ASTM A-36	1	QL	Yes	
D8220 Ladder Assembly	D8220-1	Flat Bar (181.5)	1/2 X 2 1/2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform
	D8220-2	Flat Bar (55.5)	1/2 X 2 1/2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform
	D8220-3	Flat Bar (5.5)	1/2 X 2 1/2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8220-4	Flat Bar (10.25)	1/4 X 2 FL HRB ASTM A-36	2	CM	No	Does not function to contain molten oxides. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform.
	D8220-5	Pipe	3/4 BAR CS	16	CM	No	Does not function to contain molten oxides. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform.
	D8220-6	Flat Bar (13.00)	1/4 X 2 FL HRB ASTM A-36	2	CM	No	Does not function to contain molten oxides. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform.
	D8220-7	Flat Bar (8.00)	1/4 X 2 FL HRB ASTM A-36	2	CM	No	Does not function to contain molten oxides. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform.
D8222 Housing Assembly	D8222-1	Housing Weldment Unit A	D8183	1	QL	Yes	
	D8222-2	Manway Cover	D8168-17	2	QL	Yes	
	D8222-3	Slide Gate Assembly	D8215	8	QL	Yes	
	D8222-4	Access Door Discharge Filter	D8224	2	QL	Yes	
	D8222-5	Carbon Sample Plug Assembly	B8284	3	QL	Yes	
	D8222-6	Electrical Enclosure/gauge panel assy Unit A	D8265	1	QL	Yes *	PDITs contain a small amount of molten oxides making the pressure boundary function of the PDITs an ITS function. This makes the assembly ITS. * For item# D8222-6 should refer to drawing D8265 for the safety / quality designation and CGD requirements
	D8222-7	Blind Flange Modified	8 X 150# 316L SS	3	QL	Yes	
	D8222-8	Blind Flange	8 X 150# 316L SS	9	QL	Yes	
	D8222-9	Pipe Plug	1 1/4 X 150# 316L SS	3	QL	Yes	
	D8222-10	Pipe Coupling	1 1/4 X 3000# 316L SS	3	QL	Yes	
	D8222-11	Pipe Coupling	1 1/2 X 3000# 316L SS	1	QL	Yes	
	D8222-12	Pipe T.O.E. (8.38)	1/2 SCH 40 316L SS	3	QL	Yes	
	D8222-13	Pipe T.O.P. (19.38)	1/2 SCH 40 316L SS	3	QL	Yes	
	D8222-14	Thermowell (27")	B8309-2	1	QL	Yes	
	D8222-15	Thermowell (46")	B8309-3	4	QL	Yes	
	D8222-16	Thermowell (66")	D8309-4	4	QL	Yes	
	D8222-17	Temperature Element (27")	2904100-015	1	CM	No	Additional Protection Class (APC), may be purchased as commercial component
	D8222-18	Temperature Element (46")	2904100-015	4	CM	No	Additional Protection Class (APC), may be purchased as commercial component
	D8222-19	Temperature Element (66")	2904100-016	1	CM	No	Additional Protection Class (APC), may be purchased as commercial component
	D8222-20	Radar Level Detector	2904100-017	1	QL	Yes	
	D8222-21	Manual Valve 1/2"	2904100-019	8	QL	Yes	
	D8222-22	Ball Valve 2"	2904100-020	1	QL	Yes	
	D8222-23	Gasket B/O Door 3/8THK x 1WD	Silicone Closed Cell Sponge	128	QL	Yes	
	D8222-24	Gasket 8" Flange		12	QL	Yes	
	D8222-25	Gasket Manway 3/8THK x 1WD		2	QL	Yes	
	D8222-26	Hex Nut	1/2-13UNC 316 SS	24	QL	Yes	
	D8222-27	Hex Nut	3/4-10UNC 316 SS	234	QL	Yes	
	D8222-28	Hex HD Bolt (2.5)	3/4-10UNC 316 SS	32	QL	Yes	
	D8222-29	Hex HD Bolt (3.5)	3/4-10UNC 316 SS	192	QL	Yes	
	D8222-30	Flat Washer	1/2 I.D. 316 SS	24	QL	Yes	
	D8222-31	Flat Washer	3/4 I.D. 316 SS	234	QL	Yes	
	D8222-32	DELETED					
	D8222-33	Solenoid Valve 1/2"	2904100-022	1	QL	Yes	
D8223 Housing Assembly	D8222-1	Housing Weldment Unit B	D8217	1	QL	Yes	
	D8223-2	Manway Cover	D8168-17	2	QL	Yes	
	D8223-3	Slide Gate Assembly	D8215	8	QL	Yes	
	D8223-4	Access Door Discharge Filter	D8224	2	QL	Yes	
	D8223-5	Carbon Sample Plug Assembly	B8284	3	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8223-6	Electrical Enclosure gauge panel assy Unit A	D8286	1	QL	Yes *	PDITs contain a small amount of melter offgas making the pressure boundary function of the PDITs an ITS function. This makes the assembly ITS * For Item D8223-6 should refer to drawing D8285 for the safety / quality designation and CGD requirements
	D8223-7	Blind Flange Modified	6 X 150# 316L SS	3	QL	Yes	
	D8223-8	Blind Flange	8 X 150# 316L SS	0	QL	Yes	
	D8223-9	Pipe Plug	1 1/4 X 150# 316L SS	3	QL	Yes	
	D8223-10	Pipe Coupling	1 1/4 X 3000# 316L SS	3	QL	Yes	
	D8223-11	Pipe Coupling	1 1/2 X 3000# 316L SS	1	QL	Yes	
	D8223-12	Pipe T.O.E. (8.36)	1/2 SCH 40 316L SS	5	QL	Yes	
	D8223-13	Pipe T.O.E. (19.33)	1/2 SCH 40 316L SS	2	QL	Yes	
	D8223-14	Thermowell (27")	D8309-2	1	QL	Yes	
	D8223-15	Thermowell (46")	D8309-3	4	QL	Yes	
	D8223-16	Thermowell (86")	D8309-4	4	QL	Yes	
	D8223-17	Temperature Element (27")	2904100-015	1	CM	No	Additional Protection Class (APC), may be purchased as commercial component
	D8223-18	Temperature Element (46")	2904100-016	4	CM	No	Additional Protection Class (APC), may be purchased as commercial component
	D8223-19	Temperature Element (86")	2904100-016	1	CM	No	Additional Protection Class (APC), may be purchased as commercial component
	D8223-20	Radar Level Detector	2904100-017	1	QL	Yes	
	D8223-21	Manual Valve 1/2"	2904100-019	8	QL	Yes	
	D8223-22	Ball Valve 2"	2904100-020	1	QL	Yes	
	D8223-23	Gasket B/O Door 3/8THK x 1WD	Silicone Closed Cell Sponge	12ft	QL	Yes	
	D8223-24	Gasket 8" Flange		12	QL	Yes	
	D8223-25	Gasket Manway 3/8THK x 1WD		2	QL	Yes	
	D8223-26	Hex Nut	1/2-13UNC 316 SS	24	QL	Yes	
	D8223-27	Hex Nut	3/4-10UNC 316 SS	224	QL	Yes	
	D8223-28	Hex HD Bolt (2.5)	3/4-10UNC 316 SS	32	QL	Yes	
	D8223-29	Hex HD Bolt (3.5)	3/4-10UNC 316 SS	192	QL	Yes	
	D8223-30	Flat Washer	1/2 I.D. 316 SS	24	QL	Yes	
	D8223-31	Flat Washer	3/4 I.D. 316 SS	224	QL	Yes	
	D8223-32	DELETED					
	D8223-33	Solenoid Valve 1/2"	2904100-022	1	QL	Yes	
D8224 Access Door Discharge Filter	D8224-1	Plate-1	3/16 PL 316L SS	1	QL	Yes	
	D8224-2	Plate-2	3/16 PL 316L SS	2	QL	Yes	
	D8224-3	Plate-3	3/16 PL 316L SS	2	QL	Yes	
	D8224-4	Flat bar-1	3/4 X 2 RECT BAR 316L SS	2	QL	Yes	
	D8224-5	Flat bar-2	3/4 X 2 RECT BAR 316L SS	2	QL	Yes	
	D8224-6	Flat bar-3	1/4 X 2 RECT BAR 316L SS	1	CM	No	Does not function to contain melter offgas. This bar is used to make a lifting lug for the access door
D8220	D8220-1	I-Beam (25")	4 X 7.7# HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation
Crane Trolley Assembly	D8226-2	Square Tube (91.25)	4 X 4 X 1/4 WT HRS	4	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-3	Square Tube (113.75)	4 X 4 X 1/4 WT HRS	8	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8226-4	Angle (6.00)	2 X 2 X 1/4 WT HRS	1	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-5	Angle (3.00)	2 X 2 X 1/4 WT HRS	2	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-6	Angle (3.00)	2 X 2 X 1/4 WT HRS	2	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-7	Flat Bar (6.00)	1/4 X 2 FL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-8	Flat Bar (57.56)	1/4 X 2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-9	Plate (3.00 X 4.00)	1/4 PL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-10	Plate (8.00 X 8.00)	1/4 PL HRS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-11	Plate (6.00 X 8.00)	1/4 PL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-12	Plate (7.00 X 7.00)	1/4 PL HRS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-13	Hex HD Bolt (2.00)	1/2-13UNC GR 8 PL	20	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-14	Hex Nut	1/2-13UNC GR 8 PL	20	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-15	Lock Washer	1/2 NOM ID GR 8 PL	25	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8226-16	Electric Hoist	McMaster - Carr	1	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
D8229 Pipe Support Assembly	D8229-1	Pipe Support with Gusset	D8229-1	1	QL	Yes	
	D8229-2	Pipe Support without Gusset	D8229-2	1	QL	Yes	
	D8229-3	I-Beam	6 X 12.5# HRS ASTM A-36	2	QL	Yes	
	D8229-4	Angle	2 X 2 X 1/4 WT HRS ASTM A-36	1	QL	Yes	
	D8229-5	Plate (1.80 X 7.00)	1/4 PL 316L SS	2	QL	Yes	
	D8229-6	Plate (0.50 X 1.50)	1/4 PL 316L SS	4	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8229-7	Shim	12GA SHT 316L SS	2	QL	Yes	
	D8229-8	Stud	1/2-13UNC X 3.0 LG, 316L SS	4	QL	Yes	
	D8229-9	SQ Beveled Washer	18-8 SS	4	QL	Yes	
	D8229-10	Hex Nut	1/2-13UNC 316 SS	4	QL	Yes	
D8250	D8250-1	Channel (23.38 X 126.00)	3/16 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
(Platform Assembly)	D8250-2	Channel (11.4 X 272.50)	3/16 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-3	Channel (9.0 X 91.25)	3/16 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-4	Channel (9.8 X 28.56)	3/16 PL HRS ASTM A-36	10	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-5	Channel (11.4 X 8.00)	3/16 PL HRS ASTM A-36	6	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-6	Pipe (278.40)	1 1/2 SCH 40 CS	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-7	Pipe (30.40)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-8	Pipe (19.40)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-9	Pipe (71.65)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-10	Pipe (48.13)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-11	Pipe (10.50)	1 1/2 SCH 40 CS	6	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-12	Pipe (40.50)	1 1/2 SCH 40 CS	4	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-13	Pipe (41.96)	1 1/2 SCH 40 CS	4	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8250-14	Pipe (50.77)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-15	Pipe (62.10)	1 1/2 SCH 40 CS	8	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-16	Pipe (59.23)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-17	Pipe (45.23)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-18	Pipe (27.48)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-19	Pipe (16.45)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-20	Angle (6.00 X 7.70)	3/16 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-21	Plate (7.00 X 7.00)	1/4 PL HRS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-22	Plate (5.50 X 7.00)	1/4 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-23	Plate (3.5 X 7.00)	1/4 PL HRS ASTM A-36	6	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-24	Hook (3.00)	1/4 DIA BAR HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-25	Bracket (2.25)	1/4 X 2 FL HRS ASTM A-36	4	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-26	Plate (2.81 X 17.50)	3/16 PL HRS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations
	D8250-27	Plate (2.81 X 5.62)	3/16 PL HRS ASTM A-36	9	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8250-28	Flat Bar (276.50)	1/4 X 4 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-29	Flat Bar (124.00)	1/4 X 4 FL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-30	Flat Bar (69.75)	1/4 X 4 FL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-31	Flat Bar (28.50)	1/4 X 4 FL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-32	Chain (39.00)	3/16 304L SS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-33	Chain (62.50)	3/16 304L SS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-34	Grating (25.12 WD X 99.0 LG)	1 1/2 X 3/16 BEARING BAR	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-35	Grating (25.12 WD X 75.0 LG)	1 1/2 X 3/16 BEARING BAR	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-36	Grating (29.88 WD X 75.0 LG)	1 1/2 X 3/16 BEARING BAR	3	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-37	Grating (29.88 WD X 28.5 LG)	1 1/2 X 3/16 BEARING BAR	6	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-38	Angle (28.50)	1 1/2 X 1 1/2 X 3/16 ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-39	Angle (83.25)	1 1/2 X 1 1/2 X 3/16 ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-40	Angle (91.25)	1 1/2 X 1 1/2 X 3/16 ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8250-41	Channel (8.50 X 63.25)	3/16 PL HRS ASTM A-36	3	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8250-42	Grating Retainer Plate (3.00 X 4.00)	3/16 PL HRS ASTM A-36	12	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
D8251	D8251-1	Channel (23.28 X 126.00)	3/16 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
Platform Assembly	D8251-2	Channel (11.4 X 272.50)	3/16 PL HRS ASTM A-36	3	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-3	Channel (9.9 X 91.25)	3/16 PL HRS ASTM A-36	3	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-4	Channel (9.8 X 76.50)	3/16 PL HRS ASTM A-36	10	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-5	Channel (11.4 X 6.00)	3/16 PL HRS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-6	Pipe (278.40)	1 1/2 SCH 40 CS	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-7	Pipe (30.40)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-8	Pipe (19.40)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-9	Pipe (71.85)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-10	Pipe (48.15)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-11	Pipe (40.80)	1 1/2 SCH 40 CS	6	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-12	Pipe (40.50)	1 1/2 SCH 40 CS	4	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-13	Pipe (41.98)	1 1/2 SCH 40 CS	4	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8251-14	Pipe (50.73)	1 1/2 SCH 40 CS	[illegible]	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-15	Pipe (68.10)	1 1/2 SCH 40 CS	5	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-16	Pipe (59.73)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-17	Pipe (45.23)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-18	Pipe (27.48)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-19	Pipe (16.48)	1 1/2 SCH 40 CS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-20	Angle (6.00 X 7.70)	3/16 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-21	Plate (7.00 X 7.00)	1/4 PL HRS ASTM A-36	6	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-22	Plate (5.50 X 7.00)	1/4 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-23	Plate (3.5 X 7.00)	1/4 PL HRS ASTM A-36	6	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-24	Hook (3.00)	1/4 DIA BAR HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-25	Bracket (2.75)	1/4 X 2 FL HRS ASTM A-36	4	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-26	Plate (2.81 X 17.50)	3/16 PL HRS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-27	Plate (2.81 X 5.82)	3/16 PL HRS ASTM A-36	9	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8251-28	Flat Bar (276.50)	1/4 X 4 FL HRS ASTM A 36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-29	Flat Bar (124.00)	1/4 X 4 FL HRS ASTM A 36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-30	Flat Bar (69.75)	1/4 X 4 FL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-31	Flat Bar (20.50)	1/4 X 4 FL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-32	Chain (78.00)	3/16 304L SS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-33	Chain (62.80)	3/16 304L SS	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-34	Grating (25.12 WD X 99.0 LG)	1 1/2 X 3/16 BEARING BAR	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-35	Grating (25.12 WD X 75.0 LG)	1 1/2 X 3/16 BEARING BAR	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-36	Grating (29.88 WD X 75.0 LG)	1 1/2 X 3/16 BEARING BAR	3	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-37	Grating (29.88 WD X 28.5 LG)	1 1/2 X 3/16 BEARING BAR	8	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-38	Angle (26.56)	1 1/2 X 1 1/2 X 3/16 ASTM A-36	2	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-39	Angle (83.25)	1 1/2 X 1 1/2 X 3/16 ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-40	Angle (91.25)	1 1/2 X 1 1/2 X 3/16 ASTM A-36	1	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
	D8251-41	Channel (9.90 X 83.25)	3/16 PL HRS ASTM A-36	3	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8285-13	Circuit Breaker	Allen Bradley	3	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-14	Spur Block J-Box	Pepperl + Fuchs	2	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-15	Profibus DP Station	2904100-043	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-16	Fiber Optic Repeater	2904100-041	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-17	Fiber Optic Housing	2904100-042	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-18	Power Supply	Phoenix	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-19	External GFCI Recpt	Grace	2	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-20	Wire Duct	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-21	Duct Cover	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-22	Wire Duct	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-23	Duct Cover	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-24	Duct Cover	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-25	Wire Duct	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-26	Hex Nut	3/8-16UNC 316 SS	12	QL	Yes	
	D8285-27	Hex HD Bolt 1.00 LG	3/8-16UNC 316 SS	8	QL	Yes	
	D8285-28	Hex HD Bolt 2.00 LG	3/8-16UNC 316 SS	4	QL	Yes	
	D8285-29	Lock Washer	3/8-16UNC 316 SS	12	QL	Yes	
	D8285-30	TVSS	Ferraz Shawmut	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-31	Enclosure	Hoffman	2	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8285-32	Circuit Breaker	Allen Bradley	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
D8286	D8286-1	Panel (12.00 X 67.50)	12GA SHT 316L SS	1	QL	Yes	Panel is used for mounting of the PDITs which have an ITS pressure boundary function
Electrical Enclosure	D8286-2	Z-Bar 50"	7GA SHT 316L SS	1	QL	Yes	Used to mount the electrical enclosures with PDITs to the carbon bed adsorber units. PDITs have an ITS pressure boundary function

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8751-42	Grating Retainer Plate (3.00 X 4.00)	3/16 PL HRS ASTM A-36	12	CM	No	Does not function to contain melter offgas. Platform assembly and all associated parts are external to the pressure boundary and are used for maintenance operations.
D8282 Piping Assembly 14"	D8282-1	Inlet Pipe Assembly	D8282-1	1	QL	Yes	
	D8282-2	Crossover Pipe Assembly	D8282-2	1	QL	Yes	
	D8282-3	Outlet Pipe Assembly	D8282-3	1	QL	Yes	
	D8282-4	Crossover Pipe Assembly	D8282-4	1	QL	Yes	
	D8282-5	Butterfly Valve W/ Operator	2904100-005 W/ 2904100-011	5	QL	Yes	
	D8282-6	Weld Neck Flange	14 X 150# 316L SS	18	QL	Yes	
	D8282-7	Weld Neck Flange	2 X 150# 316L SS	1	QL	Yes	
	D8282-8	90° Elbow LR	14 SCH 40 316L SS	5	QL	Yes	
	D8282-9	Straight Tee	14 SCH 40 316L SS	2	QL	Yes	
	D8282-10	Pipe (Cut at Assembly)	14 SCH 10 316L SS	408 In	QL	Yes	
	D8282-11	Pipe (8.19)	2 SCH 40 316L SS	1	QL	Yes	
	D8282-12	Pipe T.O.E (10.00)	1/2 SCH 40 316L SS	1	QL	Yes	
	D8282-13	Pipe T.O.E (3.18)	1/2 SCH 40 316L SS	11	QL	Yes	
	D8282-14	DELETED					
	D8282-15	Manual Valve 1/2"	2904100-019	12	QL	Yes	
	D8282-16	Thermowell	B8009-1	1	QL	Yes	
	D8282-17	Hex HD Bolt	1-8UNC 316 SS	120	QL	Yes	
	D8282-18	Flat Washer	316 SS	120	QL	Yes	
	D8282-19	Bellows Ass'y	2904100-021	4	QL	Yes	
	D8282-20	90° Elbow SR	14 SCH 40 316L SS	1	QL	Yes	
D8285 Electrical Enclosure	D8285-1	Panel (12.00 X 62.50)	12GA SHT 316L SS	1	QL	Yes	Panel is used for mounting of the PDITs which have an ITS pressure boundary function.
	D8285-2	Z-Bar Kit	7GA SHT 316L SS	1	QL	Yes	Used to mount the electrical enclosures with PDITs to the carbon bed adsorber units. PDITs have an ITS pressure boundary function.
	D8285-3	Enclosure	Hoffman	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8285-4	Sub-Panel	Hoffman	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8285-5	Temp. Transmitter	2904100-008	9	CM	No	Additional Protection Class (APC) may be purchased as commercial component
	D8285-6	Diff. Press. X-Mitter	2904100-010	2	QL	Yes	
	D8285-7	5 Valve Manifold	Swagelok	2	QL	Yes	
	D8285-8	Mounting Channel	Allen Bradley	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8285-9	End Plate	Allen Bradley	10	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8285-10	End Clamp	Allen Bradley	5	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8285-11	Marker Card	Allen Bradley	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8285-12	Terminal	Allen Bradley	100	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8286-3	Enclosure	Hoffman	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-4	Sub-Panel	Hoffman	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-5	Temp. Transmitter	2904100-008	8	CM	No	Additional Protection Class (APC), may be purchased as commercial component
	D8286-6	Diff. Press. X-Mitter	2904100-018	2	QL	Yes	
	D8286-7	5 Valve Manifold	Swagelok	2	QL	Yes	
	D8286-8	Mounting Channel	Allen Bradley	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-9	End Plate	Allen Bradley	10	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-10	End Clamp	Allen Bradley	5	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-11	Marker Card	Allen Bradley	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-12	Terminal	Allen Bradley	100	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-13	Circuit Breaker	Allen Bradley	3	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-14	Split Block J Box	Pepperl + Fuchs	2	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-15	Profibus DP Station	2904100-043	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-16	Fiber Optic Repeater	2904100-041	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-17	Fiber Optic Housing	2904100-042	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-18	Power Supply	Phoenix	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-19	External GFCI Recpt	Grace	2	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-20	Wire Duct	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-21	Duct Cover	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-22	Wire Duct	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-23	Duct Cover	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	COD	COMMENTS
	D8286-24	Duct Cover	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-25	Wire Duct	Panduit	A/R	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-26	Hex Nut	3/8-16UNC 316 SS	12	QL	Yes	
	D8286-27	Hex HD Bolt 1.00 LG	3/8-16UNC 316 SS	8	QL	Yes	
	D8286-28	Hex HD Bolt 2.00 LG	3/8-16UNC 316 SS	4	QL	Yes	
	D8286-29	Lock Washer	3/8-16UNC 316 SS	12	QL	Yes	
	D8286-30	TVSS	Ferraz Shawmut	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
	D8286-31	Enclosure	Hoffman	2	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation
	D8286-32	Circuit Breaker	Allen Bradley	1	CM	No	Does not function to contain melter offgas. Electrical enclosure internal component used for commercial instrumentation.
D8287 Piping Assembly 2"	D8287-1	Pipe (C/A at Assembly)	2 SCH 40 316L SS	30ft	QL	Yes	
	D8287-2	Weld Neck Flange	2 X 150# 316L SS	7	QL	Yes	
	D8287-3	90o Elbow	2 SCH 40 316L SS	8	QL	Yes	
	D8287-4	Tee	2 SCH 40 316L SS	1	QL	Yes	
	D8287-5	Gasket		7	QL	Yes	
	D8287-6	Rupture Disc		2	QL	Yes	
	D8287-7	Hex HD Bolt (2.5)	5/8-11UNC 316 SS	12	QL	Yes	
	D8287-8	Hex HD Bolt (3.00)	5/8-11UNC 316 SS	8	QL	Yes	
	D8287-9	Hex Nut	5/8-11UNC 316 SS	20	QL	Yes	
D8304 Final Assembly	D8304-1	Base Frame Assembly (1A/B)	D8218	1	QL	Yes	
	D8304-2	Base Frame Assembly (2A/B)	D8218	1	QL	Yes	
	D8304-3	Housing Assembly (1A)	D8222	1	QL	Yes	
	D8304-4	Housing Assembly (2A)	D8222	1	QL	Yes	
	D8304-5	Housing Assembly (1B)	D8223	1	QL	Yes	
	D8304-6	Housing Assembly (2B)	D8223	1	QL	Yes	
	D8304-7	Platform Assembly (1A/B)	D8250	1	QL	Yes	
	D8304-8	Platform Assembly (2A/B)	D8251	1	QL	Yes	
	D8304-9	Ladder Assembly (1A/B)	D8220	1	CM	No	Does not function to contain melter offgas. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform
	D8304-10	Ladder Assembly (2A/B)	D8220	1	CM	No	Does not function to contain melter offgas. Ladder and all associated parts are external to the pressure boundary and form part of the maintenance platform.
	D8304-11	Crane Trolley Assembly (1A/B)	D8226	1	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation.
	D8304-12	Crane Trolley Assembly (2A/B)	D8226	1	CM	No	Does not function to contain melter offgas. Crane trolley and all associated parts are external to the pressure boundary and are used as part of the carbon media loading operation
	D8304-13	Inlet Pipe Assembly (1A/B)	D8282-1	1	QL	Yes	
	D8304-14	Crossover Pipe Assembly (1A/B)	D8282-2	1	QL	Yes	
	D8304-15	Outlet Pipe Assembly (1A/B)	D8282-3	1	QL	Yes	
	D8304-16	Crossover Pipe Assembly (1A/B)	D8282-4	1	QL	Yes	
	D8304-17	Inlet Pipe Assembly (2A/B)	D8282-1	1	QL	Yes	
	D8304-18	Crossover Pipe Assembly (2A/B)	D8282-2	1	QL	Yes	
	D8304-19	Outlet Pipe Assembly (2A/B)	D8282-3	1	QL	Yes	
	D8304-20	Crossover Pipe Assembly (2A/B)	D8282-4	1	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8304-21	Pipe Assembly 2" (1/VB)	D8287	1	QL	Yes	
	D8304-22	Pipe Assembly 2" (2/VB)	D8287	1	QL	Yes	
	D8304-23	Spacer (1/4 THK 4.0 X 4.0)	Alumina Silicate Ceramic	100	QL	Yes	
	D8304-24	Gasket 2"		10	QL	Yes	
	D8304-25	Gasket 14"		20	QL	Yes	
	D8304-26	Hex HD Bolt (1.50)	1/2-13UNC 316 SS	76	QL	Yes	
	D8304-27	Hex HD Bolt (2.00)	1/2-13UNC 316 SS	200	QL	Yes	
	D8304-28	Hex Nut	1/2-13UNC 316 SS	276	QL	Yes	
	D8304-29	Lock Washer	1/2 I.D. 316 SS	276	QL	Yes	
	D8304-30	Hex HD Bolt (2.50)	5/8-11UNC 316 SS	8	QL	Yes	
	D8304-31	Hex HD Bolt (3.00)	5/8-11UNC 316 SS	16	QL	Yes	
	D8304-32	Hex Nut	5/8-11UNC 316 SS	24	QL	Yes	
	D8304-33	Hex HD Bolt (4.50)	1-8UNC 316 SS	144	QL	Yes	
	D8304-34	Hex HD Bolt (2.50)	1-8UNC 316 SS	144	QL	Yes	
	D8304-35	Hex Nut	1-8UNC 316 SS	144	QL	Yes	
	D8304-36	Insulation	Calcium-Silicate	2400 ft^2	CM	No	Does not function to contain melter offgas. Insulation is not provided by IONEX
	D8304-37	High Temperature Adhesive	Calbond R Gold	A/R	CM	No	Does not function to contain melter offgas. Insulation bonding material is not provided by IONEX
	D8304-38	Sealing Caulk	PERMATEX HI-TEMP RED RTV	A/R	CM	No	Does not function to contain melter offgas. RTV is recommended for sealing the joints of the cladding and is not provided by IONEX.
	D8304-39	Flat Washer	1/2 ID X 1.25 OD 316 SS	552	QL	Yes	
	D8304-40	Name Plate (S/No 01 THRU 06)	D8221	1	CM	No	Does not function to contain melter offgas. Nameplate is external to the pressure boundary and is only used to identify the equipment.
	D8304-41	3-Way Solenoid Valve	Valcor	12	QL	No	Valcor solenoid valves have been procured from a qualified supplier. No CGD necessary
	D8304-42	3-Way Solenoid Valve	ASCO	12	CM	No	Does not function to contain melter offgas. This 3-way solenoid valve is used during normal operation to activate the 14 inch butterfly valves to either isolate the units for maintenance or adjust the flow of offgas
D8317	D8317-1	I Beam	8 X 12 BM HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. External to the pressure boundary and is considered a none permanate piece of plant equipment. Used only for handling the equipment during transportation and installation
Spreader bar	D8317-2	Plate	1.0 PLATE ASTM A-36	4	CM	No	Does not function to contain melter offgas. External to the pressure boundary and is considered a none permanate piece of plant equipment. Used only for handling the equipment during transportation and installation
	D8317-3	Plate	1.0 PLATE ASTM A-36	4	CM	No	Does not function to contain melter offgas. External to the pressure boundary and is considered a none permanate piece of plant equipment. Used only for handling the equipment during transportation and installation
	D8317-4	Anchor Shackle (25000#)	McMaster - Carr	12	CM	No	Does not function to contain melter offgas. External to the pressure boundary and is considered a none permanate piece of plant equipment. Used only for handling the equipment during transportation and installation

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8171-7	Backing Washer	12GA SHT 316L SS	6	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8171-8	Perforated Sheet (22.38)	20GA SHT 316L SS	20	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8171-9	Perforated Sheet (10.44)	20GA SHT 316L SS	4	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8171-10	Vertical Channel W/Holes	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
D8179	D8179-1	Inlet Air Slot with Sample Holes	D8169-1	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
Adsorber Assembly	D8179-2	Inlet Air Slot without Sample Holes	D8169-2	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8179-3	Outlet Air Slot	D8170	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8179-4	Bed Air Slot with Sample Holes	D8171-1	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8179-5	Bed Air Slots without Sample Holes	D8171-2	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8179-6	Tubing	1 1/2 OD x 0.120 WT, 316L SS	3	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen, used to fill the hole spaced used for the grain theft sample
	D8179-7	Pipe Coupling	1 1/4 x 3000# 316L SS	3	QL	Yes	
	D8179-8	Inlet Plate	12GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. Plate is used to channel air into the air slots and through the carbon media
	D8179-9	Outlet Plate	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. Plate is used to channel air into the air slots and through the carbon media
	D8179-10	Divider Plate	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. Plate is used in the top plenum of the carbon media beds to separate the different medias and aid in carbon media loading
	D8179-11	Cover Plate	12GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. Plate is used to channel air into the air slots and through the carbon media
D8183	D8183-1	Adsorber Assembly	D8179	1	QL	Yes *	The pipe coupling called out as part of this assembly functions to contain melter offgas, therefore, the whole assembly is designated ITS. * For item# D8183-1 should refer to drawing D8179 for the safety / quality designation and CGD requirements
Housing Weldment	D8183-2	Back Panel	D8188-1	1	QL	Yes	
	D8183-3	Front Panel	D8188-2	1	QL	Yes	
	D8183-4	Bottom Panel	D8188-4	1	QL	Yes	
	D8183-5	Top Panel	D8188-5	1	QL	Yes	
	D8183-6	Top Panel W/Holes	D8188-6	1	QL	Yes	
	D8183-7	Top Panel	D8188-7	1	QL	Yes	
	D8183-8	Top End Panel	D8188-8	2	QL	Yes	
	D8183-9	Inlet End Panel	D8188-9	1	QL	Yes	
	D8183-10	Outlet End Panel	D8188-10	1	QL	Yes	
	D8183-11	Hopper Side Main Bed	D8188-11	8	QL	Yes	
	D8183-12	Hopper Side Guard Bed Panel	D8188-12	5	QL	Yes	
	D8183-13	Hopper End Main Bed Panel	D8188-13	8	QL	Yes	
	D8183-14	Hopper End Guard Bed Panel	D8188-14	8	QL	Yes	
	D8183-16	Hopper Bottom Panel	D8188-15	8	QL	Yes	
	D8183-16	Manway Flange	D8188-16	2	QL	Yes	
	D8183-17	Reinforcement Plate 16"	D8188-18	2	QL	Yes	
	D8183-18	Reinforcement Plate 14"	D8188-19	4	QL	Yes	

Table 2 Quality Level List (LAW)

QUALITY LEVEL

COMPONENT TAG NO.:
24590-LAW-MV-LVP-ADBR-00001A/B

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
B8597 Carbon Sample Plug	B8597-1	Pipe Plug Hex Threaded	1 1/4 x 150# 316L SS	1	QL	Yes	
	B8597-2	Tubing	1.0 OD x .120 WT 316L SS ASTM A-269	1	CM	No	Does not function to contain melter offgas. Forms part of the Carbon Sample Plug Assembly. Used to plug hole in the adsorber perforated sheet needed to take carbon samples.
	B8597-3	Round Bar 1.00 LG	1 1/4 DIA BAR 316L SS ASTM A-276 or ASTM A-479	1	CM	No	Does not function to contain melter offgas. Forms part of the Carbon Sample Plug Assembly. Used to plug hole in the adsorber perforated sheet needed to take carbon samples.
B8598 Thermowell Assy	B8598-1	Piping Coupling Threaded	1/2 x 3000# 316L SS	1	QL	Yes	
	B8598-2	Tubing LG as Req'd	.50 OD x .120 WT 316L SS ASTM A-269	1	QL	Yes	
	B8598-3	Plug (See Detail)	1/4 DIA RD BAR 316L SS ASTM A-276 or ASTM A-479	1	QL	Yes	
D8224 Access Door Discharge Filter	D8224-1	Plate - 1	3/16 PL 316L SS ASTM A-240	1	QL	Yes	
	D8224-2	Plate - 2	3/16 PL 316L SS ASTM A-240	2	QL	Yes	
	D8224-3	Plate - 3	3/16 PL 316L SS ASTM A-240	2	QL	Yes	
	D8224-4	Flat Bar - 1	3/4 x 2 RECT BAR 316L SS ASTM A-276 or A-479	2	QL	Yes	
	D8224-5	Flat Bar - 2	3/4 x 2 RECT BAR 316L SS ASTM A-276 or A-479	2	QL	Yes	
	D8224-6	Flat Bar - 3	1/4 x 2 RECT BAR 316L SS ASTM A-276 or A-479	1	CM	No	Does not function to contain melter offgas. This bar is used to make a lifting lug for the access door.
D8473 End Air Slot	D8473-1	Vertical Channel 9.04 x 89.29	12 GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8473-2	Horizontal Channel 8.89 x 75.00	12 GA SHT 316L SS	7	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8473-3	Lower Channel 9.64 x 77.00	12 GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8473-4	Upper Channel 15.14 x 77.00	12 GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8473-5	Vertical Flat Bar 1.00 x 82.00	12 GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8473-6	Vertical Flat Bar 1.00 x 87.50	12 GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8473-7	Perforated Sheet 22.38 x 76.75	C5476	3	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8473-8	Perforated Sheet 18.27 x 78.75	A9399	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
D8474 Center Air Slot	D8474-1	Vertical Channel 5.52 x 89.29	12 GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8474-2	Horizontal Channel 4.779 x 75.00	12 GA SHT 316L SS	7	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8474-3	Lower Channel 5.52 x 77.00	12 GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8474-4	Upper Channel 16.52 x 77.00	12 GA SHT 316L SS	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8474-5	Vertical Flat Bar 1.00 x 82.00	12 GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8474-6	Perforated Sheet 22.38 x 78.75	C5476	8	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8474-7	Perforated Sheet 18.27 x 78.75	A9399	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
D8475	D8475-1	Horizontal Channel 8.89 x 75.00	12 GA SHT 316L S.S	7	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
End Air Slot	D8475-2	Lower Channel 9.84 x 77.00	12 GA SHT 316L S.S	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8475-3	Upper Channel 15.14 x 77.00	12 GA SHT 316L S.S	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8475-4	Vertical Flat Bar 1.00 x 82.00	12 GA SHT 316L S.S	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8475-5	Vertical Flat Bar 1.00 x 87.50	12 GA SHT 316L S.S	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8475-6	Perforated Sheet 22.38 x 76.75	C8478	3	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8475-7	Perforated Sheet 18.27 x 76.75	A9399	1	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
D8524	D8524-1	End Air Slot	D8473	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
Adsorber Assy	D8524-2	Center Air Slot	D8474	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8524-3	End Air Slot	D8475	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8524-4	Backing Washer 3.50 OD x 2.25 ID	12 GA SHT 316L SS	3	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8524-5	Tubing 8.19 LG	1 1/2 OD x .120 WT 316L SS ASTM A-269	3	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8524-6	Pipe Coupling Threaded	1 1/4 x 3000# 316L SS	3	QL	Yes	
	D8524-7	Closure Plate 31.55 x 84.00	12 GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8524-8	Closure Plate 39.55 x 84.00	12 GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8524-9	Cover Plate 3.50 x 84.00	12 GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
D8525	D8525-1	End Air Slot	D8473	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
Adsorber Assy	D8525-2	Center Air Slot	D8474	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8525-3	End Air Slot	D8475	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8525-4	Backing Washer 3.50 OD x 2.25 ID	12 GA SHT 316L SS	3	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8525-5	Tubing 8.19 LG	1 1/2 OD x .120 WT 316L SS ASTM A-269	3	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8525-6	Pipe Coupling Threaded	1 1/4 x 3000# 316L SS	3	QL	Yes	
	D8525-7	Closure Plate 31.55 x 84.00	12 GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8525-8	Closure Plate 39.55 x 84.00	12 GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
	D8525-9	Cover Plate 3.50 x 84.00	12 GA SHT 316L SS	2	CM	No	Does not function to contain melter offgas. This part forms part of the carbon media screen
D8526	D8526-1	Adsorber Assy LAW Unit B	D8524	1	QL	Yes	
Housing Wldmt	D8526-2	Front Panel Assy LAW Unit B	D8529	1	QL	Yes	
	D8526-3	Back Panel Assy LAW Unit B	D8530	1	QL	Yes	
	D8526-4	Top Panel Assy LAW Unit B	D8531	1	QL	Yes	
	D8526-5	Bottom Panel Assy LAW Unit A/B	D8532	1	QL	Yes	
	D8526-6	Outlet End Panel Assy LAW Unit B	D8533	1	QL	Yes	
	D8526-7	Inlet End Panel Assy LAW Unit A/B	D8534	1	QL	Yes	
	D8526-8						
	D8526-9						

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8526-10	Thermowell Assy 69"	B8598-1	2	QL	Yes	
	D8526-11	Thermowell Assy 27"	B8598-2	2	QL	Yes	
	D8526-12	Filter Rack Assy	D8581	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8526-13	Lifting Lug	B8218	4	CM	No	Does not function to contain melter offgas. Lifting lugs do not form part of the pressure boundary and are only used to handle the housings for transportation and installation.
	D8526-14	Bracket .62 x 3.00	12 GA SHT 316L SS ASTM A-240	A/R	CM	No	Does not function to contain melter offgas. Used to help support the carbon media thermowells.
	D8526-15	Pipe 10.75 LG TOE	1/2 SCH 40 316L SS ASTM A 312	6	QL	Yes	
	D8526-16	Pipe 10.50 LG TOE	2 SCH 40 316L SS ASTM A-312	2	QL	Yes	
	D8526-17						
	D8526-18	Pipe 20.81 LG	2 SCH 40 316L SS ASTM A-312	1	QL	Yes	
	D8526-19						
	D8526-20	90 DEG Elbow LR BW	2 SCH 40 316L SS ASTM A-403	1	QL	Yes	
	D8526-21	Slip-On Flange	1-1/2 x 150# 316L SS ASTM A-182	2	QL	Yes	
	D8526-22	Weld Neck Flange	2 x 150# 316L SS ASTM-182	1	QL	Yes	
	D8526-23	Pipe 24.81 LG	3 SCH 40 316L SS ASTM A-312	1	QL	Yes	
	D8526-24						
	D8526-25	Weld Neck Flange	3 x 150# 316L SS ASTM A-182	1	QL	Yes	
	D8526-26	Washer 3.9 OD x 1.9 ID	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D8526-27	Pipe 10.70 LG TOE	1-1/2 SCH 40 316L SS ASTM A-312	2	QL	Yes	
D8527 Housing Wldmt	D8527-1	Adsorber Assy LAW Unit A	D8524	1	QL	Yes	
	D8527-2	Front Panel Assy LAW Unit A	D8529	1	QL	Yes	
	D8527-3	Back Panel Assy LAW Unit A	D8530	1	QL	Yes	
	D8527-4	Top Panel Assy LAW Unit A	D8531	1	QL	Yes	
	D8527-5	Bottom Panel Assy LAW Unit A/B	D8532	1	QL	Yes	
	D8527-6	Outlet End Panel Assy LAW Unit A	D8533	1	QL	Yes	
	D8527-7	Inlet End Panel Assy LAW Unit A/B	D8534	1	QL	Yes	
	D8527-8						
	D8527-9						
	D8527-10	Thermowell Assy 69"	B8598-1	2	QL	Yes	
	D8527-11	Thermowell Assy 27"	B8598-2	2	QL	Yes	
	D8527-12	Filter Rack Assy	D8581	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8527-13	Lifting Lug	B8218	4	CM	No	Does not function to contain melter offgas. Lifting lugs do not form part of the pressure boundary and are only used to handle the housings for transportation and installation.
	D8527-14	Bracket .62 x 3.00	12 GA SHT 316L SS ASTM A-240	A/R	CM	No	Does not function to contain melter offgas. Used to help support the carbon media thermowells.
	D8527-15	Pipe 10.75 LG TOE	1/2 SCH 40 316L SS ASTM A-312	6	QL	Yes	
	D8527-16	Pipe 10.50 LG TOE	2 SCH 40 316L SS ASTM A-312	2	QL	Yes	
	D8527-17						
	D8527-18	Pipe 20.81 LG	2 SCH 40 316L SS ASTM A-312	1	QL	Yes	
	D8527-19						
	D8527-20	90 DEG Elbow LR BW	2 SCH 40 316L SS ASTM A-403	1	QL	Yes	
	D8527-21	Slip-On Flange	1-1/2 x 150# 316L SS ASTM A-182	2	QL	Yes	
	D8527-22	Weld Neck Flange	2 x 150# 316L SS ASTM-182	1	QL	Yes	
	D8527-23	Pipe 24.81 LG	3 SCH 40 316L SS ASTM A-312	1	QL	Yes	
	D8527-24			1			
	D8527-25	Weld Neck Flange	3 x 150# 316L SS ASTM A-182	1	QL	Yes	
	D8527-26	Washer 3.8 OD x 1.9 ID	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D8527-27	Pipe 10.75 LG TOE	1-1/2 SCH 40 316L SS ASTM A-312	2	QL	Yes	
D8529 Front Panel Assy	D8529-1	Plate 36.5 x 90.75	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8529-2	Plate 96.00 x 117.75	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8529-3	Plate 5.00 x 111.50	1/4 PL 316L SS ASTM A-240	2	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D6529-4	Plate 5.00 x 90.00	1/4 PL 316L SS ASTM A-240	8	QL	Yes	
	D6529-5	Plate 5.00 x 40.62	1/4 PL 316L SS ASTM A-240	2	QL	Yes	
	D6529-6	Plate 5.00 x 33.50	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D6529-7	S-Beam 120.50 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D6529-8	S-Beam 87.75 LG	S8 x 18.4# CS ASTM A-36	8	QL	Yes	
	D6529-9	S-Beam 32.81 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D6529-10	S-Beam 24.25 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D6529-11	Pipe 10.12 LG	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D6529-12	Re-Bar 18"	D6538-17 (A9357)	4	QL	Yes	
	D6529-13	Gusset	D6538-5 (A9358)	4	QL	Yes	
	D6529-14	Gusset	D6538-7 (A9359)	1	QL	Yes	
	D6529-15	Gusset	D6538-9 (A9360)	1	QL	Yes	
	D6529-16	Pad w/ Holes	D6538-3 (A9361)	3	QL	Yes	
	D6529-17	Pad	D6538-4 (A9362)	5	QL	Yes	
	D6529-18	Weld Neck Flange	18 x 150# 316L SS ASTM A-182	4	QL	Yes	
	D6529-19	Plate 46.0 x 90.75	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D6529-20	Pad w/ Holes	D6538-1 (A9384)	5	QL	Yes	
	D6529-21	Pad	D6538-2 (A9383)	4	QL	Yes	
	D6529-22	Plate 6.0 x 4.81	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
D6530 Back Panel Assy	D6530-1	Plate 90.75 x 228.80	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D6530-2	Plate 27.00 x 46.75	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D6530-3	Plate 5.00 x 111.50	1/4 PL 316L SS ASTM A-240	2	QL	Yes	
	D6530-4	Plate 5.00 x 90.00	1/4 PL 316L SS ASTM A-240	8	QL	Yes	
	D6530-5	Plate 5.00 x 90.31	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D6530-6	Plate 5.00 x 63.31	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D6530-7	Plate 5.00 x 1.31	1/4 PL 316L SS ASTM A-240	2	QL	Yes	
	D6530-8	Plate 5.00 x 8.50	1/4 PL 316L SS ASTM A-240	4	QL	Yes	
	D6530-9	S-Beam 120.50 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D6530-10	S-Beam 97.75 LG	S8 x 18.4# CS ASTM A-36	8	QL	Yes	
	D6530-11	S-Beam 99.50 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D6530-12	S-Beam 72.50 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D6530-13	S-Beam 4.50 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D6530-14	Cylinder 16" ID	D6538-15 (A9381)	2	QL	Yes	
	D6530-15	Re-Bar 16"	D6538-16 (A9382)	2	QL	Yes	
	D6530-16	Pad w/ Holes	D6538-3 (A9362)	3	QL	Yes	
	D6530-17	Pad	D6538-4 (A9361)	5	QL	Yes	
	D6530-18	Flange	D6538-13 (A9385)	2	QL	Yes	
	D6530-19	Pad w/ Holes	D6538-1 (A9384)	5	QL	Yes	
	D6530-20	Pad	D6538-2 (A9363)	4	QL	Yes	
D6531 Top Panel Assy	D6531-1	Plate 80.00 x 154.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D6531-2	Plate 48.75 x 80.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D6531-3	Plate 24.75 x 80.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D6531-4	Plate 6.75 x 80.00	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D6531-5	Plate 5.00 x 78.50	1/4 PL 316L SS ASTM A-240	10	QL	Yes	
	D6531-6	Plate 5.00 x 20.88	1/4 PL 316L SS ASTM A-240	2	QL	Yes	
	D6531-7	Plate 5.00 x 15.75	1/4 PL 316L SS ASTM A-240	4	QL	Yes	
	D6531-8	Plate 5.00 x 8.50	1/4 PL 316L SS ASTM A-240	8	QL	Yes	
	D6531-9	S-Beam 81.50 LG	S8 x 18.4# CS ASTM A-36	9	QL	Yes	
	D6531-10	S-Beam 80.75 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D6531-11	S-Beam 20.88 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D6531-12	S-Beam 15.75 LG	S8 x 18.4# CS ASTM A-36	4	QL	Yes	
	D6531-13	Pipe 12.50 LG	8 SCH 10 316L SS ASTM A-312	10	QL	Yes	
	D6531-14	Re-Bar 8"	D6538-18 (A9820)	10	QL	Yes	
	D6531-15	Slip-On Flange	6 x 150# 316L SS ASTM A-182	10	QL	Yes	
D6532 Bottom Panel Assy	D6532-1	Plate 25.25 82.50	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D6532-2	Plate 9.25 154.00	1/2 PL 316L SS ASTM A-240	4	QL	Yes	
	D6532-3	Plate 3.88 x 154.00	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D6532-4	Plate 50.00 x 82.50	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D6532-5	Plate 21.19 x 60.57	1/2 PL 316L SS ASTM A-240	12	QL	Yes	
	D6532-6	Plate 27.65 x 30.06	1/2 PL 316L SS ASTM A-240	12	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8532-7	Plate 9.50 x 9.50	1/2 PL 316L SS ASTM A-240	8	QL	Yes	
	D8532-8	Plate 27.00 x 82.50	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8532-9	Plate 5.00 x 82.50	1/4 PL 316L SS ASTM A-240	3	QL	Yes	
	D8532-10	S-Beam 87.50 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D8532-11	S-Beam 82.50 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D8532-12	Slide Gate Assy	D8563	8	QL	Yes	
D8533 Outlet End Panel Assy	D8533-1	Plate 80.00 x 111.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8533-2	Plate 5.00 x 109.50	1/4 PL 316L SS ASTM A-240	4	QL	Yes	
	D8533-3	S-Beam 111.00 LG	S8 x 18.4# CS ASTM A-36	4	QL	Yes	
	D8533-4	Bag-Out Flange	D8538-10	6	QL	Yes	
	D8533-5	Door Flange	D8538-11	6	QL	Yes	
	D8533-6	Re-Bar Flange	D8538-12	6	QL	Yes	
	D8533-7	Round Bar cut to length at assy	1/4 DIA RD BAR 316L SS ASTM A-276 or ASTM A-479	12	QL	Yes	
	D8533-8	Hex HD Bolt 1.75 LG	1/2-13UNC 316 SS ASTM A-193	36	QL	Yes	
	D8533-9	Pad w/ Holes	D8538-1 (A9384)	2	QL	Yes	
	D8533-10	Pad	D8538-2 (A9383)	8	QL	Yes	
D8534 Inlet End Panel Assy	D8534-1	Plate 80.00 x 84.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8534-2	Plate 5.00 x 82.50	1/4 PL 316L SS ASTM A-240	4	QL	Yes	
	D8534-3	S-Beam 84.00 LG	S8 x 18.4# CS ASTM A-36	4	QL	Yes	
	D8534-4	Pad w/ Holes	D8538-1 (A9384)	2	QL	Yes	
	D8534-5	Pad	D8538-2 (A9383)	6	QL	Yes	
D8535 Front Panel Assy	D8535-1	Plate 96.00 x 117.75	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8535-2	Plate 48.00 x 90.75	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D8535-3	Plate 5.00 x 111.50	1/4 PL 316L SS ASTM A-240	2	QL	Yes	
	D8535-4	Plate 5.00 x 90.00	1/4 PL 316L SS ASTM A-240	8	QL	Yes	
	D8535-5	Plate 5.00 x 80.50	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D8535-6	Plate 5.00 x 33.50	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D8535-7	Plate 5.00 x 11.62	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D8535-8	S-Beam 120.50 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D8535-9	S-Beam 97.75 LG	S8 x 18.4# CS ASTM A-36	8	QL	Yes	
	D8535-10	S-Beam 61.88 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D8535-11	S-Beam 26.12 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D8535-12	Pipe 10.12 LG	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8535-13	Re-Bar 18"	D8538-17 (A9357)	4	QL	Yes	
	D8535-14	Gusset	D8538-8 (A9576)	2	QL	Yes	
	D8535-15	Gusset	D8538-5 (A9358)	1	QL	Yes	
	D8535-16	Gusset	D8538-8 (A9577)	1	QL	Yes	
	D8535-17	Pad w/ Holes	D8538-3 (A9382)	3	QL	Yes	
	D8535-18	Pad	D8538-4 (A9381)	5	QL	Yes	
	D8535-19	Weld Neck Flange	18 x 150# 316L SS ASTM A-182	4	QL	Yes	
	D8535-20	Plate 38.50 x 90.75	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8535-21	Pad w/ Holes	D8538-1 (A9384)	5	QL	Yes	
	D8535-22	Pad	D8538-2 (A9383)	4	QL	Yes	
	D8535-23	Plate 5.00 x 7.45	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
D8536 Back Panel Assy	D8536-1	Plate 96.00 x 117.75	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8536-2	Plate 48.00 x 90.75	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8536-3	Plate 5.00 x 111.50	1/4 PL 316L SS ASTM A-240	2	QL	Yes	
	D8536-4	Plate 5.00 x 90.31	1/4 PL 316L SS ASTM A-240	8	QL	Yes	
	D8536-5	Plate 5.00 x 90.00	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D8536-6	Plate 5.00 x 63.31	1/4 PL 316L SS ASTM A-240	1	QL	Yes	
	D8536-7	Plate 5.00 x 1.31	1/4 PL 316L SS ASTM A-240	2	QL	Yes	
	D8536-8	Plate 5.00 x 8.60	1/4 PL 316L SS ASTM A-240	4	QL	Yes	
	D8536-9	S-Beam 120.50 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D8536-10	S-Beam 97.75 LG	S8 x 18.4# CS ASTM A-36	8	QL	Yes	
	D8536-11	S-Beam 99.50 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D8536-12	S-Beam 72.50 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D8536-13	S-Beam 4.50 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D8536-14	Cylinder 18" ID	D8538-15 (A9381)	2	QL	Yes	
	D8536-15	Re-Bar 18"	D8538-16 (A9382)	2	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8536-16	Pad w/ Holes	D8538-3 (A9382)	5	QL	Yes	
	D8536-17	Pad	D8538-4 (A9381)	5	QL	Yes	
	D8536-18	Flange	D8538-13 (A9385)	2	QL	Yes	
	D8536-19	Plate 45.00 x 90.75	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8536-20	Plate 38.50 x 90.75	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8536-21	Pad w/ Holes	D8538-1 (A9384)	5	QL	Yes	
	D8536-22	Pad	D8538-2 (A9383)	4	QL	Yes	
D8537 Top Panel Assy	D8537-1	Plate 80.00 x 154.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8537-2	Plate 48.75 x 80.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8537-3	Plate 24.75 x 80.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8537-4	Plate 6.75 x 80.00	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D8537-5	Plate 5.00 x 78.50	1/4 PL 316L SS ASTM A-240	10	QL	Yes	
	D8537-6	Plate 5.00 x 20.88	1/4 PL 316L SS ASTM A-240	2	QL	Yes	
	D8537-7	Plate 5.00 x 15.75	1/4 PL 316L SS ASTM A-240	4	QL	Yes	
	D8537-8	Plate 5.00 x 8.25	1/4 PL 316L SS ASTM A-240	8	QL	Yes	
	D8537-9	S-Beam 81.50 LG	S8 x 18.4# CS ASTM A-36	9	QL	Yes	
	D8537-10	S-Beam 80.75 LG	S8 x 18.4# CS ASTM A-36	1	QL	Yes	
	D8537-11	S-Beam 20.88 LG	S8 x 18.4# CS ASTM A-36	2	QL	Yes	
	D8537-12	S-Beam 15.75 LG	S8 x 18.4# CS ASTM A-36	4	QL	Yes	
	D8537-13	Pipe 12.50 LG	6 SCH 10 316L SS ASTM A-312	10	QL	Yes	
	D8537-14	Re-Bar 6"	D8538-18 (A9820)	10	QL	Yes	
	D8537-15	Slip-On Flange	8 x 150# 316L SS ASTM A-182	10	QL	Yes	
D8538 Miscellaneous Details	D8538-1	Pad w/ Holes 5.00 x 7.50	1/2 PL HRS AST A-36	28	QL	Yes	
	D8538-2	Pad w/o Holes 5.00 x 7.50	1/2 PL HRS AST A-36	40	QL	Yes	
	D8538-3	Pad w/ Holes 6.00 x 8.00	1/2 PL HRS AST A-36	12	QL	Yes	
	D8538-4	Pad w/o Holes 6.00 x 8.00	1/2 PL HRS AST A-36	20	QL	Yes	
	D8538-5	Gusset 7.58 x 7.82	1/2 PL 316L SS ASTM A-240	5	QL	Yes	
	D8538-6	Gusset 8.00 x 10.83	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8538-7	Gusset 4.94 x 5.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8538-8	Gusset 3.19 x 10.88	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D8538-9	Gusset 7.89 x 8.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8538-10	Bag-Out Flange 12.75 x 57.65	3/16 PL 316L SS ASTM A-240	8	QL	Yes	
	D8538-11	Door Flange 74.00 LG	3/4 x 3 RECT BAR 316L SS ASTM A-276 or A-479	6	QL	Yes	
	D8538-12	Re-Bar Flange 74.00 LG	1.25 x 3 RECT BAR 316L SS ASTM A-276 or A-479	6	QL	Yes	
	D8538-13	Manway Flange 21.50 OD x x16.50 ID	3/4 PL 316L SS ASTM A-240	4	QL	Yes	
	D8538-14	Manway Cover 21.50 DIA	1/2 PL 316L SS ASTM A-240	4	QL	Yes	
	D8538-15	Cylinder 16" ID 14.00 x 50.65	3/16 PL 316L SS ASTM A-240	4	QL	Yes	
	D8538-16	Re-Bar 16" 72.00 LG	1 x 2 RECT BAR 316L SS ASTM A-276 or A-479	4	QL	Yes	
	D8538-17	Re-Bar 18" 68.00 LG	1 1/2 x 2 RECT BAR 316L SS ASTM A-276 or A-479	8	QL	Yes	
	D8538-18	Re-Plate 8" 11.00 OD x 8.75 ID	1/2 PL 316L SS ASTM A-240	20	QL	Yes	
D8562 Outlet End Panel Assy	D8562-1	Plate 80.00 x 111.00	1/2 PL 316L SS ASTM A-240	1	QL	Yes	
	D8562-2	Plate 5.00 x 109.50	1/4 PL 316L SS ASTM A-240	4	QL	Yes	
	D8562-3	S-Beam 111.00 LG	S8 x 18.4# CS ASTM A-36	4	QL	Yes	
	D8562-4	Bag-Out Flange	D8538-10 (A9825)	6	QL	Yes	
	D8562-5	Door Flange	D8538-11	6	QL	Yes	
	D8562-6	Re-Bar Flange	D8538-12	6	QL	Yes	
	D8562-7	Round Bar cut to length at assy	1/4 DIA RD BAR 316L SS ASTM A-276 or ASTM A-479	12	QL	Yes	
	D8562-8	Hex HD Bolt 1.75 LG	1/2-13UNC 316 SS ASTM A-193	38	QL	Yes	
	D8562-9	Pad w/ Holes	D8538-1 (A9384)	2	QL	Yes	
	D8562-10	Pad	D8538-2 (A9383)	8	QL	Yes	
D8563 Slide Gate Assy	D8563-1	Pipe 6.75 LG	8 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8563-2	Flange 14.00 x 16.00	1 PL 316L SS ASTM A-240	1	QL	Yes	
	D8563-3	Flange 14.00 x 16.00	1 PL 316L SS ASTM A-240	1	QL	Yes	
	D8563-4	Slide 10.50 x 18.75	7 GA SHT 316L SS ASTM A-240	1	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8583-5	O-Ring 9.25 ID	1/4 DIA SOLID NEOPRENE SHORE A DUROMETER McMASTER-CARR	1	QL	Yes	
	D8583-6	Hex HD Bolt 3.00 LG	3/4-10UNC 316 SS ASTM A-193	8	QL	Yes	
	D8583-7	Hex Nut	3/4-10UNC 316 SS ASTM A-194	8	QL	Yes	
	D8583-8	Lock Washer	3/4 ID 316 SS	8	QL	Yes	
D8581	D8581-1	Plate 19.31 x 47.85	1/4 PL 316L SS ASTM A-240	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
Filter Rack Assy	D8581-2	Plate 10.00 x 47.88	1/4 PL 316L SS ASTM A-240	2	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-3	Plate 8.69 x 47.88	1/4 PL 316L SS ASTM A-240	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-4	Plate 2.00 x 22.00	1/4 PL 316L SS ASTM A-240	3	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-5	Plate notch as shown 1.38 x 22.00	1/4 PL 316L SS ASTM A-240	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-6	Plate 1.38 x 22.00	1/4 PL 316L SS ASTM A-240	2	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-7	Plate 1.00 x 22.00	1/4 PL 316L SS ASTM A-240	3	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-8	Z-Bar 8.19 x 47.50	12 GA SHT 316L SS ASTM A-240	1	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-9	Z-Bar 8.19 x 47.83	12 GA SHT 316L SS ASTM A-240	2	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-10	Z-Bar 6.69 x 47.83	12 GA SHT 316L SS ASTM A-240	3	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
	D8581-11	Strip 1.00 x 23.75	20 GA SHT 316L SS ASTM A-240	12	CM	No	Does not function to contain melter offgas. This is the internal rack used to hold the discharge filters.
D8582	D8582-1	W-Beam-1 203.25 LG	W8 X 31# HRS ASTM A-36	2	QL	Yes	
Base Frame Assy	D8582-2	W-Beam-2 185.25 LG	W8 X 31# HRS ASTM A-36	2	QL	Yes	
	D8582-3	W-Beam-3 51.75 LG	W8 X 31# HRS ASTM A-36	10	QL	Yes	
	D8582-4	I-Beam-1 97.50 LG	S8 x 18.4# CS ASTM A-36	4	QL	Yes	
	D8582-5	I-Beam-2 81.50 LG	S8 x 18.4# CS ASTM A-36	4	QL	Yes	
	D8582-6	S-Beam 174.75 LG	S6 X 1.73# HRS ASTM A-36	2	QL	Yes	
	D8582-7	Plate-1 12.00 x 12.00	1.0 PL HRS ASTM A-36	10	QL	Yes	
	D8582-8	Plate-2 8.00 x 8.00	3/4 PL HRS ASTM A-36	4	QL	Yes	
	D8582-9	Plate-3 2.00 x 174.75	1/2 PL 316L SS ASTM A-240	2	QL	Yes	
	D8582-10	Hex HD Bolt 2.50 LG	3/4-10UNC 316 SS ASTM A-193	8	QL	Yes	
	D8582-11	Hex Nut	3/4-10UNC 316 SS ASTM A-194	8	QL	Yes	
	D8582-12	Lock Washer	3/4 ID 316 SS	8	QL	Yes	
D8583	D8583-1	Channel 19.75 x 97.50	3/16 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
Platform Assy	D8583-2	Channel 18.25 x 97.50	3/16 PL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-3	Channel 8.00 x 250.31	3/16 PL HRS ASTM A-36	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-4	Pipe 169.03 LG	1 1/2 SCH 40 CS ASTM A-53	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8583-5	Pipe 19.53 LG	1 1/2 SCH 40 CS ASTM A-53	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-6	Pipe 80.03 LG	1 1/2 SCH 40 CS ASTM A-53	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-7	Pipe 252.90 LG	1 1/2 SCH 40 CS ASTM A-53	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-8	Pipe 19.53 LG	1 1/2 SCH 40 CS ASTM A-53	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-9	Pipe 80.03 LG	1 1/2 SCH 40 CS ASTM A-53	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-10	Pipe 252.90 LG	1 1/2 SCH 40 CS ASTM A-53	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-11	Pipe 40.50 LG	1 1/2 SCH 40 CS ASTM A-53	10	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-12	Pipe 40.50 LG	1 1/2 SCH 40 CS ASTM A-53	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-13	Pipe 41.88 LG	1 1/2 SCH 40 CS ASTM A-53	12	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-14	Pipe 16.50 LG	1 1/2 SCH 40 CS ASTM A-53	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-15	Pipe 40.50 LG	1 1/2 SCH 40 CS ASTM A-53	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-16	Pipe 57.10 LG	1 1/2 SCH 40 CS ASTM A-53	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8583-17	Pipe 61.72 LG	1 1/2 SCH 40 CS ASTM A-53	12	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing
	D8583-18	Square Tube 91.50 LG	3 x 3 x 3/16 WT HRS ASTM A-500 GR B	8	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-19	Square Tube 134.00 LG	3 x 3 x 3/16 WT HRS ASTM A-500 GR B	8	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-20	Angle 91.50 LG	1 1/2 x 1 1/2 x 3/16 ANGLE HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-21	Angle 134.00 LG	1 1/2 x 1 1/2 x 3/16 ANGLE HRS ASTM A-36	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-22	Plate 2.81 x 19.38	3/16 PL 316L SS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-23	Plate 2.81 x 5.62	3/16 PL 316L SS ASTM A-36	12	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-24	Plate 3.00 x 6.00	1/4 PL HRS ASTM A-36	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing
	D8583-25	Chain 28.00 LG	3/16 304L SS McMASTER-CARR	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-26	Chain 62.50 LG	3/16 304L SS McMASTER-CARR	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-27	Hook 3.00 LG	1/4 DIA BAR HRS ASTM A-36	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing
	D8583-28	Flat Bar 11.50 LG	3/16 X 2 FL HRS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8583-29	Flat Bar 120.00 LG	3/16 X 2 FL HRS ASTM A-36	8	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-30	Bracket 2.25 LG	1/4 x 4 FL HRS ASTM A-36	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-31	Flat Bar 251.00 LG	1/4 x 4 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-32	Flat Bar 167.12 LG	1/4 x 4 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-33	Flat Bar 58.12 LG	1/4 x 4 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-34	Flat Bar 17.62 LG	1/4 x 4 FL HRS ASTM A-36	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-35	Grating 29.88 WD x 63.3 LG	1 1/2 x 3/16 BEARING BAR 19-W-4 MIL-G 18014	6	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-36	Grating 29.88 WD x 105.0 LG	1 1/2 x 3/16 BEARING BAR 19-W-4 MIL-G 18014	3	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-37	Grating 32.25 WD x 20.5 LG	1 1/2 x 3/16 BEARING BAR 19-W-4 MIL-G 18014	16	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-38	Grating 32.25 WD x 18.0 LG	1 1/2 x 3/16 BEARING BAR 19-W-4 MIL-G 18014	8	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-39	Hex HD Bolt 1.50 LG	1/2-13UNC 316 SS ASTM A-194	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8583-40	Hex Nut	1/2-13UNC 316 SS ASTM A-193	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8583-41	Lock Washer	1/2 ID 316 SS	4	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing
D8585 Piping Assy 18"	D8585-1	Weld Neck Flange	18 x 150# 316L SS ASTM A-182	20	QL	Yes	
	D8585-2	Bellows Assy 18 OD x OAL BW Ends	2904100-053	4	QL	Yes	
	D8585-3	Butterfly Valve w/ Pneumatic Actuator	2904100-036 2904100-037	2	QL	Yes	
	D8585-4	Straight Tee BW	18 SCH 10 316L SS ASTM A-312	2	QL	Yes	
	D8585-5	Pipe 5.75 LG TOE	1/2 SCH 40 316L SS ASTM A-312	8	QL	Yes	
	D8585-6	Pipe 14.75 LG TOE	1/2 SCH 40 316L SS ASTM A-312	5	QL	Yes	
	D8585-7	90 DEG Elbow SR BW	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8585-8	18 SCH 10 Pipe	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8585-9	18 SCH 10 Pipe	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8585-10	18 SCH 10 Pipe	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8585-11	Solenoid Valve 1/2"	2904100-023	10	QL	No	
	D8585-12	Temperature Element	2904100-032	3	QL	No	
	D8585-13	Ball Valve	1/2" 316 SS W/ TEFLON SEAL PROTECH	2	QL	Yes	
	D8585-14	Hex Head Bolt 3.0 LG	1 1/8-7UNC 316 SS ASTM A-193	160	QL	Yes	
	D8585-15	Flat washer 1 1/8 ID	316 SS	192	QL	Yes	
	D8585-16	Thermowell Assy	B8598-3	3	QL	Yes	
	D8585-17	90 DEG Elbow LR BW	18 SCH 10 316L SS ASTM A-312	6	QL	Yes	
	D8585-18	Butterfly Valve w/ Manual Actuator	2904100-036 2904100-037	4	QL	Yes	
	D8585-19	18 SCH 10 Pipe	18 SCH 10 316L SS ASTM A-312	2	QL	Yes	
	D8585-20	Pipe 8.19 LG	2 SCH 40 316L SS ASTM A-312	1	QL	Yes	
	D8585-21	Weld Neck Flange	2 x 150# 316L SS ASTM-182	1	QL	Yes	
	D8585-22	18 SCH 10 Pipe	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8585-23	18 SCH 10 Pipe	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8585-24	18 SCH 10 Pipe	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8585-25	18 SCH 10 Pipe	18 SCH 10 316L SS ASTM A-312	1	QL	Yes	
	D8585-26	Hex Head Bolt 5.0 LG	1 1/8-7UNC 316 SS ASTM A-193	16	QL	Yes	
	D8585-27	Hex Head Nut	1 1/8-7UNC 316 SS ASTM A-193	16	QL	Yes	
	D8585-28	Solenoid Valve 1/2"	2904100-023	1	QL	No	
D8586 Piping Assy 2"	D8586-1	Pipe cut at assy	2 SCH 40 316L SS ASTM A-312	60 ft	QL	Yes	
	D8586-2	Weld Neck Flange	2 x 150# 316L SS ASTM-182	7	QL	Yes	
	D8586-3	90 DEG Elbow	2 SCH 40 316L SS ASTM A-182	7	QL	Yes	
	D8586-4	Tee BW	2 SCH 40 316L SS ASTM A-182	1	QL	Yes	
	D8586-5	Gasket 2.12 ID x 3.62 OD	1/8 THK COMMERCIAL GRADE VITON RUBBER	7	QL	Yes	
	D8586-6	Rupture Disc 2" Pipe Size 15 PSI	McMASTER-CARR	2	QL	Yes	
	D8586-7	Hex HD Bolt 2.50 LG	5/8-11UNC 316 SS ASTM A-193	12	QL	Yes	
	D8586-8	Hex HD Bolt 3.00 LG	5/8-11UNC 316 SS ASTM A-193	8	QL	Yes	
	D8586-9	Hex Nut	5/8-11UNC 316 SS ASTM A-194	20	QL	Yes	
D8588	D8588-1	Flat Bar 159.3 LG	1/2 x 2 1/2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing
Ladder Assy	D8588-2	Flat Bar 35.5 LG	1/2 x 2 1/2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing
	D8588-3	Flat Bar 5.5 LG	1/2 x 2 1/2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8588-4	Flat Bar 10.25 LG	1/4 x 2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8588-5	Ladder Rung 17.00 LG	3/4 RD BAR ASTM A-36	14	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8588-6	Flat Bar 13.08 LG	1/4 x 2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8588-7	Flat Bar 8.00 LG	1/4 x 2 FL HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing
	D8588-8	Antislip Tape 2 WD x 15 LG	McMASTER-CARR	14	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
D8589 Housing Assy	D8589-1	Housing Wldmt Unit A	D8527	1	QL	Yes	
	D8589-2	Manway Cover	D8538-14	2	QL	Yes	
	D8589-3	Slide Gate Assy	D8563	6	QL	Yes	
	D8589-4	Access Door Discharge Filter	D8224	3	QL	Yes	
	D8589-5	Carbon Sample Plug Assy	B8587	3	QL	Yes	
	Deleted						
	D8589-7	Blind Flange Modified	8 x 150# 316L SS ASTM A-182	3	QL	Yes	
	D8589-8	Blind Flange	8 x 150# 316L SS ASTM A-182	7	QL	Yes	
	D8589-9	Pipe Plug Hex Threaded	1 1/4 x 3000# 316L SS	3	QL	Yes	
	D8589-10	Pipe Coupling Threaded	1 1/4 x 3000# 316L SS	3	QL	Yes	
	D8589-11	Temperature Element 27"	2904100-046	2	CM	No	Only the two inlet temperature elements and transmitter have been specifed ITS. Mid bed temperature elements and transmitters are commercial.
	D8589-12	Temperature Element 69"	2904100-048	2	CM	No	Only the two inlet temperature elements and transmitter have been specifed ITS. Mid bed temperature elements and transmitters are commercial.
	D8589-13	Blind Flange	1 1/2 x 150# 316L SS ASTM A-182	2	QL	Yes	
	D8589-14	Solenoid Valve 1/2"	2904100-023	1	QL	No	
	D8589-15	Manual Valve 1/2"	2904100-019	4	QL	Yes	
	D8589-16	Ball Valve 2"	1/2" 316 SS W/ TEFLON SEAL PROTECH	2	QL	Yes	
	D8589 17	Gasket B/O Door 4.75 x 25.00 ID Vulcanized Corners.	1/2 THK x 1 WD COMMERCIAL GRADE VITON RUBBER	12 ft	QL	Yes	
	D8589 18	Gasket 8" Flange 8.62 ID x 10.62 OD	1/8 THK COMMERCIAL GRADE VITON RUBBER	10	QL	Yes	
	D8589-19	Gasket Manway 16.5 ID x 18 5 OD	1/8 THK COMMERCIAL GRADE VITON RUBBER	2	QL	Yes	
	D8589-20	Hex Nut	1/2-13UNC 316 SS ASTM A-194	36	QL	Yes	
	D8589-21	Hex Nut	3/4-10UNC 316 SS ASTM A-194	112	QL	Yes	
	D8589-22	Hex HD Bolt 2.50 LG	3/4-10UNC 316 SS ASTM A-193	32	QL	Yes	
	D8589-23	Hex HD Bolt 3.50 LG	3/4-10UNC 316 SS ASTM A-193	80	QL	Yes	
	D8589-24	Flat Washer	1/2 ID 316 SS	36	QL	Yes	
	D8589-25	Flat Washer	3/4 ID 316 SS	112	QL	Yes	
	D8589-27	Inlt Pipe Support	D8580	1	QL	Yes	
	D8589-28	Pipe Support	D8861	2	QL	Yes	
D8590 Housing Assy	D8590-1	Housing Wldmt Unit B	D8528	1	QL	Yes	
	D8590-2	Manway Cover	D8538-14	2	QL	Yes	
	D8590-3	Slide Gate Assy	D8563	6	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8590-4	Access Door Discharge Filter	D6224		QL	Yes	
	D8590-5	Carbon Sample Plug Assy	B8597	3	QL	Yes	
	Deleted						
	D8590-7	Blind Flange Modified	6 x 150# 316L SS ASTM A-182	3	QL	Yes	
	D8590-8	Blind Flange	8 x 150# 316L SS ASTM A-182	7	QL	Yes	
	D8590-9	Pipe Plug Hex Threaded	1 1/4 x 150# 316L SS	3	QL	Yes	
	D8590-10	Pipe Coupling Threaded	1 1/4 x 3000# 316L SS	3	QL	Yes	
	D8590-11	Tempature Element 27"	2904100-046	2	CM	No	Only the two inlet temperature elements and transmitter have been specifed ITS. Mid bed temperature elements and transmitters are commercial.
	D8590-12	Tempature Element 69"	2904100-046	2	CM	No	Only the two inlet temperature elements and transmitter have been specifed ITS. Mid bed temperature elements and transmitters are commercial.
	D8590-13	Blind Flange	1 1/2 x 150# 316L SS ASTM A 182	2	QL	Yes	
	D8590-14	Solenoid Valve 1/2"	2904100-023	1	QL	No	
	D8590-15	Manual Valve 1/2"	2904100-019	4	QL	Yes	
	D8590-16	Ball Valve 2"	1/2" 316 SS W/ TEFLON SEAL PROTECH	2	QL	Yes	
	D8590-17	Gasket B/O Door	VITON	12 ft	QL	Yes	
	D8590-18	Gasket 8" Flange	SPIRAL WOUND GRAPHIC, 316 SS	10	QL	Yes	
	D8590-19	Gasket Manway	VITON	2	QL	Yes	
	D8590-20	Hex Nut	1/2-13UNC 316 SS ASTM A-194	38	QL	Yes	
	D8590-21	Hex Nut	3/4-10UNC 316 SS ASTM A-194	112	QL	Yes	
	D8590-22	Hex HD Bolt 2.50 LG	3/4-10UNC 316 SS ASTM A-193	32	QL	Yes	
	D8590-23	Hex HD Bolt 3.50 LG	3/4-10UNC 316 SS ASTM A-193	80	QL	Yes	
	D8590-24	flat Washer	1/2 ID 316 SS	36	QL	Yes	
	D8590-25	Flat Washer	3/4 ID 316 SS	112	QL	Yes	
	Deleted						
	D8590-27	Pipe Support	D8661	3	QL	Yes	
D8594 Final Assy	D8594-1	Base Frame Assy LVP-ADBR-00001 Unit A/B	D8582	1	QL	Yes	
	D8594-2	Housing Assy LVP-ADBR-00001 Unit A/B	D8589	1	QL	Yes	
	D8594-3	Housing Assy LVP-ADBR-00001 Unit B	D8590	1	QL	Yes	
	D8594-4	Platform Assy LVP-ADBR-00001 Unit A/B	D8583	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance platform are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8594-5	Ladder Assy LVP-ADBR-00001 Unit A/B	D8586	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the maintenance ladder are external to the pressure boundary and are not used to support the carbon bed adsorber housing
	D8594-6	Crane Trolley Assy LVP-ADBR-00001 Unit A/B	D8601	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8594-7	Inlet Pipe Assy LVP-ADBR-00001 Unit A/B	D8585-1	1	QL	Yes	
	D8594-8	Crossover Pipe Assy LVP-ADBR-00001 Unit A/B	D8585-2	1	QL	Yes	
	D8594-9	Outlet Pipe Assy LVP-ADBR-00001 Unit A/B	D8585-3	1	QL	Yes	
	D8594-10	Crossover Pipe Assy LVP-ADBR-00001 Unit A/B	D8585-4	1	QL	Yes	
	D8594-11	Pipe Assy LVP-ADBR-00001 Unit A/B	D8588	1	QL	Yes	
	D8594-12	Spacer 1/4 THK 6.0 x 6.0	ALUMINA SILICATE CERAMIC McMASTER-CARR	20	QL	Yes	
	D8594-13	Spacer 1/4 THK 3.0 x 6.0	ALUMINA SILICATE CERAMIC McMASTER-CARR	20	QL	Yes	
	D8594-14	Gasket 2"	SPIRAL WOUND GRAPHIC, 316 SS	10	QL	Yes	
	D8594-15	Gasket 18"	SPIRAL WOUND GRAPHIC, 316 SS	20	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8594-16	Hex HD Bolt 5.00 LG	1 1/8-7UNC 316 SS ASTM A-193	96	QL	Yes	
	D8594-17	Hex HD Bolt 3.00 LG	1 1/8-7UNC 316 SS ASTM A-193	32	QL	Yes	
	D8594-18	Hex Nut	1 1/8-7UNC 316 SS ASTM A-193	96	QL	Yes	
	D8594-19	Hex HD Bolt 2.50 LG	5/8-11UNC 316 SS ASTM A-193	4	QL	Yes	
	D8594-20	Hex HD Bolt 3.00 LG	5/8-11UNC 316 SS ASTM A-193	8	QL	Yes	
	D8594-21	Hex Nut	5/8-11UNC 316 SS ASTM A-194	12	QL	Yes	
	D8594-22	Hex HD Bolt 1.50 LG	3/4-10UNC 316 SS ASTM A-193	16	QL	Yes	
	D8594-23	Hex HD Bolt 2.00 LG	3/4-10UNC 316 SS ASTM A-193	80	QL	Yes	
	D8594-24	Hex Nut	3/4-10UNC 316 SS ASTM A-194	96	QL	Yes	
	D8594-25	Lock Washer	1/2 ID 316 SS	96	QL	Yes	
	D8594-26	Flat Washer	1/2 ID x 1.25 OD 316 SS	160	QL	Yes	
	D8594-27	Insulation	CALCIUM-SILICATE THERMO-12 R GOLD INDUSTRIAL INSULATION GROUP / JOHNS MANVILLE	1200 cu ft	N/A	N/A	Supplied by others
	D8594-28	High Temperature Adhesive	CALBOND R GOLD HIGH TEMP ADHESIVE INDUSTRIAL INSULATION GROUP / JOHNS MANVILLE	A/R	N/A	N/A	Supplied by others
	D8594-29	Sealing Caulk	PERMATEX I-TEMP RED RTV	A/R	N/A	N/A	Supplied by others
	D8594-30	Hex HD Bolt 2.50 LG	3/4-10UNC 316 SS ASTM A-193	8	QL	Yes	
	D8594-31	Hex Nut	3/4-10UNC 316 SS ASTM A-194	8	QL	Yes	
	D8594-32	Lock Washer	3/4 ID 316 SS	8	QL	Yes	
D8601	D8601-1	I-Beam 25'-0" LG	8 x 18.4# HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
Crane Trolley Assy	D8601-2	I-Beam 23'-6" LG	8 x 18.4# HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-3	Angle 4.00 LG	2 x 2 x 1/4 ANGLE HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-4				CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-5	Plate 4.00 x 8.00	1/4 PL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-6	Hex HD Bolt 2.00 LG	1/2-13UNC GR 8 PL STL	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-7	Hex Nut	1/2-13UNC GR 8 PL STL	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-8	Lock Washer	1/2 NOM ID GR 8 PL STL	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-9	Electric Hoist 2000# Cap 25ft Lift @ 16ft/MIN Push Trolley Mounted	McMASTER-CARR	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
D8660	D8660-1	S-Beam 40.50 LG	S6 x 12.5# HRS ASTM A-36	1	QL	Yes	

Drawing Number	Item No.	Description	Material or Vendor	QTY	QL/CM	CGD	COMMENTS
	D8594-16	Hex HD Bolt 5.00 LG	1 1/8-7UNC 316 SS ASTM A-193	96	QL	Yes	
	D8594-17	Hex HD Bolt 3.00 LG	1 1/8-7UNC 316 SS ASTM A-193	32	QL	Yes	
	D8594-18	Hex Nut	1 1/8-7UNC 316 SS ASTM A-193	96	QL	Yes	
	D8594-19	Hex HD Bolt 2.50 LG	5/8-11UNC 316 SS ASTM A-193	4	QL	Yes	
	D8594-20	Hex HD Bolt 3.00 LG	5/8-11UNC 316 SS ASTM A-193	8	QL	Yes	
	D8594-21	Hex Nut	5/8-11UNC 316 SS ASTM A-194	12	QL	Yes	
	D8594-22	Hex HD Bolt 1.50 LG	3/4-10UNC 316 SS ASTM A-193	16	QL	Yes	
	D8594-23	Hex HD Bolt 2.00 LG	3/4-10UNC 316 SS ASTM A-193	80	QL	Yes	
	D8594-24	Hex Nut	3/4-10UNC 316 SS ASTM A-194	96	QL	Yes	
	D8594-25	Lock Washer	1/2 ID 316 SS	96	QL	Yes	
	D8594-26	Flat Washer	1/2 ID x 1.25 OD 316 SS	160	QL	Yes	
	D8594-27	Insulation	CALCIUM-SILICATE THERMO-12 R GOLD INDUSTRIAL INSULATION GROUP / JOHNS MANVILLE	1200 cuft	N/A	N/A	Supplied by others
	D8594-28	High Temperature Ashesive	CALBOND R GOLD HIGH TEMP ADHESIVE INDUSTRIAL INSULATION GROUP / JOHNS MANVILLE	A/R	N/A	N/A	Supplied by others
	D8594-29	Sealing Caulk	PERMATEX I-TEMP RED RTV	A/R	N/A	N/A	Supplied by others
	D8594-30	Hex HD Bolt 2.50 LG	3/4-10UNC 316 SS ASTM A-193	8	QL	Yes	
	D8594-31	Hex Nut	3/4-10UNC 316 SS ASTM A-194	8	QL	Yes	
	D8594-32	Lock Washer	3/4 ID 316 SS	8	QL	Yes	
D8601	D8601-1	I-Beam 25'-0" LG	8 x 18.4# HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
Crane Trolley Assy	D8601-2	I-Beam 23'-6" LG	8 x 18.4# HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-3	Angle 4.00 LG	2 x 2 x 1/4 ANGLE HRS ASTM A-36	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-4				CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-5	Plate 4.00 x 8.00	1/4 PL HRS ASTM A-36	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-6	Hex HD Bolt 2.00 LG	1/2-13UNC GR 8 PL STL	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-7	Hex Nut	1/2-13UNC GR 8 PL STL	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-8	Lock Washer	1/2 NOM ID GR 8 PL STL	2	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
	D8601-9	Electric Hoist 2000# Cap 25ft Lift @ 16ft/MIN Push Trolley Mounted	McMASTER-CARR	1	CM	No	Does not function to contain melter offgas. Parts and components associated with the crane trolley are external to the pressure boundary and are not used to support the carbon bed adsorber housing.
D8660	D8660-1	S-Beam 40.50 LG	S8 x 12.5# HRS ASTM A-36	1	QL	Yes	

Appendix A

Mandatory Ammonium Nitrate Test Requirements for LAW Carbon Bed Adsorbers

Appendix A
Mandatory Ammonium Nitrate Test Requirements for LAW Carbon Bed Adsorbers

1.0 Purpose

The purpose of appendix A testing is to determine if sufficient amounts of ammonium nitrate can form in the LAW offgas pipeline, in the guard bed, and in the activated carbon bed adsorber media to increase the propagation rate of a bed fire.

2.0 Overview

The potential for ammonia and nitrous oxides to form ammonium nitrate within the LAW carbon bed adsorber media is unknown. A significant accumulation of ammonium nitrate within the bed media has been raised as a fire safety concern. It is postulated that ammonium nitrate may increase the rate a bed fire propagates, potentially modifying the current bed-fire mitigation strategy. It should be noted that VSL carbon bed testing has shown large temperature exotherms resulting from NOx. It may be necessary to condition the carbon media before testing with large NOx concentrations.

3.0 Objectives

1. Test 1 - Determine formation of NH_4NO_3 in the proposed LAW activated carbon adsorber media(s) configuration if the inlet gas contains NO_X and NH_3.
2. Test 2 - Assess the hazards associated with NH_4NO_3 adsorbed in the proposed LAW activated carbon adsorber media(s), (i.e. fire propagation).

4.0 Quality Assurance

Tests shall be performed in accordance with the applicable sections of NQA-1. The Test Plan will include a matrix cross-referencing the QA requirements to implementing procedures for the work, and justifying elements that are not applicable.

5.0 Test Conditions

Each of the tests in the following sections have been formulated to address the test objectives from Section 3.

The activated carbon beds proposed for the LAW off gas systems will operate under the conditions defined in mechanical data sheets. The appropriate media for each test will be selected and described in the Vendor Test Plan. The Test Plan will detail the test conditions and data collection for each test based on the media and operating conditions.

Testing will be done with a bench scale apparatus using air and water for humidity as the bulk gas.

Carbon test beds shall be insulated such that the temperature drop across the beds does not exceed 1.0 °C with dry hot air passing through the test beds at the test temperature.

5.1 Test 1 - Determine NH_4NO_3 formation in the proposed LAW activated carbon adsorption system(s).

a. Test conditions
- Sorbent - By vendor
- Bed residence time – By vendor
- Superficial gas velocity – by vendor
- Inlet HEPA temperature – 50 °C (bounding case in exception with mechanical data sheets)
- Relative humidity – 50 % (bounding case in exception with mechanical data sheets)
- Gas composition:
    a. Bulk gas – Air and water vapor
    b. Other constituents –
        i. Inlet NH_3 concentration - 10 ppm
        ii. Inlet CO concentration - 170 ppm
        iii. Inlet NO concentration - 4000 ppm
        iv. Inlet NO_2 concentration - 4000 ppm
- Inlet gas HEPA filtered to remove particulate ammonium nitrate formed prior to the carbon bed with two AG-1 certified HEPA filters operating in series.
- Eight (8) seconds gas residence time to simulate ammonium nitrate formation, prior to HEPA filtration.
- Residence time from the HEPA filters to the carbon bed is specified as 2.8 seconds.

b. Test duration
- By vendor

c. Data to be obtained
- Inlet and outlet NO, NO_2, NH_3 concentrations.
- Quantity of NH_4NO_3 - accumulated in the pipeline, HEPAs, and bed media at the end of test.
- Temperature profile of bed during loading.

5.2 Test 2 - Perform standard calorimeter test (i.e., ASTM E 1623-04 or equivalent) to measure exotherm of new bed media compared to bed media containing two years of accumulated ammonium nitrate.

5.3 Test 3 - If a substantial quantity of ammonium nitrate or a substantial exotherm is determined, re-run Test 1 and Test 2 with the addition of offgas pre-heat to 70 °C just prior to HEPA filtration.

5.4 Test 4 - If a substantial (>140 °F) temperature change is measured in the bed, re-run Test 1 with 50% of the NO and NO_2 concentrations.

6.0 Success Criteria

1. Quantization of ammonium nitrate formed in-situ on bed media, extrapolated to a two-year bed life.
2. Calorimeter test data of new bed media compared to bed media containing ammonium nitrate accumulated in two-years of bed life.
3. If Test 1 does not yield detectable levels of ammonium nitrate on the bed media, detection level shall be assumed and extrapolated to a two-year bed life. If Test 3 does not yield detectable levels of ammonium nitrate on the bed media, Test results shall take special note of this observation with no extrapolation to a two-year bed life.

Appendix B

Warranty Testing

Appendix B
Warranty Testing (by *BUYER*)

1.0 Purpose

The purpose of appendix B testing is to validate performance guarantees related to removal efficiencies and design life for the carbon bed adsorber media in a prototypic LAW and HLW offgas.

2.0 Overview

Mercury is present in many of the DOE's mixed wastes including the high-level tank wastes, which will be processed in the WTP. When this waste is processed in the WTP Low-Activity Waste (LAW) and High-Level Waste (HLW) melter systems, the resulting offgas will contain mercury (Hg) and hydrogen fluoride (HF). Sulfur-activated carbon (S-AC) has been successfully used to remove mercury from offgas. However, it has generally been used with elemental mercury and under conditions that are not representative of WTP melter offgas. Concerns related to the adsorption behavior of elemental and oxidized forms of mercury, such as mercuric chloride, have been raised regarding mercury removal efficiency and breakthrough capacity, which could have a direct impact on sizing of the adsorption system and the frequency at which S-AC must be changed. Test apparatus will include two adsorbent columns (lead and lag adsorbers), each with guard and primary activated carbon media as described in the mechanical data sheets (24590-HLW-MVD-HOP-00011, 24590-HLW-MVD-HOP-20011, 24590-LAW-MVD-LVP-00004), representative of the WTP Lead and Lag Adsorbers.

VSL testing demonstrated that a rapid temperature rise resulted when water vapor was introduced to Kombisorb BAT-37. A temperature increase rapidly progressed through the VSL test bed. However, media temperatures quickly returned to normal as the bed became acclimated to water (except for heat losses). Introduction of NOx to the Kombisorb BAT 37 resulted in an initial temperature rise followed by a gradual temperature reduction as the media became acclimated to the NOx (elevated temperatures continued as long as NOx feed continued). Because virgin activated carbon media had a much greater sensitivity to NOx, it was necessary to establish a procedure for ramping feed of NOx to the bed (referred to as conditioning). The addition of Organics is very important, however acetonitrile (to be used in this phase of the testing) did not show much of a temperature effect. Nonetheless, the INL test plan should include a separate ramp procedure for NOx and organics.

VSL testing only evaluated the primary bed material, Kombisorb BAT 37. Because it may be possible that other important temperature effects may exist within the guard bed material, Kombisorb ZA-37, the testing shall also address the effects that the simulant offgas stream composition may have on the guard bed media temperature.

VSL testing identified the need to condition virgin Kombisorb BAT 37 to water, NOx, and organics. The Vendor Test Plan shall address conditioning of virgin activated carbon media, based on review of the following VSL steps:

- As NOx and organic ramping is initiated, actions should be taken to either stop ramps or reduce rates at a temperature threshold of 120°C.

- As NOx and organic approach full rates and during steady state operations, temperatures up to 130°C are permissible.
- Organic feed shall be stopped if activated carbon media temperature exceeds 130°C.
- If at any time the carbon media temperature reaches 140°C, both NOx and organic feed shall be stopped.

Steady-state for the activated carbon adsorbers will be reached when the gas outlet temperature for the lag bed operates at less than a 1°C change for one hour and monitoring of total hydrocarbons (THC) is maintained within a 1 to 3% variation for one hour. Once steady-state media temperatures and THC concentrations are reached, introduction of mercury to the test apparatus may be initiated.

3.0 Objectives

1. Test 1 - Determine removal efficiency and loading of mercury on the guard and primary beds for the lead and lag adsorbers with HLW simulated offgas. Confirm compliance with removal efficiency requirements and 12 month design life for the HLW lead adsorber. Confirm that the maximum media operating temperatures in the lead and lag adsorbers are below 130°C.

2. Test 2 - Determine removal efficiency and loading of mercury, hydrogen chloride, hydrogen fluoride, and iodine on the guard and primary beds for the lead and lag adsorber with LAW simulated offgas. Confirm compliance with removal efficiency requirements and 24 month design life for LAW lead adsorber. Confirm that the maximum media operating temperatures in the lead and lag adsorbers are below 130°C.

4.0 Quality Assurance

Tests shall be performed in accordance with the applicable sections of NQA-1. The Test Plan will include a matrix cross-referencing the QA requirements to implementing procedures for the work, and justifying elements that are not applicable.

5.0 Test Conditions

Each of the tests in the following sections have been formulated to address the test objectives from Section 3.

The activated carbon beds proposed for the HLW and LAW off gas systems will operate under the conditions defined in mechanical data sheets (24590-HLW-MVD-HOP-00011, 24590-HLW-MVD-HOP-20011, 24590-LAW-MVD-LVP-00004). The appropriate media for each test will be selected and described in the Vendor Test Plan. The Test Plan will detail the test conditions and data collection for each test based on the media and operating conditions, including steps for conditioning of virgin activated carbon media.

Testing will be done with a bench scale apparatus using air and water for humidity as the bulk gas.

Carbon test beds shall be insulated such that the temperature drop across the beds does not exceed 1.0°C with dry hot air passing through the test beds at test temperatures. Heat tracing may also be used in combination with the insulation as a means to compensate for differences between size of the test apparatus and the WTP activated carbon units. If heaters are used, the minimum number of zone controls shall be 4 (1 for the guard and 1 for the primary activated carbon media sections in both the lead and lag adsorbers).

5.1 Test 1 - Measure mercury removal efficiency and the mercury profile through the adsorbent bed using a simulated HLW offgas that includes acetonitrile.

A. Test conditions:
- Sorbent - Donau Kombisorb BAT 37 and ZA 37
- Residence time – by vendor, to match Mechanical Data Sheet
- Superficial gas velocity – by vendor, to match Mechanical Data Sheet
- Inlet temperature – 94°C ± 0.5°C
- Mercury concentration – 52,600 µg/dscm ± 50 µg/dscm
- Relative humidity – 18.6% ± 1%
- Gas composition (actual composition):
    a. Bulk gas – Air and water vapor
    b. Concentration of organic:
        i. acetonitrile – 2 ppm ± 0.05 ppm
    c. Other components
        i. CO_2 – 0.4% ± 0.03%
        ii. CO – 5.2 ppm ± 0.2 ppm
        iii. NO – 480 ppm ± 10 ppm
        iv. NO_2 – 370 ppm ± 10 ppm
        v. HF – 6.2 ppm ± 0.2 ppm

B. Test duration:
- Initial period to condition the virgin sorbents with the test gases and to reach steady-state operations.
- 100 hours (continuous operation) or until breakthrough of mercury.

C. Data to be obtained:
- Measure Total Hydrocarbons at the outlet of the lead and lag adsorbers
- Measure inlet and outlet mercury concentrations for the lead and lag adsorbers.
- Measure mercury profile in the lead and lag adsorbers (guard and primary beds) at end of test.
- Measure inlet and outlet offgas temperatures of lead and lag adsorbers.
- Measure sulfur content of three representative samples of virgin primary media and three representative samples of primary media taken after completion of testing from the location where maximum bed temperature was reached.
- Media temperature at two equally spaced locations along the centerline of the guard bed and primary bed for both the lead and lag adsorbers (total of 4 per adsorber).
- Time at which breakthrough occurs (if realized) for any adsorbed constituents for the lead and lag adsorbers. Breakthrough is defined as the concentration at which emissions reaches 50% of the specified removal efficiency. For example, breakthrough for mercury would be 26.3 µg/dscm using the DF of 1000 and maximum mercury loading of 52,552 µg/dscm shown in the mechanical data sheets.
- Limits established for step changes to NOx concentrations (and any other limiting gas stream components determined by testing).

D. Calculations:
- Hg removal efficiency and loading (mercury profile) for the lead and lag adsorbers.
- Estimated time for breakthrough of Hg for the lead and lag test adsorbers and for the WTP lead and lag adsorbers. (Mercury concentration specified in section A is the maximum concentration required for removal efficiency calculations. Design life shall be a ratio based on nominal mercury concentration 7,608 μg/dscm.)
- Correlation of lead and lag adsorber guard and primary bed temperatures and offgas constituents.
- Analysis of the impact of key gas components on sorbent temperatures during conditioning and operational phases.

E. Performance:
- Mercury removal efficiency - 99.9%
- Carbon media temperature maintained below maximum operating temperature (130°C)
- Media Design life - 12 months (WTP lead adsorber)

5.2 Test 2 - Measure mercury, hydrogen fluoride, and hydrogen chloride , and Iodine removal efficiencies through the adsorbent beds and organic removal using a simulated LAW offgas that also includes acetonitrile.

A. Test conditions
- Sorbents – Donau Kombisorb BAT 37 and ZA 37
- Residence time – by vendor to match mechanical data sheet
- Superficial gas velocity – by vendor to match mechanical data sheet
- Inlet temperature – 105 °C± 0.5 °C *(Nominal Condition on Mechanical Data Sheet)*
- Mercury concentration - 24,000 μg/dscm ± 50 μg/dscm
    i. Elemental mercury 85wt% ± 1 wt% Hg^0
    ii. Oxidized mercury 15wt% ± 1 wt% Hg^{+2} ($HgCl_2$)
- Relative humidity – 10.2 % ± 1% *(Nominal Condition on Mechanical Data Sheet)*
- Gas composition (actual composition):
    a. Bulk gas – Air and water vapor
    b. Concentration of organic:
        i. acetonitrile – 50 ppm ± 1.5 ppm
    c. Inlet hydrogen chloride (HCl) concentration - 46 ppm ± 1.5 ppm
    d. Inlet hydrogen fluoride (HF) concentration - 2.8 ppm ± 0.1 ppm
    e. Inlet iodine (I) concentration - 1.0 ppm ± 0.1 ppm
    f. Other components:
        i. Inlet CO concentration - 480 ppm ± 10 ppm
        ii. Inlet NO concentration - 3800 ppm ± 50 ppm
        iii. Inlet NO_2 concentration - 5600 ppm ± 50 ppm
        iv. Inlet CO_2 concentration - 1.2% ± 0.5%
        v. Inlet SO_2 concentration - 5.0 ppm ± 0.1 ppm

B. Test duration:
- Initial period to condition the virgin sorbent with the test gases and to reach steady-state operations.
- 100 hours or until breakthrough of mercury (Continuous).

C. Data to be obtained:
   - Measure Total Hydrocarbons at the outlet of the lead and lag adsorbers
   - Measure inlet and outlet mercury concentrations for the lead and lag adsorbers.
   - Measure mercury profile in the lead and lag adsorbers (guard and primary beds) at end of test.
   - Measure inlet and outlet hydrogen fluoride concentrations of the lead and lag adsorbers.
   - Measure inlet and outlet hydrogen chloride concentrations of the lead and lag adsorbers.
   - Measure inlet and outlet Iodine concentrations of the lead and lag adsorbers.
   - Measure inlet and outlet organic concentrations of the lead and lag adsorbers.
   - Measure inlet and outlet offgas temperatures of the lead and lag adsorbers.
   - Measure sulfur content of three representative samples of virgin primary media and three representative samples of primary media taken after completion of testing from the location where maximum bed temperature was reached.
   - Media temperature at two equally spaced locations along the centerline of the guard bed and primary bed for both the lead and lag adsorbers (total of 4 per adsorber).
   - Time at which breakthrough occurs (if realized) for any adsorbed constituents for the lead and lag adsorbers.
   - Limits established for step changes to NOx concentrations (and any other limiting gas stream components determined by testing).

D. Calculations:
   - Mercury removal efficiency and loading (mercury profile) for the lead and lag adsorbers.
   - Estimated time for breakthrough of mercury for the lead and lag test adsorbers and for the WTP lead and lag adsorbers. (Mercury concentration specified in Section A is the maximum concentration required for DRE. Design life shall be a ratio based on nominal mercury concentration 320 µg/dscm).
   - Iodine removal efficiency and loading for the lead adsorber.
   - Estimated time for breakthrough of iodine for the test lead and lag test adsorber and for the WTP lead and lag adsorbers.
   - Hydrogen fluoride removal efficiency and loading for the lead adsorber.
   - Estimated time for lead and lag adsorber breakthrough of hydrogen fluoride for the lead and lag test adsorbers and for the WTP adsorbers.
   - Hydrogen chloride removal efficiency and loading for the lead and lag adsorbers.
   - Estimated time for breakthrough of hydrogen chloride for the lead and lag test adsorber and for the WTP adsorbers.
   - Correlation of lead and lag adsorber guard and primary bed temperatures and offgas constituents.
   - Analysis of the impact of key gas components on sorbent temperatures during conditioning and operational phases.

E. Performance:
   - Mercury removal efficiency - 99.8%
   - Hydrogen chloride removal efficiency - 97%.
   - Hydrogen fluoride removal efficiency - 97%

- Iodine removal efficiency - 99%
- Carbon media temperature maintained below maximum operating temperature (130°C)
- Design life - 24 months (WTP lead adsorber)

6.0 Success Criteria

1. Verification that specified removal efficiencies for required offgas constituents are achieved.
2. Quantization of load profiles for required offgas constituents and verification of WTP bed life.
3. Verification that carbon media temperature controls maintain carbon media temperature below its maximum allowable operating temperature of 130°C.

Appendix C

Permit Testing

Appendix C
Permit Testing (by *BUYER*)

1.0 Purpose

The purpose of appendix C testing is to determine removal efficiency and loading of spiked organics for WTP offgas permitting.

2.0 Overview

Test apparatus shall consist of two adsorbent columns (each with guard and primary activated carbon media) as described in mechanical data sheets (MDSs), representing the WTP Lead and Lag Adsorbers.

Permit requirements for the WTP melter offgas systems specify compliance with Maximum Achievable Control Technology (MACT) incinerator standards for mercury and organic (VOC and SVOC) destruction. The WTP project has conducted systems tests at the Vitreous State Laboratory (VSL) of the melter offgas systems, to determine if the offgas systems, as designed, will meet MACT requirements. However, the test carbon bed used at VSL did not contain a guard bed and in other respects (e.g., gas residence time) the VSL test bed was not representative of the WTP carbon bed design. VSL testing has also shown large temperature exotherms exist, resulting from NOx and organics (allyl alcohol and naphthalene) in the offgas stream.

VSL testing only evaluated the primary bed material, Kombisorb BAT 37. Because it may be possible that other important temperature effects may exist within the guard bed material, Kombisorb ZA 37, the testing shall also address the effects the simulant offgas stream composition may have on guard bed media temperature.

VSL testing identified the need to condition virgin Kombisorb BAT 37 to water, NOx, and organics. The Vendor Test Plan shall address conditioning of virgin activated carbon media, based on review of the following VSL steps:

- As NOx and organic ramping is initiated, actions should be taken to either stop ramps or reduce rates at a temperature threshold of 120°C.
- As NOx and organic approach full rates and during steady state operations, temperatures up to 130°C are permissible.
- Organic feed shall be stopped if activated carbon media temperature exceeds 130°C.
- If at any time the carbon media temperature reaches 140°C, both NOx and organic feed shall be stopped.

Steady-state for the activated carbon adsorbers will be reached when the gas outlet temperature for the lag bed operates at less than a 1°C change for one hour and monitoring of total hydrocarbons (THC) is maintained within a 1 to 3% variation for one hour. Once steady-state media temperatures and THC concentrations are reached, introduction of mercury to the test apparatus may be initiated.

3.0 Objectives

1. Test 1 - Determine removal efficiency and loading of mercury, allyl alcohol, and naphthalene on the guard and primary test beds for the lead and lag adsorbers with HLW simulated offgas. Measure

media temperatures and establish maximum allowable changes in NOx and allyl alcohol concentrations required to maintain control of bed temperatures due to adsorption and exothermic reactions. Confirm that the maximum media operating temperatures in the lead and lag adsorbers are below 130°C.

2. Test 2 - Determine removal efficiency and loading of mercury, hydrogen chloride, allyl alcohol, and naphthalene on the guard and primary test beds for both lead and lag adsorbers with LAW simulated offgas. Measure media temperatures and establish maximum allowable changes in NOx and allyl alcohol concentrations required to maintain control of bed temperatures due to adsorption and exothermic reactions. Confirm that the maximum media operating temperatures for the lead and lag adsorbers are below 130°C.

4.0 Quality Assurance

Tests shall be performed in accordance with the applicable sections of NQA-1. The Test Plan will include a matrix cross-referencing the QA requirements to implementing procedures for the work, and justifying elements that are not applicable.

5.0 Test Conditions

Each of the tests in the following sections have been formulated to address the test objectives from Section 3.

The activated carbon beds proposed for the HLW and LAW off gas systems will operate under the conditions defined in this section of Appendix C. The appropriate media for each test will be selected and described in the Vendor Test Plan. Test media shall be consistent with that proposed for the WTP carbon bed adsorbers. The Test Plan will detail the test conditions and data collection for each test based on the media and operating conditions, including steps for conditioning of virgin activated carbon media.

Testing will be done with a bench scale apparatus using air and water for humidity as the bulk gas. Carbon test beds shall be insulated such that the temperature drop across the beds does not exceed 1.0°C with dry hot air passing through the test beds at test temperatures. Heat tracing may also be used in combination with the insulation as a means to compensate for differences between size of the test apparatus and the WTP activated carbon units. If heaters are used, the minimum number of zone controls shall be 4 (1 for the guard and 1 for the primary activated carbon media sections in both the lead and lag adsorbers).

5.1 Test 1 - Measure mercury and allyl alcohol/naphthalene removal efficiencies, using a simulated HLW offgas.

A. Test conditions:

- Sorbent - Donau Kombisorb BAT-37 and ZA-37
- Residence time – by vendor, to match Mechanical Data Sheet
- Superficial gas velocity – by vendor, to Match Mechanical Data Sheet
- Inlet temperature – 94°C ± 0.5°C
- Mercury concentration – 52,600 µg/dscm ± 50 µg/dscm
- Relative humidity – 18.6 % ± 1%
- Gas composition:
    a. Bulk gas – Air and water vapor
    b. Concentrations of organics:

i. Allyl alcohol – 1400 ppm ± 20 ppm (dry)
ii. Naphthalene – 35 ppm ± 1 ppm (dry)

c. Other components (actual composition):

i. CO_2 – 1.2% ± 0.03%
ii. CO – 900 ppm ± 20 ppm
iii. NO – 480 ppm ± 10 ppm
iv. NO_2 – 370 ppm ± 10 ppm
v. HF – 6.2 ppm ± 0.2 ppm

B. Test duration:

- Initial period to condition the virgin sorbent with the test gases and to reach steady-state operations.
- 100 hours (continuous operation) or until breakthrough of mercury.

C. Data to be obtained:

- Measure Total Hydrocarbons at the outlet of the lead and lag adsorbers
- Measure inlet and outlet mercury concentrations for the lead and lag adsorbers.
- Measure mercury profile in the lead adsorber (guard and primary beds) at end of test.
- Measure inlet and outlet offgas temperatures for the lead and lag adsorbers.
- Measure sulfur content of three representative samples of virgin primary media and three representative samples of primary media taken after completion of testing from the location where maximum bed temperature was reached.
- Measure inlet and outlet allyl alcohol and naphthalene concentrations in the lead and lag adsorbers.
- Media temperature at two equally spaced locations along the centerline of the guard bed and primary bed for both the lead and lag adsorbers (total of 4 per adsorber).
- Time at which breakthrough occurs (if realized) for allyl alcohol and naphthalene for the lead and lag adsorbers.
- Limits established for step changes to NOx and allyl alcohol concentrations (and any other limiting gas stream components determined by testing).

D. Calculations:

- Mercury removal efficiency and loading (mercury profile) for the lead and lag adsorbers.
- Estimated time for breakthrough of mercury for the lead and lag test adsorbers and for the WTP lead and lag adsorbers.
- Allyl alcohol and naphthalene removal efficiency and loading for the lead and lag adsorbers.
- Estimated time for breakthrough of allyl alcohol and naphthalene for the lead and lag adsorbers.
- Correlation of guard and primary bed temperatures and offgas constituents for the lead and lag adsorber.
- Analysis of the impact of key gas components on sorbent temperatures during conditioning and operational phases.

E. Performance:
- Mercury removal efficiency - 99.9%
- Carbon media temperature maintained below maximum allowable operating temperature for the media (130°C)

5.2 Test 2 - Measure mercury, hydrogen chloride, allyl alcohol, and naphthalene removal efficiencies using a simulated LAW offgas.

A. Test conditions.
- Sorbents – Donau Kombisorb BAT-37 and ZA-37
- Residence time – by vendor, to match Mechanical Data Sheet
- Superficial gas velocity – by vendor, to Match Mechanical Data Sheet
- Inlet temperature – 105°C ± 0.5°C *(Nominal Condition on Mechanical Data Sheet)*
- Mercury concentration - 24,000 µg/dscm ± 50 µg/dscm
    - i. Elemental mercury 85wt% ± 1 wt% Hg^0
    - ii. Oxidized mercury 15wt% ± 1 wt% Hg^{+2} ($HgCl_2$)
- Relative humidity – 10.2% ± 1% *(Nominal Condition on Mechanical Data Sheet))*
- Gas composition:
    - a. Bulk gas – Air and water vapor
    - b. Concentrations of organics:
        - i. Acetonitrile – 50 ppm ± 1.5 ppm
        - ii. Allyl alcohol – 100 ppm ± 3 ppm (dry)
        - iii. Naphthalene – 35 ppm ± 1 ppm (dry)
    - c. Inlet hydrogen chloride concentration - 46 ppm ± 1.5 ppm
    - d. Other components (actual composition):
        - i. Inlet CO concentration - 480 ppm ± 10 ppm
        - ii. Inlet NO concentration - 3800 ppm ± 50 ppm
        - iii. Inlet NO_2 concentration - 5600 ppm ± 50 ppm
        - iv. Inlet CO_2 concentration - 2% ± 0.5%v.
        - v. Inlet SO_2 concentration - 5.0 ppm ± 0.1 ppmB.

B. Test duration:
- Initial period to condition the virgin sorbent with the test gases and to reach steady-state operations.
- 100 hours (continuous operation) or until breakthrough of mercury.

C. Data to be obtained:
- Measure Total Hydrocarbons at the outlet of the lead and lag adsorbers
- Measure inlet and outlet mercury concentrations for the lead and lag adsorbers.
- Measure mercury profile in the lead adsorber (guard and primary beds) at end of test.
- Measure inlet and outlet hydrogen chloride concentrations of the lead and lag adsorbers.
- Measure inlet and outlet allyl alcohol and naphthalene concentrations of the lead and lag adsorbers.
- Measure inlet and outlet offgas temperatures of lead and lag adsorbers.
- Measure sulfur content of three representative samples of virgin primary media and three representative samples of primary media taken after completion of testing from the location where maximum bed temperature was reached.

- Media temperatures at two equally spaced locations along the centerline of the guard bed and primary bed for both the lead and lag adsorbers (total of 4 per adsorber).
- Time at which breakthrough occurs (if realized) for allyl alcohol and naphthalene for the lead and lag adsorbers.
- .Limits established for step changes to NOx and allyl alcohol concentrations (and any other limiting gas stream components determined by testing).

D. Calculations:
- Mercury removal efficiency and loading (mercury profile) for the lead and lag adsorbers.
- Estimated time for breakthrough of mercury for the lead and lag test adsorbers and for the WTP lead and lag adsorbers.
- Hydrogen chloride removal efficiency and loading for the lead and lag adsorbers.
- Estimated time for breakthrough of hydrogen chloride for the lead and lag test adsorbers and for the WTP lead and lag adsorbers.
- Allyl alcohol and naphthalene removal efficiency and loading for the lead and lag adsorbers.
- Estimated time for breakthrough of allyl alcohol and naphthalene for the lead and lag adsorbers.
- Correlation of guard and primary bed temperatures and offgas constituents for the lead and lag adsorbers.
- Analysis of the impact of key gas components on sorbent temperatures during conditioning and operational phases.

E. Performance:
- Mercury removal efficiency - 99.8%
- Hydrogen chloride removal efficiency - 97%
- Carbon media temperature maintained below maximum allowable operating temperature for the media (130°C)

6.0 Success Criteria

1. Quantization of the removal efficiencies required offgas constituents.
2. Quantization of load profiles for required offgas constituents and determination of WTP bed life.
3. Quantization of carbon media temperature and controls to maintain carbon media below the maximum allowable operating temperature for the activated carbon media of 130°C.

Note that it is possible that the specified test conditions may result in activated carbon media temperatures that do not satisfy the success criteria. In that event, the testing will continue at the reduced allyl alcohol rate that is required to satisfy the success criteria. Because the reduced rate may not satisfy project needs, additional scope for addition of an optional testing may be required to be performed as follows:

Optional Test:
- Retest with the lead bed only on-line to demonstrate the maximum allyl alcohol and naphthalene rates that satisfy the success criteria.

Appendix D

WTP Specific Tailoring of ASME AG-1-1997

Appendix D
WTP Specific Tailoring of ASME AG-1-1997

35.0 ASME AG-1, Code on Nuclear Air and Gas Treatment

Revision: 1997 (R2000)
Sponsoring Organization: The American Society of Mechanical Engineers

WTP Specific Tailoring

The following tailoring of ASME AG-1 is required for use by the RPP-WTP project as an implementing standard for the use of Important-to-Safety (ITS) radial HEPA filter systems and the use of ITS axial flow HEPA filters as inbleed units in the Laboratory C5V Exhaust System. Where not specifically identified herein, the remainder of the code requirements are invoked.

Section FK is added as an addendum to ASME AG-1-1997 with the ASME AG-1a-2000 Addenda AG-1 edition invoked on the project.

In addition to the above tailoring for HEPA filter systems, ASME AG-1 is tailored to add ISO 1940-1:2003, Mechanical Vibration - Balance Quality Requirements For Rotors in A Constant (Rigid) State - Part 1: Specification And Verification Of Balance Tolerances, for balancing multi-stage blowers.

Page 228.9; Article HA-2000 Reference Documents

Revise Article HA-2000 as follows:

Change the code edition of ASME N509 as applied as a referenced (daughter) standard to AG-1 from 1989, reaffirmed December 6, 1996 to 2002.

Justification: The version of the ASME N509 Standard currently referenced as a daughter by AG-1 was issued in 1989 and Reaffirmed in 1996. At the time the N509-1989 (R1996) code was selected to be a daughter of AG-1, the ASME AG-1 code did not include requirements for HEPA filter housings. These requirements were later added in the 2000 Addenda to the AG-1 code. The ASME N509-2002 edition does not provide component requirements for HEPA filter housings and HEPA filters but instead refers the user to AG-1 for this information. Therefore, by making this change it will reduce potential redundancies and conflicts.

Page 228.16; Subsubarticle HA-4420 Access Doors and Panels

Revise Subsubarticle HA-4420 as follows for remote change housings:

Not applicable. The requirements of this article are not applicable to Remote Change Radial HEPA Filter Housings; the access doors and panels shall satisfy HA-4500, Pressure Boundary Leakage, and HA-5300, Pressure Boundary Leakage Testing.

Justification: Remote housings are not designed to "incorporate a means for adjusting compression forces, gasket compression..." There are not hinges or latches in the design and they are not designed for manual operation. Therefore, the requirements described in this code article are not applicable.

The remote housing design requires remote access, using a grapple to manipulate doors in a cave environment that may become subject to contamination and high radiation fields. The design incorporates low maintenance features not subject to failure (i.e., vertical housings and heavy doors). The housing doors seal by virtue of their weight alone. Door guides are included. A bar placed across the tops of the doors (and pinned in position) is used to ensure the doors remain in place during seismic events.

Page 228.18; Paragraph HA-4443 Clamping Mechanism

Revise Paragraph HA-4443 as follows for remote change and safe change radial HEPA housings:

Replace the text with: The requirements of this article are not applicable to Safe Change and Remote Change Radial HEPA Filter Housings. For Safe Change and Remote Change Radial HEPA filter housings, the design shall ensure that the housing knife-edge is embedded into the pliable filter sealant and will provide a seal for the complete perimeter of each filter.

Justification: The remote change housings are not side access housings and are not designed for manual operation. There are no clamping mechanisms or filter indexing mechanisms. The weight of the remote filter and differential pressure across the filter is relied upon to ensure that the knife-edge is embedded into the fluid seal.

The safe change housings are front access and are not walk-in style. The filter is not accessed from its side. Therefore, filter retrieval features and filter indexing mechanisms do not apply. A clamping mechanism that is capable of moving the filter (e.g., for side access housings) is not required. The safe change housings are designed to allow a person to insert and remove each filter.

Subarticle FK-4100 General Design

Revise second paragraph of Subarticle FK-4100 as follows for remote change and safe change radial HEPA filter designs:

Replace the text with: For Remote Change and Safe Change Radial HEPA Filters, the total media area provided within the filter pack shall be such that maximum media velocity is 6.5 ft/min (2.0 m/min) at the rated flow.

Justification: The RPP-WTP radial filter design is based upon a UK Atomic Energy Standard Specification AESS 30/95100. This Standard contains an equivalent requirement to that found in AG-1. It states: "The effective area of filter medium used for each insert shall be not less than 3.0 sq m for every 100 l/s rated airflow." The Project proposes to meet this criterion. Converting these metric units for a UK 950 l/s (~2,000 cfm) rated filter equates to approximately 6.5 ft/min media velocity or a minimum of 308 sq. ft of media.

The DOE Nuclear Air Cleaning Handbook (Reference DOE-HDBK-1169-2003 Chapter 2.3.7 and Figure 2.8(a)) illustrates the importance and intent behind this code requirement. AG-1 Subsubarticle FK-1130 states that a HEPA filter shall have *"a minimum efficiency of 99.97% (that is, a maximum particle penetration of 0.03%) for 0.3 micrometer diameter test aerosol particles."* This defines the minimum performance of a HEPA type filter. The curves depicted in Figure 2.8(a) of the Handbook show that at 10.5 ft/min air velocity, the 0.30-micron particle size can be expected to penetrate a HEPA filter such that the AG-1 FK-1130 performance requirement would not be met.

Numerous aerosol penetration tests have been performed on the proposed filter design both inside prototype housings and on individual prototype radial filters designed with a media area of 236 sq. ft., or approximately 8.5 ft/min media velocity. Each test demonstrated that a filter design with media velocities of this magnitude would meet the qualification performance requirements as stated in AG-1 (e.g., 99.97% efficiency or better for penetration of 0.3-micron particles).

The proposed RPP-WTP design uses a filter with approximately 325 sq. ft. of effective media area, or a media velocity of approximately 6.1 ft/min. This represents a small improvement on the UK design and therefore continues to meet the UK Standard requirement.

Further addition of filter media to meet the more restrictive AG-1 Section FK requirement would possibly result in other undesirable design and performance characteristics (e.g., increased DP, reduced pleat spacing). The filter geometry is also limited by many other design restrictions including: available building space, personnel filter handling limitations, and waste disposal package limitations.

Table FK-4000-1

Revise Table FK-4000-1 rating information for the 2,000 acfm filter as follows for remote change and safe change HEPA radial filter designs:

**TABLE FK-4000-1 (TAILORED)
TYPE 1 RADIAL FLOW HEPA FILTER – NOMINAL RATINGS**

Maximum Rated Air Flow		Maximum Resistance	
(acfm)	(m^3/hr)	Inches WC	Pa
40	68	1.3	325

Maximum Rated Air Flow		Maximum Resistance	
(acfm)	(m^3/hr)	Inches WC	Pa
100	170	1.3	325
250	425	1.3	325
500	850	1.3	325
1000	1700	1.3	325
1500	2550	1.3	325
2000	3400	1.6	400

Justification: A new filter design is being developed with the intent of qualifying it in accordance with the AG-1 code. The RPP-WTP radial flow HEPA filter design originated from UK Atomic Energy Standard Specification AESS 30/95100. The radial flow HEPA filters will be designed for a maximum initial pressure drop of approximately 1.55 inches WC at a rated flow of 2,000 cfm. This is just slightly greater than (~ delta of 0.15 inches WC) the acceptance criterion stated in UK Atomic Energy Standard Specification AESS 30/95100. This increase in observed pressure drop is primarily due to small design differences between the UK design and the design proposed for use in the RPP-WTP. These differences include increases in filter pack depth, increases in faceguard to media pack gaps (used to enhance protection of the media), and space to accommodate the filters gel seal channel. The UK filter pack depth is approximately 68mm or ~2.7 inches. The RPP-WTP filters are available in 1-inch increment pack depths with a 3-inch pack depth proposed for use on the RPP-WTP. The slightly deeper RPP-WTP media pack design will increase the filter media area and increase the removal efficiency for small particles. The benefits gained in the RPP-WTP radial filter design are viewed to outweigh the negligible increase in airflow resistance (~ 3 to 5% of typical filter loading at change-out of filter element).

Paragraph FK-6211 **Flatness and Squareness**

Revise Paragraph FK-6211 (a) as follows for remote change and safe change radial HEPA filter designs:

Type 1 filter flange and end cap tolerances shall meet the following criteria: parallel within $\frac{1}{8}$ in., flat within $\frac{1}{16}$ in.

Justification: TAILORING OF PARALLELISM TOLERANCE: The tailoring presented above changes the code requirement for flange to end cap parallelism from 1/16 in. to 1/8 in. For the Remote Change Filter, the inlet flange, which includes the gel channel with a nominal width of 3/4 in., creates the seal and supports the filter inside the housing. The outlet end cap is fully suspended inside the housing by the opposite inlet flange (i.e., outlet end cap does not touch the housing and is not used to form the seal).

Parallelism to within 1/8 in. will ensure that an adequate housing-to-filter seal is created. For the Safe Change Filter, as with the remote filter, the seal is formed by insertion of a housing knife-edge into a filter gel filled channel with a nominal width of 3/4 in. The gel channel is located on the filter inlet flange. Parallelism to within 1/8 in. will ensure an adequate housing-to-filter seal is created.

TAILORING OF SQUARENESS TOLERANCE: The "squareness" tolerance from FK-6211 is being addressed with a tolerance for circular runout as stated in tailoring for FK-6212. Circular runout controls the cumulative variations that may be present in the positional relationship between the inlet flange and outlet end cap. Inspection for circular runout is equivalent to and meets the code requirement to maintain the squareness characteristic while taking into account the entire length of the filter. Maintaining radial filter circular runout to within the 5/32" tolerance will ensure the filter forms an adequate seal within the filter housing.

Paragraph FK-6212 **Overall Dimensions**

Replace Paragraph FK-6212 as follows for the remote change and safe change radial HEPA filter design: Type 1 filter length shall be (+0 / -$\frac{1}{8}$ in.), circular runout of filter flange with respect to the filter end cap shall be within 3/32 in., all other dimensions $\pm\frac{1}{16}$ in.

Justification: "Seal ring" and "seal face" are terms specific to Section FK radial filters with gaskets and therefore dimensions and tolerances associated with these terms are not applicable to the Type 1 gel seal radial filters to be used at the RPP-WTP.

TAILORING OF CONCENTRICITY: Concentricity is the condition in which the axes of all cross-sectional elements of a surface of revolution are common to the axis of a datum feature. Concentricity is being replaced with a tolerance for circular runout as a more practical method to verify roundness. Runout refers to the result of rotating a part about its central axis while measuring with a dial indicator its surface deviation from perfect roundness. With circular runout, the dial indicator is not moved along the direction of the axis of the part (as with "total runout"). Circular runout is therefore applied independently at each single circular element along the length of the part as the part is rotated through 360 degrees. The tolerance for circular runout provided in the tailored text controls the cumulative variations that may be present in the positional relationship between the inlet flange and outlet end cap.
The 3/32 in. tolerance provided for circular runout will ensure the filter forms an adequate seal within the filter housing.

TAILORING OF GENERAL DESIGN TOLERANCE OF +/- 1/16 IN.: REPLACE: "all other dimensions +/- 1/16 in." WITH: "all other dimensions +/- 1/16 in. with exception that design filter media to faceguard gap shall be +/- 1/8 in. (i.e., to maintain a minimum media to faceguard gap of 1/8")."

Justification: The proposed design is verified to be safe through code required filter qualification testing as described in Section FK-5100.

Section FG **Mounting Frames**

Not Applicable.

Justification: The ASME Committee on Nuclear Air and Gas Treatment (CONAGT) has stated that Section FG only applies to walk in housings. None of the filter housings (i.e., radial or axial filter designs) to be installed on the RPP-WTP Project is a "walk in" design. Reference ASME Technical Interpretation File # 05-990, RPP-WTP CCN # 107935).

Page 607; Paragraph TA-4632 Airflow Distribution Test (AD)

Revise Paragraph TA-4632 as follows for remote change and safe change radial HEPA housings:

Replace "downstream" with "upstream". Add for clarity: "For Remote Change and Safe Change Radial HEPA filter banks, flow measurement location is upstream vs. code required downstream."

Justification: The requirement for flow measurements to be taken downstream of each HEPA filter in a bank is in order to verify equal flow distribution between filters in a bank. In traditional axial flow systems, a measurement location downstream is preferred due to the improvements in the flow conditions (i.e., flow straightening) inside the housing created by the filter itself. However, due to the difference in configuration created by the radial filter, the flow profile both entering and exiting the filter is extremely complex (i.e., not uniform over the filter face). Testing and analysis (computational fluid dynamic models) performed on prototype units to date have determined that taking the flow measurement upstream and inside the filter (inlet) using a hot wire anemometer provides the most repeatable measurement. Accuracy of the measurement is still hindered by flow conditions and anemometer placement; however, increased precision is obtained by taking an average of multiple measurements at multiple locations within each filter inlet. Predicted results from CFD modeling have agreed with actual field measurements using this technique. The project intends to design (based on the prototype tests) and use an anemometer instrument developed specifically for the radial filter design and place it at the inlet (i.e., upstream) side of the filter. Verification, in the field, of acceptable air distribution between filters in a bank can then be accomplished, as the code requires.

Page 607; Paragraph TA-4633 Air-Aerosol Mixing Test (AA)

Revise Paragraph TA-4633 as follows for axial housings used as LAB C5V Inbleeds:

This article is not applicable to LAB C5V inbleed axial filter housings.

Justification: The intent of this test is to verify that the test aerosol is uniformly mixed in the air stream when it reaches the filter in order to verify that each filter in a filter bank is being challenged. This test is concerned primarily with designs and layouts where a single point injection of aerosol in close proximity to the filter bank may result in non-uniform distribution of the test agent.

The Laboratory Facility C5V Inbleed housing is designed such that each filter is assigned its own aerosol injection manifold. The manifold design and its proximity to the filters have been qualified to meet the aerosol mixing test criteria presented in AG-1. The housing is not designed to accommodate the air-aerosol mixing field-commissioning test per TA-4633. However, the housing design is not being modified for RPP-WTP use and aerosol mixing, by virtue of the manufacturer test sections, will not be impacted by the installation in the RPP-WTP Laboratory Facility.

Page 111; Section BA-4162 **Vibration, Centrifugal Fans**

Supplement Section BA-4162 as follows for balancing multi-stage blowers:

Since Section BA-4162 of ASME AG-1 is not applicable for multi-stage blowers used in ventilation/offgas systems, multi-stage blowers shall be balanced to Quality Grade 2.5 of ISO 1940-1:2003, Mechanical Vibration - Balance Quality Requirements For Rotors in A Constant (Rigid) State - Part 1: Specification And Verification Of Balance Tolerances.

Justification: ASME AG-1 is not applicable for multi-stage blowers. ASME AG-1 Section GC is applicable to multi-stage blowers. However, Section GC is in the course of preparation and is not available for use at this time.

Appendix E

WTP Specific Tailoring of ASME B31.3-1996

Appendix E
WTP Specific Tailoring of ASME B31.3-1996

26.0 ASME B31.3-1996, Process Piping

Revision: 1996
Sponsoring Organization: ASME

WTP Specific Tailoring

The following tailoring of ASME B31.3, *Process Piping*, is required for use by the WTP contractor as an Implementing Standard for: (1) the fabrication and installation of those portions of the C5V ductwork that are being embedded in concrete, (2) the use of ASME B16.9 welding tees in accordance with ASME B31.3-2002, (3) use of vacuum box leak testing, and (4) the ASME B31.3-1998, paragraph 345.2.3(c), allowance for not leak testing closure welds outside of inaccessible areas.

- The tailored sections of ASME B31.3 applicable to embedded ductwork will only be utilized to the extent that it will cover the fabrication, installation, and inspection (and associated testing) of Category D fluid service piping being used as C5 ductwork. Air testing requirements for this ductwork will be compliant with ASME AG-1. Below is a description of those portions of ASME B31.3 that apply to fabrication, installation, and inspection of Category D fluid service piping and the sections of the SRD that they will apply to.
- The tailored sections of ASME B31.3 applicable to welding tees will only be used for ASME B16.9 welding tees. As long as the stress intensification factors from ASME B31.3-2002 are used in the stress analysis for the welding tees, welding tees fabricated to either the 1996 or the 2002 edition of ASME B31.3 can be used. Below is a description of those portions of ASME B31.3, Appendix D, Table D300, that apply to welding tees and the section of the SRD to which they will apply.
- The tailored paragraphs of ASME B31.3 applicable to vacuum box leak testing, in lieu of hydrostatic or pneumatic leak testing, will only be used to leak test full penetration circumferential piping field butt welds inside an inaccessible area (as defined in Appendix H, Section 6.0) out to the first isolation component outside the inaccessible area. Further, if the 100 % volumetric inspection using ultrasonic examination per ASME B31.3 paragraph 344.6, is conducted for welds to be vacuum box tested, then the ultrasonic examination shall be conducted using a method that creates and maintains a reproducible computerized image(s) of the entire weld in the axial and radial direction.
- The tailored paragraphs of ASME B31.3 adopting the provisions of ASME B31.3 (c) - 1998 Addendum paragraph 345.2.3(c) are applicable to all ASME B31.3 piping in all facilities except for closure welds in inaccessible areas.

Piping providing a confinement function in accordance with SRD 4.4-3 will comply with the following sections of ASME B31.3-1996, *Process Piping*. These sections of ASME B31.3 are applicable for embedded ductwork.

Chapter 3, Materials

Chapter 5, Fabrication

Table 341.3.2, Visual acceptance criteria for Category D fluid service piping

Justification: Due to wall thickness requirements of duct embedded in concrete, piping materials are required. ASME B31.3 will apply to materials, fabrication, and inspection standards as appropriate. Testing requirements for nuclear air treatment systems will be consistent with ASME AG-1.

Piping providing a confinement function in accordance with SRD 5.3-2 will comply with the following sections of ASME B31.3-1996, *Process Piping*. These sections of ASME B31.3 are applicable for embedded ductwork.

Chapter 3, Materials

Chapter 5, Fabrication

Table 341.3.2, Visual acceptance criteria for Category D fluid service piping

Justification: Due to wall thickness requirements of duct embedded in concrete, piping materials are required. ASME B31.3 will apply to materials, fabrication, and inspection standards as appropriate. Testing requirements for nuclear air treatment systems will be consistent with ASME AG-1.

Piping providing a confinement function in accordance with SRD 4.2-2 will comply with ASME B31.3-1996, *Process Piping*, with the following modification:

In Table D300, the description of welding tee per ASME B16.9 shall be revised so it is consistent with that shown in Table D300 of ASME B31.3-2002:

		Stress Intensification Factor [Notes (2), (3)]			
Description	**Flexibility Factor k**	**Out-of-Plane, i_o**	**In-Plane i_i**	**Flexibility Characteristic, h**	**Sketch**
Welded tee per ASME B16.9 [Notes (2), (4), (6), (11), (13)]	1	$\frac{0.9}{h^{2/3}}$	$3/4\ i_o + 1/4$	$3.1\frac{\bar{T}}{r_2}$	Same as ASME B31.3-1996

This means that for welding tees per ASME B16.9, note 11 in Table D300 is also changed to:

(11) If $r_x \geq 1/8 D_b$ and $T_c \geq 1.5\bar{T}$, a flexibility characteristic of $4.4\,\bar{T}/r_2$ may be used.

Justification: The use of a lower flexibility characteristic for welding tees per ASME B.16.9 in accordance with ASME B31.3-2002 will increase both the out-of-plane and in-plane stress intensification factors. The increased stress intensification factors will reduce the allowable out-of-plane and in-plane moments that can be applied to the welding tee and keep the calculated stress below the stresses allowable by ASME B31.3-1996.

Important to Safety piping within the scope of SRD 4.2-2 shall comply with ASME B31.3-1996, Chapter V, Paragraph 345, using the following approach for vacuum box leak testing. Vacuum box leak testing, in lieu of hydrostatic or pneumatic leak testing, may be used to leak test full penetration circumferential piping, field butt welds inside an inaccessible area (as defined in Appendix H, Section 6.0) out to the first isolation component outside the inaccessible area, only under the following conditions:

Vacuum Box Leak Test Method - The vacuum box leak test shall be in accordance with a Bubble Test - Vacuum Box Technique method specified in ASME BPV Code, Section V, Article 10, Appendix II, subject to the requirements listed below:

(a) Sensitivity of the test shall be demonstrated to be not less than 1E-3 atm-ml/sec at 15 psig.

(b) The test pressure shall be a partial vacuum of at least 7 psi below atmosphere, applied to the outside of the weld.

(c) The required partial vacuum shall be maintained for at least 20 sec examination time.

In addition, the following limitations and restrictions shall apply to the application of vacuum box leak testing in lieu of a hydrostatic or a pneumatic leak test:

- Vacuum box leak testing will only be used to leak test circumferential piping field welds inside an inaccessible area (as defined in Appendix H, Section 6.0). This includes any welds in extensions of piping systems contained or originating in accessible areas between the inaccessible area boundary and the first isolation valve or device beyond the inaccessible area boundary;
- It shall only be used for piping field welds where required to avoid damage to components, ensure the safety to construction workers, perform leak tests of field welds where physical limitations prevent hydrostatic or pneumatic leak testing as prescribed in ASME B31.3-1996 paragraph 345.4 and paragraph 345.5 respectively;
- Pipe welds that are to be vacuum box leak tested will be assessed for suitability. The number of welds to be vacuum box leak tested shall be limited to a maximum of three welds between termination points (two termination or closure welds and one intermediate weld) on a given pipe system except where physical limitations prevent examination by hydrostatic or pneumatic leak testing. DOE will be informed of such exceptions, and may at its discretion and within 48 hours of being informed, respond to BNI on the suitability of the use of vacuum box leak testing for such instances. Termination points may be tanks, vessels, valves, etc. (Specifically excluded from the definition of termination points are junctions where the piping changes design class). This could be either the last two closure welds in an inaccessible area or the last closure weld in the inaccessible area and the last closure weld outside the

inaccessible area. In addition, vacuum box leak testing would be permitted for the connection welds between construction modules if this is limited to one module-to-module weld per piping run within the cells. This is in addition to termination welds on the piping run. A module is defined as a pre-leak-tested subassembly containing multiple pipe spools;

- Vacuum box leak testing shall be limited to full penetration girth butt welds, on straight pipe or between straight pipe and pipe components of the same nominal pipe size and same wall thickness on both sides of the weld at the weld location. The following configurations are candidates for vacuum box testing:

  (a) Straight pipe to straight pipe connection butt welds

  (b) Straight pipe to 90° elbow connection butt welds

  (c) Straight pipe to 45° elbow connection butt welds

  (d) Straight pipe to concentric reducer connection butt welds

  (e) Straight pipe to eccentric reducer connection butt welds

  (f) Straight pipe to butt welding tee connection butt welds

  (g) Straight pipe to butt welding reduced outlet tee connection butt welds

  (h) Straight pipe to valve nozzle connection butt welds

  (i) Straight pipe to tank or vessel nozzle connection welds

  (j) Straight pipe to safe-end of a weldolet connection butt welds - full penetration butt welded connection only

  (k) Straight pipe to pipe cap connection butt welds

  Prior to the application of vacuum box testing using any of the candidate configurations on piping butt welds at the WTP, the Contractor must successfully demonstrate to the DOE, for the candidate configuration, that (1) all portions of the weld to be inspected are visible and can be inspected in accordance with the ASME Boiler and Pressure and Vessel Code, Section V, Article 10, Appendix II - 1995; (2) the vacuum box can adequately maintain a partial vacuum of 7 psid; and (3) vacuum box leak testing can be accomplished in the time limits and other requirements established by this procedure. The DOE shall be advised at least 7 days in advance of any demonstration to qualify a new weld configuration so that they can witness the demonstration. The Contractor shall document any demonstration relied upon to justify the use of vacuum box leak testing on a new configuration. Further, vacuum box leak testing shall be conducted with a vacuum box that completely encapsulates the weld at the test location;

- All welds shall be 100 % volumetrically inspected in accordance with ASME B31.3-1996, paragraphs 344.5 or 344.6. If the 100 % volumetric inspection is conducted using ultrasonic examination per ASME B31.3-1996 paragraph 344.6, then the ultrasonic examination shall be conducted using a method that creates and maintains a reproducible computerized image(s) of the entire weld in the axial and radial direction;

- It shall be limited to welds made using the Orbital welding machines. The only exception is that vacuum leak box testing may be used on manual welds if the 100 % volumetric inspection was conducted by radiography per ASME B31.3-1996 paragraph 344.5;

- The piping systems and or components on both sides of the weld to be vacuum box leak tested shall have been subjected to a hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.4, a pneumatic test in accordance with ASME B31.3-1996 paragraph 345.5, a combination pneumatic-hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.6, or in the case of components, leak tested in accordance with the Code or Standard applicable to the design of the component;

- At a minimum, a flexibility analysis in accordance with ASME B31.3-1996 paragraphs 319.4.2 (a) and (b) shall be required on any piping systems that contain welds that are to be vacuum leak box tested. In addition, a comprehensive flexibility analysis in accordance with ASME B31.3-1996 paragraphs 319.4.2 (c) and (d) shall be performed on any piping systems that contain welds that are to be vacuum box leak tested when the piping systems have a design temperature greater than or equal to 150 °F;
- For manual welds, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a) through (g) shall be invoked on any weld to be vacuum box leak tested with the exception that the requirement of subparagraph 344.7.1 (e) "... aided by liquid penetrant or magnetic particle examination when specified in the engineering design" shall not be required. For welds made using Orbital welding machines, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a), (b), (c), (d), and (g) shall be invoked. The requirements of 344.7.1 (e) and (f) shall not be required. The implementation of these requirements shall be documented in the weld inspection report;
- Pipe welds and the associated line numbers that are to be vacuum leak box tested shall be identified in advance of the testing. This identification shall be documented in the controlled document Weld List, which must include this information prior to the initiation of any vacuum box leak testing associated with those welds and line numbers. It is understood that the controlled document Weld List may need to be revised and updated periodically through the construction phase of the WTP Project; and
- The following special requirements shall be placed on the training programs used to certify the technicians that will be conducting the vacuum box leak tests:
  1. The BNI Construction Manager shall pre-approve the technician qualifying examination(s) for vacuum box leak testing;
  2. The BNI Construction Manager shall pre-approve the qualifications of each Level III technician preparing or giving the examinations for vacuum box leak testing;
  3. DOE ORP at their discretion shall reserve the right to observe any and/or all practical leak test examinations and review of the results of any and/or all written vacuum box leak test examinations;
  4. The minimum topical content of each Level II examination shall be specified by BNI and approved by DOE;
  5. The 80 % correct criteria for passing the examination shall apply to each part of the three part examinations that are to be given;
  6. BNI shall provide reasonable assurance that they will take adequate measures to assure the integrity of written examination is maintained; and
  7. There shall be several versions of each examination in use to assure Level II knowledge and ability concerning vacuum box leak testing is confirmed.

Justification: The requirement for the vacuum box leak test sensitivity is consistent with the ASME B31.3 requirement for a sensitive leak test as given in ASME B31.3-1996 paragraph 345.8 and for at least 7 psi vacuum and an examination time of at least 20 seconds. The limitations in using vacuum box leak testing better define when this method can be used. DOE ORP may further change the definition and application of these special vacuum box leak testing criteria based on the Contractor's experience with their use, or the Contractor's request for a change.

Piping system closure welds outside of inaccessible areas (as defined in SRD Appendix H, Section 6.0) shall comply with the requirements of ASME B31.3-1998, subparagraph 345.2.3(c). When ASME B31.3-1998, subparagraph 345.2.3(c) is invoked the following restrictions shall apply:

- It shall not be invoked on any closure welds on piping systems in inaccessible areas as defined in Section 6.0 of Appendix H of the SRD. This includes any welds in extensions of piping systems contained or originating in inaccessible areas, between the inaccessible area boundary and the first isolation valve, or device beyond the inaccessible area boundary;
- It shall only be invoked on full penetration butt welds in straight pipe, full penetration butt welds at the safe-end of an equipment nozzle, or full penetration butt welds at the safe-end of branch connections. [The safe-end is defined as the piping to equipment nozzle connecting weld or the branch connection to branch piping connecting welds.];
- The requirements of ASME B31.3(c) - 1998, subparagraph 345.2.3 (c) shall be met;
- The piping systems and or components on both sides of the closure weld shall have been subjected to a hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.4, a pneumatic leak test in accordance with ASME B31.3-1996 paragraph 345.5, a combination pneumatic-hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.6, or in the case of components leak tested in accordance with the Code or Standard applicable to the design of the component;
- For manual welds, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a) through (g) shall be invoked with the exception that the requirement of subparagraph 344.7.1 (e) "...aided by liquid penetrant or magnetic particle examination when specified in the engineering design" shall not be required. For welds made using the Orbital welding machines, the requirements of ASME B31.3 -1996 paragraph 344.7.1 (a), (b), (c), (d), and (g) shall be invoked. The implementation of these requirements shall be documented in the weld inspection report;
- Piping welds and the associated line numbers for which the closure weld classification is invoked shall be documented in a controlled document Weld List;
- Piping components may include mechanical elements other than piping; and
- In addition, BNI shall incorporate these requirements into the appropriate specification. DOE-ORP may further change the definition and application on the use of closure welds based on the Contractor's experience with their use or the Contractor's request for a change.

Justification: This change does not change the safety function of any pressure boundary components. The requirement to leak test pressure boundary field welds is primarily to ensure the reliability of the welds in addition to the reliability provided by the other required examinations. The exception allowed by ASME B31.3-1998, paragraph 345.2.3 that the final weld connecting piping systems or components which have been successfully tested in accordance with paragraph 345 need not be leak tested provided the weld is examined in-process in accordance with paragraph 344.7 (a), (b), (c), (d), and (g) and passes with 100 % radiographic examination in accordance with paragraph 344.5 or 100 % ultrasonic examination in accordance with paragraph 344.6 provides adequate assurance that the weld is reliable and leak tight. The change continues to provide adequate safety since it requires that all piping closure welds that are not leak tested are in-process examined and 100 % volumetrically examined which exceeds the requirements of ASME B31.3-1996 for closure welds that are leak tested. The inability to hydrostatically or pneumatically leak test these closure welds does not affect the soundness of the welds.

Appendix F

WTP Specific Tailoring of AISC (ASD)

Appendix F

WTP Specific Tailoring of AISC (ASD)

9.0 AISC M016, Manual of Steel Construction, Allowable Stress Design (ASD)

Revision: 9th Edition
Sponsoring Organization: American Institute of Steel Construction

WTP Specific Tailoring

The following tailoring of M016 is required for use by the WTP contractor as an implementing standard for design of structural steel for Seismic Category III SSCs.

No specific section

Load combinations for design of structural steel members utilize those identified in UBC 97, Section 1612.3.

Justification: These load combinations represent the commercial requirements for allowable stress design of structural steel. Use of these load combinations will ensure compliance with the commercial design in accordance with the UBC.

No specific section

Seismic detailing requirements shall be in accordance with UBC 97, Chapter 22, Division V, Section 2214 for moderate seismic risk structures.

Justification: The requirements contained in this section contain accepted industry practice for design of important commercial steel structures. Use of this section will ensure compliance with the commercial design in accordance with the UBC.

Appendix G
WTP Specific Tailoring of ASME NQA-1-1989

Appendix G
WTP Specific Tailoring of ASME NQA-1-1989

C.37 ASME NQA-1-1989, Quality Assurance Program Requirements for Nuclear Facilities

Revision: 1989

Sponsoring Organization: The American Society of Mechanical Engineers

WTP Specific Tailoring

The following tailoring of ASME NQA-1-1989 is required for use by the WTP project as an implementing standard to perform Commercial Grade Dedication activities using ASME NQA-1-2004.

NQA-1-1989, Supplement S-1 Terms and Definitions

Replace the Commercial Grade Item definition with definition from NQA-1-2004, Part I, Section 400:

Commercial Grade Item: a safety class/safety significant structure, system, or component (SSC), or part thereof, that affects its safety function, that was not designed and manufactured in accordance with the requirements of this Standard.

Justification: By tailoring NQA-1-1989 to incorporate elements of NQA-1-2004, the Commercial Grade Item definition is broadened to reflect current industry practices related to Commercial Grade Dedication. Currently there are gaps among NQA-1 qualified suppliers and utilization of NQA-1-2004 will enable WTP to employ technically acceptable suppliers not available under the provision of NQA-1-1989. The NQA-1-1989 standard was established primarily to provide for the purchase of replacement parts for nuclear-related facilities and is not sufficient to support the purchase of commodities and equipment needed for a new facility.

Commercial Grade Items may be either off the shelf/catalog items or "engineered items", i.e., items for which some custom design effort is required by the supplier to meet purchaser requirements. If the critical characteristics of an "engineered item" cannot be verified solely based on material or performance attributes, verification of critical design characteristics should be based on NQA-1-2004, Section 704 (e.g., by design verification methods) or by application of alternate standards for qualification of suppliers of Safety Class/Safety Significant items.

NQA-1-1989, Supplement S-1 Terms and Definitions

Add to the reference section ASME NQA-1-1989, Supplement S-1, the following definitions from NQA-1-2004, Part I, Section 400:

Commercial Grade Service: a service that was not provided in accordance with the requirements of this standard.

Critical Characteristics: important design, material, and performance characteristics of a commercial grade item or service that, once verified, will provide reasonable assurance that the item or service will perform its intended safety function.

Dedication: an acceptance process performed in accordance with this Standard to provide reasonable assurance that a commercial grade item or service will successfully perform its intended safety function and, in this respect, is deemed equivalent to an item or services provided under the requirements of this Standard.

Dedicating Entity: the organization that performs the dedication process.

Justification: The tailoring of the NQA-1-1989, by adding definitions of Commercial Grade Service, Critical Characteristic, Dedication, Dedicating Entity, and Safety Function to NQA-1-2004, allows for the use of the Commercial Grade Dedication process to procure equipment requiring design services by the supplier. This incorporates definitions consistent with NQA-1-2004 text.

NQA-1-1989, Supplement 7S-1 Supplementary Requirements for Control of Purchased Items and Services

Replace NQA-1-1989 supplement 7S-1 Section 10, Titled Commercial Grade Items in its entirety with NQA-1-2004, Requirement 7, Section 700.

Justification: NQA-1-2004 provides greater flexibility for implementing the Commercial Grade Dedication process while assuring that equipment acquired under these processes will support their safety functions.

Modify new Section 701 General as follows:

701 General

When Commercial Grade Items or Services are utilized, the dedicating entity can utilize the requirements of this section for procurement and acceptance of items or services as an acceptable alternative to Sections 2 through 9 of this Supplement, except that Supplier evaluation and selection, where determined necessary by the Purchaser, shall be in accordance with Section 3.1 of this Supplement. The applicable requirements of this Standard shall apply to dedication activities for acceptance.

When a Commercial Grade Item has been delivered or installed, prior to the decision to dedicate, the dedicating entity can utilize the requirements of this section for acceptance of the item when the critical characteristics can be verified solely by inspections, tests, or analyses.

Justification: Corrects the section numbers to correspond to the appropriate section of NQA-1-1989 and provides for use of Commercial Grade Dedication for delivered and/or installed SSCs whose safety classification is subsequently upgraded.

Modify (referenced section number only) new Section 704.2 Source Verification as follows:

704.2 Source Verification

Source verification is only applicable to the actual item(s) or service(s) that are verified at the Supplier's facility or other applicable location. Source verification shall be performed in accordance with Section 8.2.2 of this Supplement, including a checklist or plan with the documented evidence of the source verification furnished to the dedicating entity and shall include or address the following:

(a) identification of the item(s) or service(s) included within the scope of the source verification

(b) identification of the critical characteristics, including acceptance criteria, to be controlled by the Supplier

(c) verification of the Supplier's processes and controls are effectively implemented for the identified critical characteristics

(d) identification of the activities witnessed during the source verification and the results obtained

(e) documentation of the adequacy of the Supplier's processes and controls.

Justification: Corrects the paragraph number to correspond to the appropriate section of NQA-1-1989.

Appendix H

WTP Specific Tailoring of IEEE Std. 384

Appendix H
WTP Specific Tailoring of IEEE Std. 384

19.0 IEEE-384, IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits

Revision: 1992
Sponsoring Organization: The Institute of Electrical and Electronics Engineers, Inc.

<u>RPP-WTP Specific Tailoring</u>

The following tailoring of IEEE-384 is required for use by the RPP-WTP project as an implementing standard for SDC, SC, SDS, or SS electrical equipment and circuit design.

All Sections   Clarification of Nuclear Power Generating Station Terminology

The term "Standby Generator" in the Standard is synonymous with "Emergency Generator" in the RPP-WTP.

Justification: As determined by the ISM review process, the Standby Generators on the RPP-WTP are not classified as SDC or SC while the Emergency Generators are classified as SDC or SC.

Section 2.0   Purpose

Replace with the following:

This standard establishes the criteria for implementation of the independence requirements of IEEE 603-1998 (as tailored in C.33) and IEEE 308-1991 (as tailored in C.18).

Justification: This section was revised to clarify that SRD implementing standards IEEE 603-1998 and IEEE 308-1991 are tailored in Appendix C.

Section 3.0   References

The following reference standards, do not apply for the RPP-WTP.

- [1] ANSI/ANS-58.2-1988 Design Basis for Protection of Light Water Nuclear Power Plants Against the Effects of Postulated Pipe Rupture.

Justification: This document is applicable to the high pressure steam lines found in nuclear power generating stations and doesn't apply for the RPP-WTP.

- [4] ANSI/NFPA 803-1988 Fire Protection for Light Water Nuclear Power Plants.

Justification: This document specifically addresses nuclear power generating stations. Per Section 4.5 of volume II of the SRD, the RPP-WTP will use NFPA 801-2003 as an implementing standard for fire protection.

- [11] IEEE Std 494-1974 (reaff 1990), IEEE Standard Method for Identification of Documents Related to Class 1E Equipment and Systems for Nuclear Power Generating Stations.

Justification: This standard has been withdrawn by the IEEE standards committee and no replacement standard has been recommended. This standard is not called out as an implementing standard in the SRD. Procedures for identification of documents related to SDC, SC, SDS, or SS equipment will be developed internally for the RPP-WTP project.

Replace the 1991 version of IEEE 603 with the following version.

IEEE Std 603-1998, *IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations.*

Justification: SRD Safety Criterion 4.4-4 lists the 1998 version of IEEE 603 as an implementing standard for SDC and SC electrical power systems. The 1998 revision of IEEE 603 shall be used in place of the 1991 revision called out as a reference in the body of IEEE 384-1992 for SDC and SC electrical power systems only.

The following reference Standards shall be included:

- [16] DOE/RL-96-0006, Revision 1, *Top-level Radiological, Nuclear, and Process Safety Standards and Principles for TWRS Privatization Contractors.*

Justification: Called out as a regulatory basis in the SRD.

- [17] ANSI/ISA-S84.01-1996, *Application of Safety Instrumented Systems for the Process Industries.*

Justification: Replaces IEEE-603 for Control and Instrumentation Systems at the WTP, per 24590-WTP-ABCN-ESH-01-027.

- [18] NFPA 801-2003, *Standard for Fire Protection for Facilities Handling Radioactive Materials.*

Justification: Called out as an implementing standard under safety criteria 4.5-1 through 4.5-4.

Section 4.0 Definitions

- The definition of **design basis events** shall be replaced with the following:

"Postulated events providing bounding conditions for establishing the performance requirements of structures, systems, and components that are necessary to: 1) ensure the integrity of the safety boundaries protecting the worker; 2) place and maintain the facility in a safe state indefinitely; or 3) prevent or mitigate the event consequences so that the radiological exposures to the general public or the workers would not exceed appropriate limits. The Design-Basis Events also establish the performance requirements of the structures, systems and components whose failure under Design-Basis Event conditions could adversely affect any of the above functions."

Justification: This definition is from DOE/RL-96-0006.

Section 5.3 Equipment and Circuits Requiring Independence

Replace with the following sentence:

Equipment and circuits requiring independence shall be determined during the ISM review cycle and shall be identified on documents and drawings in a distinctive manner.

Justification: The reference to IEEE-494 is not applicable since this standard has been withdrawn by the IEEE standards committee and no replacement standard has been recommended. This standard is not called out as an implementing standard in the SRD. The ISM process will provide reliability requirements for each control strategy. These reliability requirements determine when control strategies require independence, redundancy, and seismic qualifications.

Section 6.1.3.2 Area Boundaries

Replace the reference to NFPA 803-1988[4] with NFPA 801-2003 [18].

Justification: Standard NFPA 803-1998 is not applicable for the RPP-WTP. Per Section 4.5 of the SRD, NFPA 801-2003 shall be used for the RPP-WTP.

Section 6.5 Containment Electrical Penetrations

Not applicable for the RPP-WTP.

Justification: Containment electrical penetration assemblies are unique to the containment structure of Nuclear Power Generating Stations and have no equivalent in the RPP-WTP project.

Appendix I

WTP Specific Tailoring of IEEE Std. 323

Appendix I
WTP Specific Tailoring of IEEE Std. 323

23.0 IEEE-323, Qualifying Class 1E Equipment for Nuclear Power Generating Stations

Revision: 1983
Sponsoring Organization: The Institute of Electrical and Electronics Engineers, Inc.

RPP-WTP Specific Tailoring

The following tailoring of IEEE-323 is required for use by the RPP-WTP project as an implementing standard for ITS electrical and instrument system design.

Section 1.1, Scope

- This Standard applies to SSCs designated as SDC, SC, SDS, or SS (where the SS SSCs is required to perform a credited safety function in a harsh environment).

Justification: SS SSCs, which are required to perform a safety function in a harsh environment, have been included within the scope of this standard.

Section 2, References

The following reference Standard shall be included:

- [9] DOE/RL-98-0006 Revision 3 Top-level Radiological, Nuclear, and Process Safety Standards and Principles for the RPP Waste Treatment Plant Contractor.

Justification: The added references are applicable for the RPP-WTP project.

Section 3, Definitions

- Modify the definition of **harsh environment** to be: An environment expected as the result of the postulated service condition appropriate for the design basis event of the RPP-WTP. It is an environment that exceeds the conditions of a mild environment. Equipment that do not experience an environment beyond a mild environment during a design basis event can be considered to be in a mild environment.

Justification: A **harsh environment**, as defined by this standard, applies to a Nuclear Power Generating Station and are the result of a loss of cooling accident (LOCA)/high energy line brake (HELB) inside the containment and post-LOCA or HELB outside containment. The modified definition applies to RPP-WTP.

This modified definition is further supported by 10 CFR 50.49, Environmental qualification of electric equipment important to safety for nuclear power plants, which states, in Section C: " Requirements for (1) dynamic and seismic qualification of electric equipment important to safety, (2) protection of electric equipment important to safety against other natural phenomena and external events, and (3) environmental qualification of electric equipment important to safety located in a mild environment are not included within the scope of this Section. A mild environment is an environment that would at no time be significantly more severe than the environment that would occur during normal plant operation, including anticipated operational occurrences."

The definition of **mild environment** within the standard states:

"An environment expected as a result of normal service conditions and extremes (abnormal) in service conditions where seismic is the only design basis event (DBE) of consequences."

Therefore the normal operating environment for a SSC is considered a "mild environment" by this definition.

The following definition is applicable for the RPP-WTP:

- The definition of **design basis events** shall be added with the definition from DOE/RL-96-0006 which states:

"Postulated events providing bounding conditions for establishing the performance requirements of structures, systems, and components that are necessary to: 1) ensure the integrity of the safety boundaries protecting the worker; 2) place and maintain the facility in a safe state indefinitely; or 3) prevent or mitigate the event consequences so that the radiological exposures to the general public or the workers would not exceed appropriate limits. The Design-Basis Events also establish the performance requirements of the structures, systems and components whose failure under Design-Basis Event conditions could adversely affect any of the above functions."

Justification: The above listed definition was added to be applicable to the RPP-WTP project.

Section 7, Simulated Test Profiles

Delete this section.

Justification: This section is specific to Nuclear Power Generating Stations and describes profiles and margin for LOCA/HELB harsh environments.

Appendix J

WTP Specific Tailoring of IEEE Std. 344

Appendix J
WTP Specific Tailoring of IEEE Std. 344

22.0 IEEE-344, IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations

Revision: 1987(R1993)
Sponsoring Organization: The Institute of Electrical and Electronics Engineers, Inc.

RPP-WTP Specific Tailoring

The following tailoring of IEEE-344 is required for use by the RPP-WTP project as an implementing standard for SDC/SDS or SC/SS Seismic Class I electrical and instrument system design.

Pages 1-43, All Sections **Clarification of Nuclear Power Generating Station Terminology**

The term "Class 1E" in the Standard applies to "SC-I" in the RPP-WTP.

Justification: The Scope, Section 1.0 of IEEE-344 applies to equipment that needs to function during and after an SSE for a Nuclear Power Generating Station. For RPP-WTP the equipment that needs to function during and after a design basis earthquake is SDC/SDS/SC/SS equipment which must be qualified to SC-I.

Page 1, Section 1.2 **References**

Delete reference [5] CFR (Code of Federal Regulations), Title 10 Energy, Part 100 Reactor Site Criteria, published by office of the Federal Register, 1992.

Justification: Reference [5] contains radiation dose criteria and seismic criteria for Nuclear Power Generating Stations and is not applicable to the RPP-WTP project. The applicable criteria for RPP-WTP is found in 24590-WTP-SRD-ESH-01-001-02, Safety Requirements Document (SRD) Volume II, Safety Criteria 2.0-1 for radiological dose and 2.0-2 for chemical hazards. The applicable seismic criteria is contained in 24590-WTP-SRD-ESH-01-001-02, Safety Requirements Document (SRD) Volume II, in Section 4.1 General Design, Safety Criterion 4.1-3. This Safety Criterion defines Seismic Category (SC) I, II and III and provides seismic loads and source documents.

Delete reference [3] ANSI/IEEE Std 382-1985, *IEEE Standard for Qualification of Actuators for Power Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants*.

Justification: This standard will be replaced with IEEE Std 382-1996. The IEEE Std 382-1996 includes a Required Input Motion (RIM) curve.

Pages 1-2, Section 2 **Definitions**

Delete the definitions for **Operating basis earthquake** (OBE) and **safe shutdown earthquake** (SSE).

Add a definition for **design basis earthquake** as: Earthquakes for RPP-WTP and the applicability to systems, structures and components (SSCs) is contained in 24590-WTP-SRD-ESH-01-001-02, Safety Requirements Document (SRD) Volume II, in Section 4.1 General Design, Safety Criterion 4.1-3. This Safety Criterion defines Seismic Classes (SC) I, II and III and provide seismic loads and source documents.

Justification: The definition of OBE and SSE are applicable to Nuclear Power Generating Stations and the new definitions is applicable to the RPP-WTP project as defined in the SRD. This is consistent with the tailoring of AISC N690 as documented in ABCN-013.

Pages 1-43, All Sections Clarification of OBE and SSE

The term SSE in the standard is treated as a design basis earthquake. The requirement to apply and document the loads of a number of OBEs before an SSE is deleted from the standard.

Justification: The earthquake applicable to RPP-WTP is the design basis earthquake. The requirement to subject equipment to several OBEs prior to an SSE is not included in the requirements of the SRD for the RPP-WTP project. This is consistent with the tailoring of AISC N690 as documented in ABCN-013.

Page 13, Section 7.1.3.2 Repairs

In the fifth line delete the words, ", such as LOCA,".

Justification: LOCA is a term specific to Nuclear Power Generating Stations and not to the RPP-WTP project.

Page 15, Section 7.1.5 Vibrational Aging

In the last paragraph change the first sentence to read: "The purpose of the vibrational aging is to show that the lower levels of normal and transient vibration associated with plant operation will not adversely affect an equipment's performance of its safety function nor cause any condition to exist that, if undetected, would cause failure of such performance during a subsequent design basis earthquake.

Justification: This sentence within the standard included additional vibration aging of an OBE, but used the terms "lower intensity earthquake" rather than OBE. The rewording is needed to clarify the meaning of the sentence. The requirement to subject equipment to several OBEs prior to an SSE is not included in the requirements of the SRD for the RPP-WTP project. The earthquake applicable to RPP-WTP is the design basis earthquake. This is consistent with the tailoring of AISC N690 as documented in ABCN-013.

Page 16, Section 7.1.6.1, Hydrodynamic Loads

Delete the words, "and the loss-of-coolant accident (LOCA)

Justification: LOCA is a term specific to Nuclear Power Generating Stations and not to the RPP-WTP project.

This page intentionally left blank.

Quarter Ending 12/31/2010 24590-HLW-PCN-ENV-10-004

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Page 2 of 2: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant

Replace Permit Specification 24590-HLW-3PS-MQR0-TP002, *Engineering Specification for HLW System HDH Canister Rinse Bogie* in Appendix 10.7 of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator:		Reviewed by ORP Program Office:	
[signature]	10/4/10	[signature]	10/28/10
D. M. Busche	Date	D. L. Noyes	Date

Quarter Ending 12/31/2010 24590-HLW-PCN-ENV-10-004

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update 24590-HLW-3PS-MQR0-TP002, *Engineering Specification for HLW System HDH Canister Rinse Bogie.*

The following specification is being submitted to replace the specification currently in Appendix 10.7:

Appendix 10.7			
Replace:	24590-HLW-3PS-MQR0-TP002, Rev. 2	With:	24590-HLW-3PS-MQR0-T0002, Rev. 4

This modification requests Ecology approval and incorporation into the permit the specific changes to this specification that are identified below and/or by revision bars shown on the specification that have been issued since the last revision of the specification. Revisions are the result of ongoing design (changes from vendor preliminary data to vendor detailed design) and incorporate general criteria from a design verification review. The following identifies the significant changes that have been revised on the attached specification:

- Minor editorial and format changes
- In Section 2.3, 24590-WTP-PER-PL-02-001, Rev 6, *Engineering Specification for Piping Material Classes*, has been replaced by 24590-WTP-3PS-P000-T0001 Rev 4, *Engineering Specification for Piping Material Classes*
- Adds Section 3.8 specifying a fail-open functional requirement for drain valve YV0182
- Adds Section 5.2.1.21 specifying drip tray requirements in the case of vertically split gear cases
- Section 11.14 adds 24590-WTP-SDDR-MH-07-00110, -00111, -00114, -00117, and -00118 to the list of documentation incorporated by reference

The following is a list of outstanding change documents that have not been incorporated into this modification:

- 24590-QL-MRA-MQTS-00002-T0003
- 24590-WTP-SDDR-MH-07-00287
- 24590-WTP-SDDR-MH-08-00174
- 24590-WTP-SDDR-MH-08-00271
- 24590-WTP-SDDR-MH-09-00227

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number:

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: [X] Yes [ ] Denied (state reason below)	Reviewed by Ecology:
Reason for denial:	JJWallace for 12·17·10
	J. J. Wallace — Date

ISSUED BY
RPP-WTP PDC

R10923205

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

HLW System HDH Canister Rinse bogie

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

Content applicable to ALARA? ☒ **Yes** ☐ **No**

ADR No.
24590-HLW-ADR-M-02-048

Rev
1

Quality Level
Q
DOE Contract No. DE-AC27-01RV14136

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

4	6/3/08	D. Lopez	A. Ceja	J. Hancock	N/A	N/A	D. J. Wilsey
3	4-18-05	J. Hancock	R. Wight	P. Snider	C. Meng	G. T. Warner	D. J. Wilsey
2	2-3-04	J. Hancock	E. Szavay	J. L. Weamer	N/A	G. T. Warner	D. J. Wilsey
1	4-14-03	J. Hancock	J. Roach	J. L. Weamer	N/A	G. T. Warner	D. J. Wilsey
0	9-12-02	S. Bradshaw	J. Hancock	N/A	N/A	G. Warner	G. Duncan
REV	**DATE**	**BY**	**CHECK**	**REVIEW**	**E&NS**	**QA**	**DPEM**

SPECIFICATION No.
24590-HLW-3PS-MQR0-T0002

Rev
4

Revision History

Revision	Reason for Revision
0	Issued for Procurement
1	Issued for Purchase. Seismic requirements clarified. Appendix A updated. Appendix B & C added. Additional revisions indicated with revision bars.
2	Issued for Purchase. SCN 24590-HLW-3PN-MQR0-00002 & 24590-HLW-3PN-MQR0-00002 incorporated. Additional revisions indicated with revision bars.
3	Issued for Purchase. SCN's 24590-HLW-3PN-MQR0-00003, 24590-HLW-3PN-MQR0-00004, 24590-HLW-3PN-MQR0-00005, 24590-HLW-3PN-MQR0-00006, 24590-HLW-3PN-MQR0-00007 & 24590-HLW-3PN-MQR0-00008 incorporated. SDDR's 24590-WTP-SDDR-PROC-04-00857, 24590-WTP-SDDR-PROC-05-00041, 24590-WTP-SDDR-PROC-05-00180, 24590-WTP-SDDR-PROC-05-00551, & 24590-WTP-SDDR-PROC-05-00552 incorporated. Exclusions to general specifications identified in sections 5.1.6, 5.2.2.2, 5.2.2.17, 5.7.1, 5.7.8, 5.8.1.1, 6.1, 7.2, 8.2.3.1, and 8.5.1.
4	Issued for purchase SCN's: 24590-HLW-3PN-MQR0-00009, 24590-HLW-3PN-MQR0-00010, and 24590-HLW-3PN-MQR0-00011 Incorporated. SDDR'S: 24590-WTP-SDDR-M-05-00403, 24590-WTP-SDDR-MH-07-00115 incorporated. SDDRs incorporated by Reference: 24590-WTP-SDDR-M-05-00117, 24590-WTP-SDDR-MH-07-00110, 24590-WTP-SDDR-MH-07-00111, 24590-WTP-SDDR-MH-07-00114, 24590-WTP-SDDR-MH-07-00117, and 24590-WTP-SDDR-MH-07-00118. QA and E&NS signatures are not required on the sign off sheet because they have both previously reviewed and approved all the incorporated change documents for this revision.

Contents

Appendices

Figures

1 Scope

1.1 Project Description and Location

1.1.1 The Office of River Protection (ORP) and its contractors manage 177 underground radioactive waste storage tanks at the Hanford Site in Washington. These tanks contain approximately 55.5 million US gallons of radioactive waste. Bechtel National, Inc. (BNI) has entered into a contract with the US Department of Energy (DOE) to design, construct, and commission a Hanford Tank Waste Treatment and Immobilization Plant (WTP) to process and vitrify the waste into a stable form that is suitable for permanent storage. The WTP will be constructed in the 200 East Area of the Hanford Site, near Richland, Washington. The main facilities within the WTP complex will be the Pretreatment (PTF), Low-Activity Waste (LAW) and High-Level Waste (HLW) Facilities.

1.2 Equipment, Material, and Services Required

1.2.1 This engineering specification covers the equipment, materials and services required for the design and supply of the HLW Canister Decontamination Handling (HDH) System, Canister Rinse Bogie and associated equipment.

1.2.2 A bogie is a four (4) wheeled trolley that travels on a pair of parallel rails.

1.2.3 The Canister Rinse Bogie is used to transport Immobilized High-Level Waste (IHLW) Canisters containing radioactive material from one location to another during process activities. A vessel located on the bogie holds the canister and performs a pre-wash of the canister at an intermediate station. The bogie travels in a process tunnel during normal operation, but has the ability to leave the tunnel and enter an adjoining room for maintenance purposes. A shield door separates the process and maintenance areas, and provides radiological shielding.

1.2.4 This specification supports Material Requisition (MR) No. 24590-QL-MRA-MQTS-00002

1.2.5 The Seller shall design, fabricate, inspect and functionally test equipment as specified in this specification. The equipment shall be fabricated and assembled in compliance with this specification, referenced codes and standards, and detail drawings reviewed by the Buyer. The Seller is responsible for:

- Design
- Procurement of materials
- Fabrication
- Assembly
- Tagging equipment with a component tag number (CTN)
- Functional Testing
- Examination/inspection
- Packaging and preparation for shipping
- Loading of equipment on Buyer arranged conveyance
- Umbilical electric cable located in Bogie Maintenance Area, see Section 3

- Submittals as identified in the submittal requirements found in the Purchase Order (PO) and this specification
- Installation, Operation, and Maintenance Manuals
- Lists of recommended spare parts
- Field support for installation and testing

1.2.6 The Seller shall provide the following equipment and any other equipment as necessary to perform the requirements identified in this specification:

Plant Item Number 24590-HLW-	**Description**
MQ-HDH-TRLY-00003	Canister Rinse Bogie
MV-HDH-VSL-00001	Canister Rinse Bogie Decon Vessel
MH-HDH-RAIL-00002	Canister Rinse Bogie Rails
MH-HDH-RAIL-00004	Canister Rinse Bogie Seismic Rails
MH-HDH-MHAN-00016	Canister Rinse Vessel Service Track
MH-HDH-MHAN-00017	Canister Rinse Bogie Service Track
MH-HDH-RCVY-00009	Canister Rinse Bogie Recovery System
MH-HDH-MHAN-00011	Canister Rinse Bogie Spool Piece
MH-HDH-MHAN-00015	Canister Rinse Vessel Lid
MP-HDH-PMP-00001	Bogie Decon Canister Pump
JC-HDH-PNL-00001	Canister Rinse Bogie ASD Control Cabinet

1.2.7 The Seller shall provide any special lifting equipment and tools, for assembly (or disassembly), installation, or maintenance of the bogie and associated equipment.

1.2.8 The Buyer shall provide a "mock-up" canister for shop testing, see Section 8.2 of this specification.

1.2.9 The Seller shall verify the accuracy and applicability of design information to meet the requirements identified in this specification. The Seller is encouraged to propose design improvements, which could result in quality, performance, cost, or schedule benefits beyond those offered by the Design Proposal Drawings (DPDs), and Mechanical Data Sheets (MDSs) accompanying the Purchase Order.

1.2.10 All requests for substitutions, modifications, or relaxation of this specification or requirements specified in the referenced documents shall be identified in writing for the consideration of the Buyer. For DPDs and MDSs, the following shall be considered required elements: parameters indicated as bounding ("max", "min", "not-to-exceed", or similar qualifier); information present on the DPDs and MDSs that includes the term "required", "mandatory", "shall", or similar term; components or equipment identified as pre-selected or mandatory by the Buyer. The Seller shall document such changes in a Supplier Deviation Disposition Request (SDDR) in accordance with Section 2 of the Purchase Order.

1.2.11 The following items and services will be supplied by the Buyer and are not included in the Seller's scope of work:

- Embed plates embedded in structural concrete to which equipment is anchored
- Waste Neutralization Vessel (PI. No. 24590-HLW-MV-HDH-VSL-00003)

- Shipment from Seller's location to the Hanford receiving location
- Unloading at Hanford receiving location
- Field assembly, installation, erection and field testing of the bogie, vessel, and associated equipment
- Field startup, test, and run-in labor and materials
- Installation of conduit and wiring from the Seller provided control cabinets to the Buyer's Motor Control Center (MCC), Buyer's Controller, and Buyer's Remote I/O
- Mains electric power supply and connections
- Field touch-up painting
- Programming of the bogie control system
- Startup and commissioning
- Mock-up canister

1.3 Work by Others

1.3.1 The Seller may subcontract portions of the work, including any portion of the design, fabrication, manufacturing, or inspection, provided it meets the conditions of this specification and the Buyer's approval is obtained.

1.3.2 The Seller shall be ultimately responsible for the completeness and quality of all materials and services provided.

1.4 Definitions and Abbreviations

1.4.1 Definitions

1.4.1.1 Buyer: Bechtel National, Inc. (BNI)

1.4.1.2 Offeror: The party submitting a proposal for the equipment and/or services described in this specification.

1.4.1.3 Seller: The party selected to provide the equipment and/or services described in this specification.

1.4.1.4 Shall: Indicates a mandatory requirement in order to comply

1.4.1.5 Should: Indicates a recommendation for compliance

1.4.2 Abbreviations

ANSI	American National Standards Institute
AISC	American Institute of Steel Construction
API	American Petroleum Institute
ASD	Adjustable Speed Drive
ASME	American Society of Mechanical Engineers
AWS	American Welding Society
BNI	Bechtel National, Inc.
CFR	Code of Federal Regulations
CM	Commercial Quality

CMAA	Crane Manufacturers Association of America
CTN	Component Tag Number
DOE	Department of Energy
DPD(s)	Design Proposal Drawing(s)
EMI	Electromagnetic Interface
HDH	HLW Canister Decontamination Handling
HLW	High-Level Waste
HMI	Human-Machine Interface
ICN	Integrated Control Network
ICS	Industrial Controls and Systems
IEEE	Institute of Electrical and Electronics Engineers
IHLW	Immobilized High-Level Waste
IJB	Instrument Junction Box
I/O	Input/Output
ISA	Instrumentation, Systems, and Automation Society
ITS	Important to Safety
LAW	Low-Activity Waste
LOI	Local Operator Interface
MCC	Motor Control Center
MDS(s)	Mechanical Data Sheet(s)
MHD(s)	Mechanical Handling Diagram(s)
MR	Material Requisition
MSDS	Material Safety Data Sheet
MTR(s)	Material Test Report(s)
NDE	Non-Destructive Examination
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Agency
NQA	Nuclear Quality Assurance
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
P&ID(s)	Piping and Instrumentation Diagram(s)
PO	Purchase Order
PTF	Pretreatment Facility
PTFE	Polytetrafluoroethylene
QAP	Quality Assurance Program
QL	Quality Level
RFI	Radio Frequency Interface
RIO	Remote I/O
SC	Seismic Category
SDC	Safety Design Class
SDDR	Supplier Deviation Disposition Request
SDS	Safety Design Significant
SSC(s)	Structures, Systems or Components
TEFC	Totally Enclosed Fan Cooled
TFE	Tetrafluoroethylene
UBC	Uniform Building Code
UL	Underwriters Laboratories
WNRF	Weld Neck Raised Face
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.5 Safety/Quality Classifications

1.5.1 Important to Safety

1.5.1.1 Structures, Systems, and Components (SSCs) that serve to provide reasonable assurance that the facility can operate without undue risk to the health and safety of the workers and public are classified as Important to Safety (ITS). ITS encompasses the broad class of facility features addressed in the top-level radiological, nuclear, and process safety standards and principles that contribute to the safe operation and protection of workers and the public during all phases and aspects of facility operations (i.e., normal operation and accident mitigation).

1.5.1.2 SSCs designated as ITS are classified as either Safety Design Class (SDC) or Safety Design Significant (SDS).

- The classification Safety Design Class (QL-1) is assigned to SSCs that prevent or mitigate offsite public, worker, or co-located worker radiological exposures that could exceed the standards.

- The classification Safety Design Significant (QL-2) is assigned to SSCs that ensure the that radiological standards for normal operation are not exceeded.

1.5.1.3 For Quality Assurance requirements of ITS SSCs refer to Section 10 of this specification.

1.5.2 Non Important to Safety

1.5.2.1 SSCs designated as Non-ITS, or Commercial Quality (CM), are those SSCs not classified as SDS, SDC, or Immobilized High-Level Waste (IHLW) product-quality affecting. Non-ITS items are manufactured using standard commercial practices as required by applicable industry standards, with the quality requirements identified in the Seller's Quality Assurance Program (QAP).

1.5.2.2 For Quality Assurance requirements of Non-ITS SSCs refer to Section 10 of this specification.

1.5.3 Equipment Classifications

1.5.3.1 The table below identifies equipment that have components designated as ITS.

Equipment	Components	Safety Classification (Quality Level)	Critical Characteristics
Canister Rinse Bogie	All components that maintain structural integrity (i.e. load path items) of the bogie and vessel support stand. These include but are not limited to, bogie chassis, vessel support stand, uplift restraints, bumpers, bogie rail end stops, and bolted/welded connections on the load path, including connections to bogie chassis.	SDS (QL-2)	Maintain vessel and canister on bogie and prevent bogie from derailing under normal operating conditions (following a wheel failure) or an SC-II design basis earthquake.
	All other components (including drive system and wheel modules)	Non-ITS	N/A
Canister Rinse Bogie Seismic Rails	All load path components that maintain the structural integrity, including bolted/welded connections.	SDS (QL-2)	Prevent bogie from derailing under normal operating conditions (following a wheel failure) or an SC-II design basis earthquake.
	All other components	Non-ITS	N/A

1.5.3.2 All other equipment identified in this specification are designated as Non-ITS. SSCs, identified as Non-ITS can include, but are not limited to, non-load path items and proprietary items such as motors, gearboxes and winches.

1.5.3.3 For seismic loading requirements, refer to Section 5.6.4 of this specification.

2 Applicable Documents

2.1 General

2.1.1 Work shall be carried out in accordance with, but not limited to, the applicable codes and standards listed in the following subsections. The specific revision or effective date identified, as well as the specific revision or effective date of codes and standards that they incorporate by reference (daughter codes and standards) shall be followed. If a date or revision is not identified, the latest issue, including addenda, in effect at the date of contract award or later, shall be used. Deviation from the dated codes and standards shall only apply with the agreement of the Buyer, or when in accordance with Sections 6.5 and 6.6 of this specification.

2.1.2 The Seller shall refer to Section 2 of the Purchase Order for the appropriate revisions of the WTP project documents identified in Sections 2.3, 2.4 and 2.5 of this specification.

2.1.3 Any known or suspected conflicts between the specifications, drawings, and the applicable codes and standards, shall be brought to the attention of the Buyer, via a SDDR, for resolution prior to start of work.

2.1.4 Where requirements in this specification exceed code requirements, this specification shall govern.

2.1.5 Deleted

2.2 Codes and Standards

2.2.1 American Society of Mechanical Engineers (ASME)

ASME NQA-1-1989, *Quality Assurance Program Requirements for Nuclear Facility Applications*

ASME B&PV Section VIII Division 1, *Rules for Construction of Pressure Vessels DIVISION 1 Non-Interfiled (Boiler and Pressure Vessel Codes)*

ASME B31.3 -1996, *Process Piping*

ASME NOG-1-2002, *Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)*

ASME/ANSI B73.2M, *Specification for Vertical In-Line Centrifugal Pumps for Chemical Process*

ASME B46.1, *Surface Texture (Surface Roughness, Waviness & Lay)*

2.2.2 American Welding Society (AWS)

AWS D1.1 2002, *Structural Welding Code – Steel*

AWS D1.6, *Structural Welding Code – Stainless Steel*

2.2.3 American Institute of Steel Construction (AISC)

AISC MO16, *Manual of Steel Construction, Allowable Stress Design, 9th Edition*

2.2.4 Crane Manufacturers Association of America (CMAA)

CMAA 70-2000, *Specification for Top Running Electric Overhead Traveling Cranes*

2.2.5 Department of Energy (DOE) Orders and Directives

DOE O 414.1A, *Quality Assurance*

2.2.6 Instrumentation, Systems, and Automation Society (ISA)

ISA 5.1, *Instrument Symbols and Identification*

2.2.7 National Electrical Manufacturers Association (NEMA)

NEMA, MG-1-1998, *Motors and Generators*

2.2.8 Institute of Electrical and Electronics Engineers (IEEE)

IEEE Std 1023-1988, *IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations*

IEEE Std 1205-2000, *IEEE Guide for Assessing, Monitoring, and Mitigating Aging Effects on Class 1E Equipment used in Nuclear Power Generating Stations, Annex D*

2.2.9 Code of Federal Regulations (CFR)

FED-STD 595B-1994, *Colors Used in Government Procurement*

10 CFR Part 830, *Quality Assurance Criteria*

2.2.10 Uniform Building Code (UBC)

UBC-1997, *Uniform Building Code*

2.2.11 Underwriters Laboratories (UL)

UL 508 -1999, *Standard for Safety Industrial Control Equipment*

2.2.12 National Fire Protection Association (NFPA)

NFPA Volume 70, 1999 National Electric Code (NEC)

2.2.13 Department of Defense and Energy Standards, Nuclear Regulations

MIL-STD-1472F Human Engineering

DOE-HDBK-1140, 2001 of	Human Factors/Ergonomics Handbook for the Design for Ease Maintenance
NUREG-0700	Human System Interface Design Review Guidelines
NUREG-0711	Human Factors Engineering Program Review Model

2.2.14 American Society of Testing Materials (ASTM)

ASTM A554 Standard Specification for Welded Stainless Steel Mechanical Tubing.

2.2.15 EN 292-1 Safety of Machinery - Basic Concepts, General Principles of Design - Part 1; Basic Terminology, Methodology.

2.2.16 EN 292-2 Safety of Machinery - Basic Concepts, General Principles of Design - Part 2; Technical Principle and Specifications.

2.2.17 ISO 281:1990 Roller bearings - Dynamic load ratings and rating life.

2.2.18 AGMA 908 Geometry Factors for Determining Pitting Resistance and Bending Strength of Spur, Helical, and Herringbone Gear Teeth.

2.2.19 AGMA 2001 Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gears.

2.3 WTP Project Specifications

2.3.1 24590-WTP-3PS-M000-T0002, Rev 0, *General Specification for Mechanical Handling Equipment Design and Manufacture,* Bechtel National, Inc., Richland, Washington. Sections which do not apply to this equipment: 3.5.8.1, 3.5.8.2, 3.5.8.5, 3.6, 3.7, 4.1.9, 4.1.10, 4.1.11, 4.1.12, 4.10.1, 4.10.4, 4.12, and 4.13.

2.3.2 24590-WTP-3PS-P000-T0001, Rev 4, *Engineering Specification for Piping Material Classes,* Bechtel National, Inc., Richland, Washington. Section which does not apply to this equipment: 16.

2.3.3 24590-WTP-3PS-EKP0-T0001, Rev 2, *Engineering Specification for Electrical Requirements for Packaged Equipment,* Bechtel National, Inc., Richland, Washington. Sections which do not apply to this equipment: 6.4.2.3, 6.4.3.1, 6.6.1, 6.6.3, and 6.8.

2.3.4 24590-WTP-3PS-JQ07-T0001, Rev 1, *Engineering Specification for Instrumentation for Package Systems,* Bechtel National, Inc., Richland, Washington. Sections which do not apply to this equipment: 3.4.5.1, 3.4.5.2.3, 3.4.5.4.4, 3.4.5.9, 3.4.5.10, 3.4.5.12, 3.4.5.13, 3.4.5.14, 3.4.5.15, 3.4.5.16, 3.4.5.17, 3.7.1, 3.8.3, 3.8.4, 3.8.6, 3.8.7, and 3.8.8.1.

2.3.5 24590-WTP-3PS-MUMI-T0002, Rev 2, *Engineering Specification for Low Voltage Induction Motors,* Bechtel National, Inc., Richland, Washington. Sections which do not apply to this equipment: 5.1.1, 5.3, and 5.4.1.

2.3.6 24590-WTP-3PS-JD02-T0001, *Engineering Specification for Intelligent Drives for Packaged Equipment,* Bechtel National, Inc., Richland, Washington

2.3.7 Deleted.

2.3.8 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling, and Storage Requirements*, Bechtel National, Inc., Richland, Washington

2.3.9 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment,* Bechtel National, Inc., Richland, Washington

2.3.10 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements,* Bechtel National, Inc., Richland, Washington

2.3.11 24590-WTP-3PS-SS00-T0001, Rev 5, *Welding of Carbon Structural Steel*, Bechtel National, Inc., Richland, Washington. Section which does not apply to this equipment: 8.18.

2.3.12 24590-WTP-3PS-SS00-T0002, *Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*, Bechtel National, Inc., Richland, Washington

2.3.13 24590-WTP-3PS-JV15-T0001, *Engineering Specification for Actuators for On/Off Valves*, Bechtel National, Inc., Richland, Washington

2.3.14 24590-WTP-3PS-PV00-T0001, Rev 1, *Engineering Specification for Technical Supply Conditions for Valves*, Bechtel National, Inc., Richland, Washington. Section which does not apply to this equipment: 5.4.

2.4 WTP Design Documents

2.4.1 Design Proposal Drawings (DPDs)

Document Number	Document Description
24590-HLW-M0-HDH-00013	Canister Rinse Bogie Arrangement
24590-HLW-M0-HDH-00012001	Canister Rinse Bogie
24590-HLW-M0-HDH-00012002	Canister Rinse Bogie
24590-HLW-M0-HDH-00008	Canister Rinse Bogie Rails
24590-HLW-M0-HDH-00010	Canister Rinse Bogie Seismic Rails
24590-HLW-M0-HDH-00043	Canister Rinse Bogie Service Tracks
24590-HLW-M0-HDH-00029	Canister Rinse Bogie Recovery System

2.4.2 Mechanical Data Sheets (MDSs)

Document Number	Document Description
24590-HLW-M0D-HDH-00029	Canister Rinse Bogie Spool Piece

Document Number	Document Description
24590-HLW-M0D-HDH-00030	Canister Rinse Vessel Lid
24590-HLW-MPD-HDH-00001	HDH-PMP-00001 Canister Rinse Bogie Pump
24590-HLW-MVD-HDH-00009	HDH-VSL-00001 Canister Rinse Bogie Vessel

2.4.3 Reference Drawings and Data Sheets

Document Number	Document Description
24590-HLW-M6-HDH-00002	P&ID – HLW Canister Decontamination Handling System
24590-HLW-M0-HDH-00001001	DPD, Canister Rinse Bogie Decon/Maint Shield Door Arrangement
24590-HLW-M0-HDH-00001002	DPD, Canister Rinse Bogie Decon/Maint Shield Door Arrangement & Details
24590-HLW-M0-HDH-00002	DPD, Canister Rinse Bogie Decon/Maint Shield Door Embed Plates
24590-HLW-M0-30-00001001	HLW Test Canister Assembly
24590-HLW-M0D-HDH-00002	MDS, Canister Rinse Bogie Maint Crane 1
24590-HLW-M0D-HDH-00003	MDS, Canister Rinse Bogie Maint Crane 2

2.5 Other WTP Documents

2.5.1 24590-WTP-3PD-MQTS-00002, *Supplier Quality Assurance Program Requirements Data Sheet*, Bechtel National, Inc., Richland, Washington

2.5.2 24590-WTP-3PD-MQTS-00004, *Supplier Quality Assurance Program Requirements Data Sheet*, Bechtel National, Inc., Richland, Washington

2.5.3 24590-HLW-SOC-S15T-00009, Rev 0D, *HLW Vitrification Building Seismic Analysis - In-Structure Response Spectra (ISRS)*, Bechtel National, Inc., Richland, Washington.

2.5.4 24590-HLW-SOC-S15T-00039, Rev D, *HLW Vitrification Building Seismic Analysis - Enveloped In-Structure Response Spectra*, Bechtel National, Inc., Richland, Washington.

3 System Description

3.1 The Canister Rinse Bogie operates in the HLW Canister Decontamination Handling (HDH) System.

3.2 The Canister Rinse Bogie travels in the Canister Rinse Tunnel (Room H-B039B) during normal operations. The Canister Rinse Tunnel is classified as a C5/R5 and C3/R3 transition zone. Maintenance activities are performed in an adjoining Bogie Maintenance Area (Room H-B039A), separated by a shield door from the process area. The Bogie Maintenance Area is classified as C3/R3. For environmental conditions and definitions of the classification of areas refer to project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture*.

3.3 Where dual classifications are identified on the DPDs, for example, C5/R5 and C3/R3, they indicate a transition zone where the room is designated as C5/R5 when a container is present and C3/R3 when a container is not present.

3.4 The Canister Rinse Bogie transfers glass filled IHLW Canisters from a position below the Canister Handling Cave (Room H-136) to a position below the Canister Decontamination, Swabbing and Monitoring Cave (Room H-133). A vessel located on the bogie holds the canister and performs a pre-wash of the canister at an intermediate station.

3.5 The purpose of the pre-wash is to perform a general rinse of the canister prior to transfer into the Canister Decontamination, Swabbing and Monitoring Cave.

3.6 The basic operations are as follows:

- Bogie and vessel positioned under the hatch located in the Canister Handling Cave
- Canister lowered into vessel, through hatch, by overhead crane located in the Canister Handling Cave
- Bogie, vessel and canister travel to the Canister Rinse Station
- Canister rinse cycle, see Section 4.2 of this specification
- Bogie, vessel and canister travel to a position under the hatch located in the Canister Decontamination, Swabbing, and Monitoring Cave
- Canister removed from bogie after 30 minute drying period, through hatch, by overhead crane located in the Canister Decontamination, Swabbing, and Monitoring Cave
- Bogie and vessel travel to a position under the hatch located in the Canister Handling Cave

3.7 Process and electrical services are provided to the bogie and vessel through service tracks (energy chains) located in the Canister Rinse Tunnel. When the bogie requires transferring from the process area to the maintenance area the service tracks and the service connections (process and electrical) are manually disconnected from the bogie at the shield door aperture and parked on a bracket located at the door aperture. A Seller provided umbilical electrical cable, located in the maintenance area, is manually connected to the bogie terminal box allowing the bogie to transfer into the maintenance area. The umbilical electrical cable provides the power and control to the bogie only. Once the bogie is located in the maintenance area the shield door is closed prior to any maintenance activities being performed.

3.8 The drain valve (YV0182) (Classified as Safety Significant and Seismic Category SC-1) for the Canister Rinse Bogie shall be designed to fail in the open position upon loss of normal power. This is to mitigate the possibility of the accumulation of Hydrogen (HPAV) if the system were to shut down with a canister on the rinse bogie for an extended period of time.

4 Equipment Description

4.1 Canister Rinse Bogie

4.1.1 The bogie is a motorized trolley used for transporting IHLW Canisters containing radioactive material from one location to another during process activities.

4.1.2 The bogie is driven by an on-board geared motor, and travels on a pair of floor-mounted rails.

4.1.3 Power and control are provided to the bogie through a service track.

4.1.4 The bogie control system uses bogie mounted proximity switches and the motor brake to control the process stopping positions of the bogie

4.1.5 The bogie control system uses a bogie mounted ultimate travel limit switch to prevent the bogie from impacting the rail end stops in the event of a proximity (positioning) switch failure.

4.1.6 A stand mounted to the bogie chassis supports the Canister Rinse Vessel.

4.1.7 Restraints mounted to the side of the vessel support stand, in conjunction with the seismic rails (see Section 4.4), prevent the bogie from overturning or derailing in the event of a wheel failure or a seismic event.

4.2 Canister Rinse Vessel

4.2.1 The vessel is mounted to a support frame located on the bogie chassis. The vessel locates the canister for transfer and provides the containment and associated services for canister washing.

4.2.2 An inflatable seal mounted to the top flange of the vessel provides the seal between the vessel and the spool piece (see Section 4.7) to provide containment of the water spray during the rinse cycle. Process air is supplied to the inflatable seal from the Buyer's plant utility system through a 1" pipe, and has a line pressure of 90 - 100 psig. The line pressure is reduced to 25 psig by a pressure regulator for the inflatable seal air supply.

4.2.3 A series of spray nozzles located in the vessel directs demineralized water to spray the entire surface of the canister. The proposal drawings provided with this specification show an upper and lower spray ring. This allows the canister to be sprayed in stages due to the limiting flow rate. Demineralized water is supplied to the vessel from the Buyer's plant utility system through a 2" pipe, and has a maximum flow rate of 90 gpm and pressure 60 psig.

4.2.4 The maximum batch transfer to the vessel is 360 gallons. Maximum batch transfer is defined as the maximum water volume transferred to the vessel during the rinse cycle.

4.2.5 Two (2) solenoid operated on/off control valves divert the water flow between the upper and lower spray rings while a centrifugal pump continually discharges the water from the vessel during the rinse cycle. Water is discharged from the vessel to the Buyer's Waste Neutralization Vessel through a 2" pipe.

4.2.6 A high-high level switch and continuous level instrument monitor the water levels in the vessel during the rinse cycle.

4.2.7 The following rinse cycle is based on the proposal drawings provided with this specification:

- Pressurize the inflatable seal to make the seal between the vessel and the spool piece.

- Open the upper demineralized water line for the upper spray ring to begin the water wash.
- After the vessel has filled to 10 gallons, confirm that the vessel discharge pump has begun discharging the water at 80 gpm.
- After washing with 180 gallons of water in 2 minutes, close upper demineralized water line. After 2.5 minutes the vessel should be fully drained (check the level indicator on the vessel).
- Open the lower demineralized water line for the lower spray ring to finish the water wash.
- After the vessel has filled to 10 gallons, check that the vessel discharge pump has begun discharging the water at 80 gpm.
- After washing with 180 gallons of water in 2 minutes, close lower demineralized water line. After the vessel is emptied (2.5 minutes), ensure the vessel discharge pump is shut off.
- Depressurize the inflatable seal.

4.2.8 The pressurized demineralized water and plant process air are provided to, and removed from, the vessel through a dedicated process service track. Power and control are provided to the vessel equipment through the same service track that provides the electrical services to the bogie.

4.3 Canister Rinse Bogie Rails

4.3.1 The bogie rails run between the Canister Rinse Tunnel and the Bogie Maintenance Area. The rail supports are mounted on embeds located in the floor.

4.3.2 The rails guide the bogie between the process stations maintaining the relative position of the bogie to the process stations.

4.3.3 End-stops are located at the end of the rails to prevent bogie over-travel.

4.4 Canister Rinse Bogie Seismic Rails

4.4.1 The seismic rails are mounted on embeds located in the North and South walls of the Canister Rinse Tunnel.

4.4.2 The seismic rails, in conjunction with the bogie restraints, prevent the bogie from overturning or derailing in the event of a wheel failure or a seismic event.

4.5 Canister Rinse Bogie Service Tracks

4.5.1 Two (2) service tracks (energy chains) are located in the Canister Rinse Tunnel. One service track provides the routing for the electrical services to the bogie and the vessel, the other provides the routing for process services (water and air) to the vessel. The service tracks are dynamic tracks that allow movement of the bogie while maintaining fixed connections at the entry to and exit from the track for connection and routing of services.

4.5.2 The proposed design includes 4 cable systems: (1) mechanical handling power - bogie motor, (2) mechanical handling instrumentation - position sensors/limit switches, (3) process power - pumps and valves, (4) process instrumentation - level switches and transmitters.

4.5.3 The proposed design includes 3 process hoses: (1) water supply, (2) water discharge, and (3) air supply.

4.5.4 A Seller supplied bracket, at the shield door aperture, allows the service tracks to be parked in position prior to transferring the bogie into the maintenance area.

4.6 Canister Rinse Bogie Recovery System

4.6.1 The recovery system provides a means of recovering the bogie in the event of a component failure that would cause the bogie to become immobile.

4.6.2 In a recovery event the bogie is towed by a recovery block located at the West end of the bogie rail. The recovery block is connected, via a static cable, to a wall-mounted electric winch located in the maintenance area.

4.6.3 In a recovery event the canister is either removed from a position directly under the Canister Handling Cave (if the bogie has not moved from its park position), or the bogie is recovered to a position under the Canister Decontamination, Swabbing and Monitoring Cave where the canister is removed. The bogie is then recovered into the Bogie Maintenance Area where hands-on maintenance can be performed.

4.7 Canister Rinse Bogie Spool Piece

4.7.1 The spool piece is mounted to an embed located on the ceiling of the Canister Rinse Tunnel at the Canister Rinse Station. The spool piece provides the sealing surface for the vessel mounted inflatable seal.

4.8 Canister Rinse Vessel Lid

4.8.1 The vessel lid is placed over the top of the vessel while the bogie and vessel are located in the maintenance area. The vessel lid minimizes the potential for transfer of radioactive particulate (contamination) from inside the vessel while it is located in the maintenance area. The vessel lid is stored in the maintenance area.

5 Design Requirements

5.1 General

5.1.1 System components and equipment provided in accordance with this specification shall not exceed the bounding equipment envelope dimensions implied or explicitly indicated on the DPDs and MDSs referenced in Section 2.4 of this specification.

5.1.2 Equipment weights shall not exceed the bounding weights indicated on the DPDs and MDSs without Buyer authorization. The Seller shall be responsible for any analysis required to determine embed loadings for equipment weights exceeding the bounding weights indicated on the DPDs and MDS, and are subject to Buyer review.

5.1.3 System components and equipment provided in accordance with this specification shall utilize the facility concrete embedments as depicted in the DPDs and MDSs referenced in Section 2.4 of this specification. Equipment mountings shall be capable of accommodating embed plate placement and orientation tolerances specified in sections 5.1.3.1 and 5.1.3.2 of this specification.

5.1.3.1 Tolerances for concrete placement shall be in accordance with the Table for Concrete Placement Tolerances, unless noted otherwise on the project drawings.

Table for Concrete Placement Tolerances

Component	Category	Tolerance
Footings	Lateral Alignment – As cast to center of individual footing.	0.02 times width of footing in direction of misplacement but not more than 2 in.
	Horizontal dimension for unformed members cast against soil. 2 feet or less Over 2 feet, but less than 6 feet Over 6 feet	 +3 in. or –1/2 in +6 in. or –1/2 in. +12 in. or –1/2 in.
	Level Alignment – Top of footings	+1/2 in. and –2 in.
	Cross-Sectional Dimensions – Horizontal dimension of formed members.	+2 in. and –1/2 in.
	Cross-Sectional Dimensions – Vertical dimension (thickness)	+5%
	Relative Alignment – Single footing side and top surface slope with respect to specified plane.	+1 in. within 10 feet
Cast-In-Place Concrete for Buildings	Vertical Alignment/Plumbness – (Lines, surfaces, and rises): Outside corner of exposed corner columns and control joint grooves in concrete exposed to view.	±1 in. ±1/2 in.
	Lateral Alignment: (Horizontal Location) Members Centerline location of openings 12 in. or smaller in slabs and edge location of larger openings. Sawcuts, joints, and weakened plane embeds	 ±1 in. ±1/2 in. ±3/4 in.

	Level Alignment:	
	Elevation of top of slabs and other formed surfaces before removal of shoring	±3/4 in.
	Elevation of lintels, sills, parapets, horizontal grooves, and other lines exposed to view	±1/2 in.
	Elevation of slabs on grade	±3/4 in.
	Cross-Sectional Dimensions: Members such as columns, beams, piers, or walls with thickness:	
	12 in. dimension or less	+ 3/8 in. or −1/4 in.
	More than 12 in. dimension but not over 3 ft dimension	+ 1/2 in. of −3/8 in.
	Over 3 ft dimension	+ 1 in. or −3/4 in.
	Relative Alignment:	
	Vertical alignment of outside corner of exposed corner columns and control joint grooves in concrete exposed to view	±1/4 in. in 10 ft.
	All other formed surfaces may slope in 10 ft with respect to the specified plane	±3/8 in. in 10 ft.
	Offset between adjacent pieces of formwork facing material shall not exceed:	
	Surfaces that receive special protective coatings-Class B See Section 3.1.4 for further clarifications.	± 1/4 in.
	For a Class C surface	±1/2 in.
	Openings Through Members:	
	Cross-sectional size of openings	−1/4 in. or +1 in.
	Location of centerline of opening	±1/2 in.

5.1.3.2 Placement tolerances for embedded items shall be in accordance with the Table for Embedded Item Placement Tolerances, unless noted otherwise on the project drawings:

Table for Embedded Item Placement Tolerances

Conditions	Embed Type	Tolerance
Lateral alignment in both directions in the plane of the slab or wall. Level alignment through the slab or wall.	Standard Embeds per drawing 24590-WTP-DD-S13T-00002	±2 in.

5.1.4 Equipment standardization shall be employed throughout equipment designs where safety requirements and cost requirements can be satisfied. Items performing similar duties should, as far as possible, be standardized so that one particular make, model and size can be used in all similar applications.

5.1.5 The design shall consider human factors engineering and ergonomic requirements to ensure good human factor principles, guidelines, and methods are integrated into equipment design in accordance with IEEE Std 1023-1988 *IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations*. The codes and standards identified in Appendix H, or buyer approved equal, shall be used to implement IEEE Std 1023. The specific human factor attributes applying to the equipment shall be invoked.

5.1.6 For general design requirements of mechanical handling equipment refer to project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture,* excluding sections 3.5.8.1, 3.5.8.2, 3.5.8.5, 3.6, 3.7, 4.1.9, 4.1.10, 4.1.11, 4.1.12, 4.10.1, 4.10.4, 4.12, and 4.13.

5.1.7 Equipment that is not painted (or otherwise coated) and exposed to radiation that can cause surface contamination shall have decontaminable surface finishes of 63 microinches (or better) roughness average in accordance with ASME B46.1. Except when the equipment is infrequently handled or decontaminated, in which case it can have decontaminable surface finishes of 125 microinches (or better) roughness average in accordance with ASME B46.1.

5.2 Mechanical Requirements

5.2.1 Canister Rinse Bogie

5.2.1.1 The bogie shall be designed to travel on stainless steel fabricated rails with rail centers of 82 inches, see Section 5.2.3.

5.2.1.2 The bogie shall be capable of transporting a glass filled IHLW Canister, weighing 9260 lbs (max), and the Canister Rinse Vessel including rinse water.

5.2.1.3 Special attention shall be paid to the bogie chassis, to ensure plain surfaces can be cleaned easily, and potential contamination traps are minimized. Tube sections should be used in preference to structural 'I' beams and channels. All tubing shall be sealed to prevent the ingress of contamination. Drain holes shall be provided wherever water may collect during wash down, except in sealed tubing.

5.2.1.4 The bogie chassis shall accommodate a support frame for the Canister Rinse Vessel. The support frame shall be capable of supporting the vessel while located on the bogie.

5.2.1.5 The bogie chassis and vessel support frame shall be fitted with appropriate lifting features to assist with maintenance activities, using an overhead crane, while the bogie is located in the maintenance area. The combined weight of the bogie chassis and the vessel support frame shall not exceed 10,000 lbs. The Seller shall provide any special lifting equipment required. The Buyer will provide to the Seller details of the crane hook prior to final design.

5.2.1.6 The bogie chassis and vessel support frame should be fabricated from ASTM A36 steel. Proprietary items shall be "as supplied" providing they are suitable for the operating conditions.

5.2.1.7 The bogie chassis shall accommodate equipment associated with the Canister Rinse Vessel.

5.2.1.8 The vessel support frame shall have location features to aid in the alignment and set down of the Canister Rinse Vessel.

5.2.1.9 The bogie shall have two driven wheels.

5.2.1.10 The bogie shall be guided by two (2) double flanged wheels on one side of the bogie. The opposite two wheels shall be plain. The flanged wheels shall be located on the same rail as the recovery winch. The wheel flanges shall be of adequate size to withstand skew forces from track misalignment and forces imposed due to recovering the bogie with a seized drive system.

5.2.1.11 Clearances between wheel flanges and rail, accounting for manufacturing tolerances, shall be sufficient to allow free running of the bogie while achieving the required positional tolerances in accordance with Section 5.3.4 of this specification.

5.2.1.12 Seismic restraints shall be mounted to the vessel support frame, to prevent the bogie from derailing in the event of a flanged wheel failure under normal operation, or an SC-II design basis earthquake, in accordance with Sections 1.5.3 and 5.6 of this specification.

5.2.1.13 The drive system and wheel modules shall be designed for ease of maintenance and replacement.

5.2.1.14 The bogie shall have four (4) bumpers, one at each corner of the bogie; to prevent damage to the bogie, shield door, or rail end-stops. The bumpers shall be designed to absorb the impact of a fully laden bogie, traveling at full operating speed, with a closed shield door, such that the resulting force imparted on the shield door does not exceed 1500 lbf.

5.2.1.15 There shall be two (2) proximity switches mounted on the bogie chassis for operational positioning of the bogie.

5.2.1.16 There shall be one (1) ultimate-travel limit switch mounted on the bogie chassis to prevent over travel of the bogie in the event of a proximity switch failure. The limit switch shall be capable of operating with the bogie traveling in both directions.

5.2.1.17 Adjustable proximity switch targets and limit switch strikers shall be supplied with the bogie as required per the system drawings. The targets and strikers shall be designed to be adjustable for on-site installation.

5.2.1.18 A means of detecting a canister is present in the vessel shall be provided.

5.2.1.19 The bogie shall be designed to limit individual wheel loads during normal operation to less than 1/3 of the total laden bogie weight while traveling on rails installed per paragraph 5.2.3.5. This requirement can be demonstrated by analysis or test.

5.2.1.20 Gears and gearboxes, shall comply with AGMA Standards, or, EC Machinery Directive 98/37/EC, EN 292-1 & 292-2 *Safety of Machinery*, and ISO 281 - 1990 *Roller bearings, Dynamic load ratings and rating life*.

5.2.1.21 In addition to the requirement defined in 24590-WTP-3PS-M000-T0002, Rev 0, Section 4.10.6, gear cases can be split vertically provided that, in the event of a fluid leak, the fluid is contained in a driptray. The driptray shall have a minimum fluid capacity of 1.5 times greater than the fluid capacity of the gearbox.

5.2.2 Canister Rinse Vessel

5.2.2.1 The vessel shall be designed in accordance with ASME B&PV Section VIII, Division 1, except that code stamping is not required.

5.2.2.2 Process piping shall be designed in accordance with the applicable requirements identified in ASME B31.3 and project specification 24590-WTP-3PS-P000-T0001, *Engineering Specification for Piping Material Classes*, excluding section 16. The piping material class for interfacing to the Buyer provided piping shall be S11B.

5.2.2.3 The centrifugal discharge pump shall be in accordance with the requirements identified in ASME/ANSI B73.2M *Specification for Vertical In-Line Centrifugal Pumps for Chemical Process*.

5.2.2.4 The vessel shall have lifting features to allow the vertical removal of the vessel from the bogie, using an overhead crane, while located in the maintenance area. Pipe connections shall be configured such that vessel can be removed easily. The weight of the vessel and internal components shall not exceed 10,000 lbs. The Seller shall provide any special lifting equipment required. The Buyer will provide to the Seller details of the crane hook prior to final design.

5.2.2.5 The design of the spray system shall ensure that the spray pattern is generally in a downward direction, minimizing "back spray" within the vessel, and providing full coverage of the canister surface. The canister can be sprayed in stages due to the limit on flow rate. If the canister is sprayed in stages it shall be sprayed from top to bottom.

5.2.2.6 The Seller shall make every effort to minimize the volume of water used during the rinse cycle while achieving the full coverage of the canister.

5.2.2.7 The vessel shall contain guides and a pedestal for locating and seating the canister. The guides internal diameter shall be 27 inches ± 1/4 inch. This diameter takes into account misalignment, due to tolerance build-up, between the bogie and the overhead crane during loading and unloading of the canister. The guides shall be designed such that the potential for scratching of the canister surface is minimized during loading and unloading.

5.2.2.8 The container guides shall be configured such that spray coverage is not affected. Lifting features shall be located at the top of the guides to allow removal from the vessel, using an overhead crane, while the bogie is located in the maintenance area. The Seller shall provide any special lifting equipment required. The Buyer will provide to the Seller details of the crane hook prior to final design.

5.2.2.9 The spray system shall be removable from the vessel without the requirement for hands on access to the internals of the vessel. Pipe connections shall be located at the top of the vessel and shall be arranged to allow manual disconnection and removal of the spray system, using an overhead crane, while the bogie is located in the maintenance area. The Seller shall provide any special lifting equipment required. The Buyer will provide to the Seller details of the crane hook prior to final design.

5.2.2.10 The vessel piping and internal components shall be designed to minimize contamination traps and maximize contamination removal through rinsing.

5.2.2.11 The inflatable seal shall be mounted to the top flange of the vessel. The seal shall be capable of containing the water spray in the vessel during the rinse cycle.

5.2.2.12 The centrifugal discharge pump shall be capable of discharging water from the vessel such that the static head of water does not contact the canister or compromise the spray nozzles.

5.2.2.13 The vessel shall have a high-high penetration point for a level switch to detect the maximum static head of water. The penetration shall be a 2" Weld Neck Raised Face (WNRF) flange. Initiation of the high-high level switch shall terminate the spray sequence.

5.2.2.14 The vessel shall have an external chamber located on the side of the vessel for a continuous level instrument. The external chamber shall have a minimum internal diameter of 2". The top of the chamber shall be flanged for device mounting. The bottom leg of the chamber shall interconnect to the vessel drain pipe at the bottom of the vessel. The top leg of the chamber shall penetrate the vessel at a point above the maximum static head of water such that the operating range of the level instrument places the maximum static head of water at the 50% - 75% point of the level instruments range. The continuous level instrument shall initiate the discharge of the rinse water at a set level.

5.2.2.15 Transmitters for both the level switch, and the continuous level instrument, will be mounted in the corridor adjacent to the transfer tunnel.

5.2.2.16 The vessel shall have a vent pipe located within the vessel for venting during the normal rinse cycle. The design of the vent pipe should address the unlikely event of slight pressurization of the vessel during normal spraying operations that would cause a water column to be pushed through the vent pipe. An air in-bleed near the top of the vent pipe will allow air to escape the vessel if the bottom of the vent pipe becomes submerged. An in-bleed is defined as a hole in the pipe that either has a small bent tube, plating, or other method for baffling mist from entering the hole, while allowing air to escape through it. The vent pipe shall run from a point just below the top of the vessel to a point just above the canister bottom, creating an arduous path to prevent the release of mist carryover from the vessel. The Seller shall determine during shop tests the levels of mist carryover released from the vent pipe, see Section 8.2.3 of this specification.

5.2.2.17 The control valves shall be of the pneumatic operated actuator type. The control valves shall meet the applicable requirements identified in 24590-WTP-3PS-JV15-T0001, *Engineering Specification for Actuators for On/Off Valves*, and 24590-WTP-3PS-PV00-T0001, *Engineering Specification for Technical Supply Conditions for Valves,* excluding section 5.4.

5.2.2.18 The operating position of the control valves shall be monitored by position switches on the actuator. The actuator shall operate the valve to a "failed closed" condition in the event of power failure.

5.2.2.19 The vessel, and associated rigid piping supplying demineralized water to the vessel, shall be constructed from 316L stainless steel.

5.2.2.20 The canister shall not come into contact with any material other than stainless steel.

5.2.2.21 The vessel shall accommodate all static, dynamic, and seismic loads in accordance with Section 5.6 of this specification.

5.2.3 Canister Rinse Bogie Rails

5.2.3.1 The rail assembly shall be fabricated from a suitable grade stainless steel, with the running rail made from an age-hardened martensitic stainless steel.

5.2.3.2 The rail hardness shall be suitable for the intended application, but as a minimum shall be greater than that of the wheel. The rail and wheels should both be of similar high hardness to avoid unnecessary wear, and shall be of a dissimilar material such that galling does not take place.

5.2.3.3 End-stops shall be provided at the ends of each rail. The end-stops shall be capable of withstanding the impact of a fully laden bogie traveling at full operating speed, without exceeding allowable stresses.

5.2.3.4 The Seller shall provide shim packs for site adjustment to achieve the required installation tolerances. Refer to Section 3.5.3 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, for details of installation features.

5.2.3.5 The bogie rails shall be fabricated to achieve the following installation tolerances:

Rail Span	± 1/8 inch
Rail straightness	± 1/8 inch
Rail elevation	± 1/8 inch
Difference in rail heights	± 1/16 inch

5.2.4 Canister Rinse Bogie Seismic Rails

5.2.4.1 The seismic rails shall prevent the bogie from derailing in the event of a flanged wheel failure under normal operation, or an SC-II design basis earthquake, in accordance with Sections 1.5.3 and 5.6 of this specification.

5.2.4.2 The seismic rails shall be constructed from a suitable grade stainless steel.

5.2.4.3 The seismic rails shall accommodate the full process travel of the bogie.

5.2.4.4 The seismic rails shall be adjustable in both the vertical and the North-South directions for on-site setting. Refer to Section 3.5.3 of project specification 24590-WTP-3PS-M000-

T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, for details of installation features.

5.2.5 Canister Rinse Bogie Service Tracks

5.2.5.1 One (1) each service track shall be provided for electrical cables and process hoses associated with the operation of the Canister Rinse Bogie and Canister Rinse Vessel.

5.2.5.2 The service track for the process hoses shall be located on the South side of the bogie. The service track for the electrical cables shall be located on the North side of the bogie.

5.2.5.3 The service tracks shall be capable of operating over the full process movement of the bogie and have sufficient additional capacity to transfer the bogie to the shield door aperture.

5.2.5.4 The process service track shall be capable of accommodating the loads exerted when the process hoses (water and air) are pressurized.

5.2.5.5 The service tracks shall contain sufficient lengths of electrical cable and process hoses to allow for remaking of connections at the Buyer's facility to the Buyer provided cables and piping. The Buyer will provide to the Seller interface details prior to final design.

5.2.5.6 The service tracks, electrical cables and process hoses shall be capable of being manually disconnected and reconnected to the bogie at the shield door aperture.

5.2.5.7 The electrical cables and process hoses shall be capable of being easily disconnected and reconnected to the bogie using quick disconnect type connectors. The process hose connectors shall be of the non spill double shutoff type. The Seller shall consider the use of manifolds or multi-pin connectors to simplify the operation with the aim to minimize operator time while the shield door is in the open position.

5.2.5.8 The service tracks shall provide protection for the cable and hoses as the bogie moves to prevent them from becoming entangled or damaged.

5.2.5.9 The service tracks shall be constructed from a suitable grade stainless steel.

5.2.5.10 The tracks shall be of an open construction to allow for ease of decontamination and access to electrical cables and process hoses for inspection.

5.2.6 Canister Rinse Bogie Recovery System

5.2.6.1 The bogie recovery system shall be capable of recovering a fully laden bogie with a seized drive system, as a minimum.

5.2.6.2 The wire rope shall be polyethylene sheathed for ease of decontamination.

5.2.6.3 The design shall ensure that proper fleet angles are maintained between the winch and the pulley to ensure correct cable winding during recovery.

5.2.6.4 The Seller shall provide all support structures required for mounting of the recovery winches to the embeds identified on the DPDs.

5.2.6.5 The gearbox shall be capable of being decoupled from the winch drum to allow periodic maintenance. The decoupling process shall be a simple procedure with minimal effort by maintenance personnel.

5.2.6.6 The recovery block shall be capable of being pushed along the rails by the bogie to its park position.

5.2.7 Canister Rinse Bogie Spool Piece

5.2.7.1 The spool piece shall provide the sealing surface for the vessel mounted inflatable seal.

5.2.7.2 The spool piece shall include features to allow on-site adjustment of the sealing face to accommodate the inflatable seal operating parameters and installation tolerances. Refer to Section 3.5.3 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, for details of installation features.

5.2.7.3 The spool piece shall be constructed from a suitable grade stainless steel.

5.2.8 Canister Rinse Vessel Lid

5.2.8.1 The vessel lid shall be fitted with appropriate lifting features to assist with handling, using an overhead crane located in the maintenance area. The Seller shall provide any special lifting equipment. The Buyer will provide to the Seller details of the crane hook prior to final design.

5.2.8.2 The lid shall contain guide features to assist with the location of the lid over the vessel.

5.2.8.3 The lid shall not interfere with the inflatable seal.

5.2.8.4 The lid shall be constructed from a suitable grade stainless steel.

5.3 Performance

5.3.1 Design Life

5.3.1.1 All equipment shall be designed to operate over a plant life of 40 years and in accordance with the duty cycles identified in Section 5.3.2 of this specification.

5.3.1.2 It is recognized that some commercially available components may not have a design life of 40 years. These components shall be configured and incorporate features to allow hands-on maintenance and replacement.

5.3.2 Duty Cycles

5.3.2.1 A cycle consists of the complete movement of a bogie from its starting position to its final destination and back to its starting position, including all process activities between.

5.3.2.2 The Canister Rinse Bogie is subject to the following duty cycles:

Duty Cycles (per year)		Duty Cycles (per day)
Min	**Max**	**Max**
180	730	2

5.3.3 Speeds

5.3.3.1 The Canister Rinse Bogie shall travel between process stations at a nominal speed of 10 ft per minute (normal) and shall ramp down when approaching a station to a suitable creep speed which maintains throughput and positional accuracy. The Seller shall determine and document the creep speed during testing.

5.3.3.2 After each process stop, the bogie shall ramp up to the normal operating speed. The Seller shall confirm the suitability of the acceleration and deceleration rates during the shop tests, to ensure smooth starting and stopping of the bogie.

5.3.3.3 The Canister Rinse Bogie shall be recovered at an appropriate speed to ensure smooth movement of the bogie during the full recovery travel. The proposal drawings show the recovery speed at 1 ft per minute. However, the Seller shall determine the most appropriate speed whether identical to the proposal or otherwise.

5.3.4 Positional Accuracy

5.3.4.1 The Canister Rinse Bogie shall be capable of repeatable positioning to within ±1/8 inch in all directions. The accuracy is required to minimize misalignment, due to tolerance build-up, between the bogie and the overhead crane used to load/unload the canister.

5.4 Design Conditions

5.4.1 For general design conditions refer to Section 3.3 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture.*

5.5 Environmental Conditions

5.5.1 For Hanford Site Climatological Data refer to Section 1 of the Purchase Order, *Information and Instructions to Bidders.*

5.5.2 For general facility internal conditions refer to Section 3.4 of project specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture.*

5.5.3 The bogie, vessel, and associated equipment may be subject to decontamination prior to hands-on maintenance being performed. This could include wiping equipment with wet rags and washing with water or dilute nitric acid.

5.5.4 The Canister Rinse Tunnel will be subject to periodic washdown with demineralized water, from a fixed spray system, to maintain general cleanliness of the tunnel.

5.6 Design Loads

5.6.1 General

5.6.1.1 The equipment identified in this specification shall accommodate all static, dynamic, and seismic loads, in accordance with this section and the requirements identified in Sections 1.5.3 and 5.2.

5.6.1.2 For normal service conditions a bogie shall be treated as a crane trolley and shall be evaluated in accordance with the applicable requirements identified in CMAA 70.

5.6.1.3 The bogie and bogie components, SC-I and SC-II SSCs, shall be seismically qualified to not fail during all operating conditions, including the design basis earthquake, and shall be in accordance with the requirements of ASME NOG-1-2002, *Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder),* Sections 4150 and 5481. Extraordinary loadings, in addition to the loadings identified in CMAA 70, Section 3.3.2, shall include seismic acceleration loads identified in Section 5.6.4, and test loads (125%) applied during load test. The permissible stresses for seismic conditions shall be in accordance with CMAA 70, Section 3.4.3. Stress Level and Case 3.

5.6.1.4 Design of SC-III and SC-IV SSCs shall be governed by the provisions of AISC MO16, *Manual of Steel Construction, Allowable Stress Design, 9th Edition.*

5.6.1.5 ITS (load path) items shall be designed in accordance with ASME NOG-1-2002, Sections 4130, 4200, 4300, 4400, 5100, 5300, 5456 and 5458, as applicable.

5.6.1.6 For SC-II SSCs, loads shall be combined in accordance with ASME NOG-1-2002. For SC-III and SC-IV SSCs, loads shall be combined in accordance with the Uniform Building Code (UBC) Section 1612.3.2.

5.6.2 Static Loads

5.6.2.1 The bogie shall be capable of transporting a glass filled IHLW Canister, weighing 9260-lbs (max), and the canister rinse vessel during normal operation under the duty cycles identified in Section 5.3.2 of this specification.

5.6.2.2 Canister dimensions:

Diameter: 24.12 inches (maximum)
24 inches (nominal)

Height: 177.165 inches (maximum)
176.75 inches (nominal)

5.6.3 Dynamic loads

5.6.3.1 The bogie, vessel, and bogie rails shall be capable of withstanding impact loads from the canister under normal service conditions. Under normal service conditions the crane hoist operating speed at point of impact will be 5 feet per minute maximum.

5.6.3.2 The bogie and bogie rails shall be capable of withstanding all loads associated with impacts to the rail end-stops by the bogie (with load) traveling at full operating speed.

5.6.4 Seismic Loads

5.6.4.1 The following table identifies equipment requiring seismic protection and their associated Seismic Category (SC). Definitions of the seismic categories:

Seismic Category I (SC-I):
SSC important to safety and which has a seismic safety function.

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

Seismic Category III (SC-III):
(a) SSC important to safety, but without seismic safety function.
(b) SSC not important to safety, but which has an inventory of radioactive or hazardous material in an amount less than that which would lead to an "important to safety" designation.

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

Plant Item Number 24590-HLW-	Description	Seismic Category
MQ-HDH-TRLY-00003	Canister Rinse Bogie	SC-II
MV-HDH-VSL-00001	Canister Rinse Bogie Decon Vessel	SC-III
MH-HDH-RAIL-00002	Canister Rinse Bogie Rails	SC-III
MH-HDH-RAIL-00004	Canister Rinse Bogie Seismic Rails	SC-II
MH-HDH-MHAN-00016	Canister Rinse Vessel Service Track	SC-III
MH-HDH-MHAN-00017	Canister Rinse Bogie Service Track	SC-IV
MH-HDH-RCVY-00009	Canister Rinse Bogie Recovery System	SC-IV
MH-HDH-MHAN-00011	Canister Rinse Bogie Spool Piece	SC-IV
MP-HDH-PMP-00001	Bogie Decon Canister Pump	SC-III

5.6.4.2 Where specific seismic requirements are identified in Section 1.5.3, for the Canister Rinse Bogie and the Canister Rinse Bogie Seismic Rails, the applicable components shall be designed to SC-II. All other components shall be designed to SC-III.

5.6.4.3 SSCs designated SC-II, see Section 1.5.3 of this specification, the seismic loads imparted on the equipment shall be evaluated in accordance with the response spectra identified in the table below. A damping value of 7% shall be used.

Equipment	Seismic Response Spectra Reference
Canister Rinse Bogie (24590-HLW-MQ-HDH-TRLY-00003, and associated equipment)	See 24590-HLW-S0C-S15T-00009 Rev 0D Fig. 10 Seismic Response at -31 ft and -21 ft Elevation, East-West (attached) Fig. 11 Seismic Response at -31 ft and -21 ft Elevation, North-South (attached) Fig. 12 Seismic Response at -31 ft and -21 ft Elevation, Vertical (attached)
Canister Rinse Bogie Seismic Rails (24590-HLW-MH-HDH-RAIL-00004, and associated equipment)	See 24590-HLW-S0C-S15T-00039 Rev D Sheet No. B-9, Fig. B-7 Seismic Response, East-West (attached) Sheet No. B-10, Fig. B-8 Seismic Response, North-South (attached) Sheet No. B-11, Fig. B-9 Seismic Response, Vertical (attached)

5.6.4.4 For SSCs designated as SC-III, the seismic loads shall be evaluated in accordance with the Uniform Building Code (UBC), Section 1632, using the following parameters:

Ip = 1.5

Ca = 0.24

hr = 91

hx = rail elevation

5.6.4.5 For all other SSCs, the seismic loads imparted on the equipment shall be evaluated in accordance with the Uniform Building Code (UBC), Section 1632, using the parameters above with an Ip of 1.0.

5.6.4.6 The 200 East Area of the Hanford Site is located in Seismic Zone 2B.

5.7 Electrical Requirements

5.7.1 The requirements in 24590-WTP-3PS-EKP0-T0001, *Engineering Specification for Electrical Requirements for Packaged Equipment*, excluding sections 6.4.2.3, 6.4.3.1, 6.6.1, 6.6.3, and 6.8, shall apply to this specification. Where there is a conflict between this specification and 24590-WTP-3PS-EKP0-T0001, the Seller shall report all conflicts to the Buyer. At such time, all conflicts shall be resolved.

5.7.2 All electrical equipment and material, including industrial control panels and cabinets that are assemblies of industrial control devices, shall be suitable for installation and use in conformity with the provisions of NFPA 70. Suitability of equipment shall be evidenced by listing or labeling as a completed assembly by Underwriters Laboratories (UL). Equipment and assemblies not listed or labeled shall be required to bear a UL "Field Evaluated Product" mark. Equipment and materials listed, labeled or field evaluated by other nationally recognized testing laboratories (NRTLs) as recognized by OSHA, may be accepted only after receipt of prior written approval from the Buyer.

5.7.3 The Seller shall provide all cables and multi-conductor cable systems from the bogie and associated equipment to the Buyer's designated interface point, see Section 5.8.2. The Seller shall recommend connector types at the Buyer's interface for connection to the Buyer-provided cabling.

5.7.4 All cables shall be evaluated for radiation tolerance by addressing IEEE Std 1205-2000, *IEEE Guide for Assessing, Monitoring, and Mitigating Aging Effects on Class 1E Equipment used in Nuclear Power Generating Stations, Annex D* for acceptable insulation for radiation environments. Generally Tetrafluoroethylene (TFE) and Polytetrafluoroethylene (PTFE) should be avoided in radiation areas.

5.7.5 The Seller shall provide details of the electrical cable end connections (at bogie terminal box) to the Buyer for interfacing of the Seller provided umbilical electrical cable, located in the maintenance area. Unique pin arrangements and/or color coding shall be provided for the electrical connectors to prevent incorrect engagement.

5.7.6 The Seller shall specify within the proposal the full load amp and voltage rating for the bogie and associated electrically powered equipment.

5.7.7 When more than one motor is powered from a single control cabinet the Seller shall specify the ampere rating for the main over current device serving the cabinet.

5.7.8 Induction motors shall meet the requirements of 24590-WTP-3PS-MUMI-T0002, *Engineering Specification for Low Voltage Induction Motors*, excluding sections 5.1.1, 5.3, and 5.4.1, and shall be of a Totally Enclosed Fan Cooled (TEFC) type. Deviation from the specifications shall be submitted, on an SDDR form, to the Buyer and may be accepted based on the application and technical requirements. When deviating from the specifications, the motors shall comply with the equivalent International Electrotechnical Commission standard (IEC). The Seller shall provide certification that the manufacturer satisfactorily performed standard and routine tests on electric motors.

5.7.9 Flux Vector or Servo Drives shall meet the requirements of 24590-WTP-3PS-JD02-T0001, *Engineering Specification for Intelligent Drives for Packaged Equipment.*

5.7.10 All electrical equipment and electrical cables shall be suitable for the environment in which they will operate.

5.7.11 Separate disconnects shall be provided from the control cabinet for each major component. Seller shall provide all necessary schematics, wiring diagrams and details necessary to facilitate installation and connection to Buyer's system.

5.7.12 All conductors shall be numbered on both ends for ease of identification.

5.7.13 Cable design and construction shall take account of Electromagnetic Interface (EMI) and Radio Frequency Interface (RFI).

5.7.14 Individual and overall shields shall be provided, as appropriate, to ensure that circuits are not subjected to or affected by interference. The shields shall be terminated at individual slip rings/brush gears. The Buyer will then make arrangements to terminate them at a suitable ground point. All special grounding design requirements are the responsibility of the Seller.

5.7.15 The Seller shall be responsible for assuring operability of the cable system under all design conditions.

5.7.16 In addition to tagging requirements defined in Engineering Specification for Instrumentation for Packaged Systems, 24590-WTP-3PS-JQ07-T0001 Rev 1, and Engineering Specification for Electrical Requirements for Packaged Equipment, 24590-WTP-3PS-EKP0-T0001 Rev 2. Tags subject to high radiation environments, stainless steel is preferred.

5.8 Instrumentation and Control Requirements

5.8.1 General

5.8.1.1 The requirements in project specification 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems,* excluding sections 3.4.5.1, 3.4.5.2.3, 3.4.5.4.4, 3.4.5.9, 3.4.5.10, 3.4.5.12, 3.4.5.13, 3.4.5.14, 3.4.5.15, 3.4.5.16, 3.4.5.17, 3.7.1, 3.8.3, 3.8.4, 3.8.6, 3.8.7, and 3.8.8.1, shall apply to this specification. Where there is a conflict between this specification and 24590-WTP-3PS-JQ07-T0001, the Seller shall report all conflicts to the Buyer. At such time, all conflicts shall be resolved.

5.8.1.2 Control panels, including Supplier Packaged Equipment panels, shall be provided with an Alarm Test function such as a "push to test" button that verifies that alarm indicating functions operate satisfactorily. In order to maintain consistent operation between equipment items, this requirement shall apply to all alarm indicating lights, including LED's. This requirement is limited to alarm indications and is not applicable to other indications.

5.8.1.3 The Seller shall be responsible for the final determination of the required level and type of controls and instrumentation necessary for the proper operation and monitoring of the Seller's proposed system. Any changes to the required control and monitoring features shall be reflected in the Seller's submittals for control and instrumentation (as required by this specification and the G321-E form) and shall be subject to Buyer authorization. The Seller's submittals that necessitate changes to the control and instrumentation shall not generally require that an SDDR be submitted. An SDDR shall be submitted if the Seller's control and instrumentation submittals fail to reflect incorporation of any functional requirement of the supplied equipment (as described in this specification, DPDs, or Arrangement).

5.8.1.4 The Seller shall provide, as early as practicable in the design process (but no later than as required by the submittal schedule), required control and instrumentation submittals necessary to support the Buyer's revisions to their Mechanical Handling Diagrams (MHDs). These submittals are required in order to finalize the relevant facility interfaces (e.g., wall penetrations, conduit, and Integrated Control Network interfacing) to suit the Buyer's construction schedules.

5.8.1.5 To ensure commonality across project equipment, 24590-WTP-3PS-JQ07-T0001 identifies preferred instrument vendors for some components. Components not included in the specification are selected at the Seller's discretion with review and permission to proceed from the Buyer unless otherwise specifically stated within this specification.

5.8.1.6 The Seller shall provide all limit switches and proximity switches as required in the design of the bogie system, and shall meet the requirements of sections 3.4.5.7 and 3.4.5.8 of 24590-WTP-3PS-JQ07-T0001.

5.8.1.7 The bogie control systems shall utilize the Integrated Control Network (ICN) platform described in 24590-WTP-3PS-JQ07-T0001.

5.8.1.8 Instrumentation for control and positioning is defined on the DPDs. The instrument tag numbers on the DPDs shall be used to tag instruments. Additional instruments provided by the Seller shall be tagged using ISA 5.1, and sequence numbers provided by the Buyer.

5.8.1.9 The Seller shall provide to the Buyer control logic diagrams and a structured description of the control requirements, procedures, interlocks, and sequences of operation necessary to perform the basic functions of the bogie, vessel, and associated equipment. Documentation of the control requirements shall conform to the requirements of 24590-WTP-3PS-JQ07-T0001, Section 3.5, *Control Software*.

5.8.1.10 The Buyer will develop the application software that controls the bogie, vessel, and associated equipment identified in this specification. All Human Machine Interfaces (HMI), including facility control room HMI, Local Operator Interfaces (LOI), and Bogie Maintenance Areas, will be interfaced to and controlled by the Buyer-developed Intergrated Control Network (ICN). The Buyer's software shall be tested during the Seller's Factory Acceptance Tests (FAT).

5.8.1.11 Motor drives and other 'intelligent' devices as applicable shall have Profibus DP® capability where feasible.

5.8.1.12 Where integral brake motors are used on adjustable speed drives the brake shall be wired independently from the motor winding. All brakes shall be "fail-on" in the event of loss of power.

5.8.1.13 All instrumentation and instrument cables shall be suitable for the environment in which they will operate.

5.8.1.14 The Seller shall provide a phase monitor relay to provide protection against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage of the 3Ph 480 voltage feed to Seller's equipment.

5.8.2 Interfaces Between Buyer and Seller

5.8.2.1 General

5.8.2.1.1 This specification identifies equipment that is classified as a "Type B-Option 1" package. A "Type B" package is one in which the Seller provides the starters/drives and shall have the equipment located near the Seller's equipment in a Seller provided control cabinet.

5.8.2.2 Type B Package

5.8.2.2.1 Appendix A, Figure 1, shows a pictorial representation of a "Type B-Option 1" package definition that the Seller shall comply with. This Type B package shall include Seller provided equipment control cabinets that include Seller provided starters/drives, control transformers, Profibus DP® interface(s), Fiber Optic cable interfaces, control wiring interface, etc. The Buyer will be responsible for the Profibus DP® cable from the Buyer Controller, the control signal wiring from the Remote I/O (RIO), a single 480 VAC, 3 phase power supply from the Buyer's MCC to the Seller's equipment control cabinets. The Buyer will also be responsible for all cabling between the Seller's equipment control cabinet and the Seller's equipment "skid" with the exception of specialty cable. Specialty cable is defined as cable assemblies normally part of the equipment package such as drag chains and festoon or cable that is not included in the Buyer's standard cable list. For the purpose of this specification, a "skid" is defined as the part of a Seller's package which is shipped pre-assembled and pre-wired.

5.8.3 Bogie Positioning Control

5.8.3.1 Bogie shall have a minimum of two proximity switches mounted to the bogie chassis used for operational positioning of the bogie. Both switches shall provide a signal under normal operating conditions.

5.8.3.2 The bogie utilizes two (2) or three (3) targets for each stopping position as required per the system drawings. The first target, approached from a specific direction (two targets required if approaching stopping position from two directions), is used to slow the bogie to creep speed; the second target stops the bogie. To achieve positional accuracy, the bogie may require to be stopped by approaching the target from one direction only. In this case the bogie will proceed past the stopping point then reverse to approach the position target from the designated stopping direction.

5.8.3.3 Under a recovery event the bogie mounted proximity switches are also used to position the bogie, in conjunction with the proximity switch targets, at the appropriate process station for canister removal.

5.8.3.4 The recovery winch drive shall include a Profibus DP® interface to enable operation from the Buyer's LOI.

5.8.4 Communication Network Interface

The Buyer has selected the Industrial^{IT} platform from ABB, Inc. as the primary control system for the WTP Facility. A Profibus DP® communication network will be used to communicate to drives and intelligent positioning instruments. The Seller shall provide the following components for a fiber optic cable interface:

5.8.4.1 Profibus DP Communication Interface

5.8.4.1.1 The Seller shall provide a native Profibus DP® slave interface for the control panel or instrument and the associated drivers (GSD files) for communication with the Buyer's control system. The interface should support communication speeds up to 12 Mbit/sec over the Profibus DP® network.

5.8.4.2 Fiber Optic Connections

5.8.4.2.1 The Seller shall provide a fiber optic connection external to the control panel or instrument per the following requirements:

a) The Seller shall install a Hirschmann OZD Profi 12M G12 fiber optic converter within the control panel or near the instrument for each communication network.
b) The Seller shall patch the Hirschmann fiber optic converter(s) to a fiber optic patch plate where the Buyer will terminate the Buyer's fiber optic cable(s). The patch plate shall utilize MT-RJ multimode fiber optic connectors.
c) The Seller shall use multimode 62.5/125 glass fiber in the patch cable with appropriate connectors on each end of the patch cable to connect between the fiber optic converter and the patch plate. Any unused fiber optic connections shall be fitted with protective caps to guard against extraneous light and dirt.
d) The Seller shall derive the appropriate power for the fiber optic converter(s) from the control panel. A separate power supply shall be provided for each communication network.

5.8.4.3 Alternate Communication Interface

5.8.4.3.1 If a native Profibus DP® interface is not available, then the Seller may propose an alternate communication interface or network that is compatible with the Buyer's control system for Buyer review.

If an alternate communication interface is proposed:

a) The Seller shall provide all necessary interfaces or converters required to provide the Buyer's control system with the appropriate communications.
b) The Seller shall provide any required drivers, software, and protocol conversion information to the Buyer for design, development, testing, and maintenance of the supplied networks and interfaces for the period of performance of the contract, including software or firmware upgrades or revisions.

6 Materials

6.1 For general material requirements refer to Section 4 of 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, and applicable requirements identified in the project specifications referenced in this document. Sections 4.1.9, 4.1.10, 4.1.11, 4.1.12, 4.10.1, 4.10.4, 4.12, and 4.13 of 24590-WTP-3PS-M000-T0002 do not apply.

6.2 The Seller may use cast iron for the bogie wheels and wheel housings provided they meet the design requirements identified in Section 5 of this specification.

6.3 For specific material requirements refer to Section 5 of this specification.

6.4 Welded stainless steel mechanical tubing, conforming to ASTM A554, is acceptable for use, in the manufacture of structural members and support brackets.

6.5 All material supplied to ASTM standards, pertaining to QL or ITS equipment, shall be in accordance with the codes and standards identified in Section 2 of this specification, otherwise an SDDR shall be submitted to the Buyer, to obtain a material equivalency. Equivalency of materials shall, as a minimum, consider physical and chemical properties.

6.6 All material supplied to ASTM standards, pertaining to CM, Non-ITS equipment, shall be in accordance with any year of the standard.

7 Fabrication

7.1 For general fabrication requirements refer to Section 5 of 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*, and applicable requirements identified in the project specifications referenced in this document.

7.2 Welding shall be in accordance with the applicable requirements identified in project specification 24590-WTP-3PS-SS00-T0001, *Specification for Welding of Carbon Structural Steel*, excluding section 8.18, and in accordance with 24590-WTP-3PS-SS00-T0002, *Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel.*

7.3 The vessel shall be fabricated in accordance with ASME B&PV Section VIII, Division 1, except that code stamping is not required.

7.4 Process piping shall be fabricated in accordance with the applicable requirements identified in ASME B31.3, Category D Fluid Service.

8 Tests and Inspections

8.1 General

8.1.1 Test and inspections shall be performed in accordance with the requirements identified in this section and the project specifications referenced in this document.

8.1.2 The Seller shall be responsible for performing and documenting all inspections and testing necessary to demonstrate compliance with all relevant specifications, drawings, and related standards.

8.1.3 Shop tests identified in section 8.2 are defined as Factory Acceptance Tests (FAT). A FAT procedure shall be submitted to the Buyer along with the Inspection and Test Plan. FAT reports shall also be submitted to the Buyer.

8.2 Shop Tests

8.2.1 General

8.2.1.1 The Seller shall perform, in-house, full-scale, Buyer-witnessed, functional testing of the bogie, vessel, and associated equipment, to demonstrate, as a minimum, the requirements identified in this section.

8.2.1.2 The Seller may combine some of the tests providing each requirement can be verified.

8.2.1.3 The tests and demonstrations identified in this specification are not limiting, and shall not relieve the Seller of their responsibilities to fully test and demonstrate the performance of the bogie, vessel, and associated equipment, to the satisfaction of Buyer, in accordance with the Buyer-reviewed Inspection and Test Plan.

8.2.1.4 Where maintenance tests are identified they shall be performed wearing appropriate personnel protective clothing (e.g. gloves, coveralls) to simulate in-cell maintenance conditions. The Buyer will provide, to the Seller, the appropriate personnel protective clothing prior to performing the maintenance tests. The tests shall be video taped, timed, and recorded in the maintenance procedures.

8.2.1.5 The bogie control and instrumentation shall be tested in accordance with a defined schedule. All steps shall be taken to ensure that tests are realistic and representative of the bogie operating sequences. Operation of switches and contacts shall be via movement of the bogie and not by the shorting or open circuit action of terminals.

8.2.1.6 The Seller shall provide all wiring, electrical feeds, power supplies, transformers, operator panels, test equipment, and connections for shop testing of the bogie and associated equipment.

8.2.1.7 The Seller shall be responsible for any alterations to the Seller's facility that may be required to perform the tests, and any additional equipment and materials required.

8.2.1.8 The Buyer shall provide a "mock-up" canister, fabricated from a cylindrical tube, replicating the canister envelope dimensions, key features, and weight, for performing the shop tests.

8.2.1.9 The Seller shall notify the Buyer of any failed tests or defective components following testing. All corrective actions suggested by the Seller shall be reviewed by the Buyer prior to implementation and subsequent re-testing.

8.2.2 Canister Rinse Bogie

8.2.2.1 The Seller shall replicate normal service design load conditions (with and without canister), and operating speeds, as required, to represent the normal operating conditions of the bogie.

8.2.2.2 The Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.1 of this specification:

- Smooth and free running of the drive shaft, gearbox, and wheels, through the full operating travel of the bogie.
- Running clearances between interfacing equipment through the full operating travel of the bogie.
- Bogie operating speeds in accordance with Sections 5.3.3 and 5.8.3 of this specification.
- Positional accuracy of the bogie in accordance with Sections 5.3.4 and 5.8.3 of this specification.
- Operation of the ultimate-travel limit switch.
- Maximum buffer impact load.
- Proof load test the bogie and rails to 1.25 times rated load capacity.
- Lubrication points are accessible without major disassembly.
- Removal and replacement of maintainable and modular components.

8.2.3 Canister Rinse Vessel

8.2.3.1 The Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.2 of this specification:

- Perform a hydrostatic leak test of the vessel, pump and associated piping by filling the vessel with water to the top flange and holding for a minimum of one (1) hour, after which, run the pump until all water is discharged from the vessel.
- Inspection and testing of the vessel, pump and associated piping as required by the applicable requirements identified in ASME B&PV Section VIII Division 1, ANSI B73.2M, and ASME B31.3.
- Functional testing of the spray system using the "mock-up" canister. The spray test shall be performed such that full visual observation of the spray coverage and "back spray" can be achieved by eye and with a video camera. Part of the test should be performed using food coloring or dye to aid in visualization.
- Level of mist carryover released from the vent tube during the rinse cycle.
- Operation of the inflatable seal and the sealing interface with the spool piece.
- Inspect and test the control valves in accordance with the applicable requirements identified in 24590-WTP-3PS-JV15-T0001, *Engineering Specification for Actuators for On/Off Valves*, and 24590-WTP-3PS-PV00-T0001, *Engineering Specification for Technical Supply Conditions for Valves,* excluding section 5.4.
- Performance of the level switch and continuous level instrument.
- Canister set-down at nominal handling speed of 5 feet per minute.
- Disconnection of the vessel services and removal of the vessel from the bogie.
- Mounting of vessel on the bogie and reconnection of the vessel services.
- Removal and installation of the canister guides and spray rings.

8.2.4 Canister Rinse Bogie Rails

8.2.4.1 During performance and maintenance testing, the Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.3 of this specification.

- Assemble rail sections and verify rail alignment to drawing tolerances and CMAA 70.

8.2.5 Canister Rinse Bogie Service Tracks

8.2.5.1 The Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.5 of this specification:

- Service tracks are moved freely by the bogie through the full operating travel.
- Replicate on-site shield door aperture interfaces and demonstrate the disconnection and reconnection of the electrical and process services and service tracks.

8.2.6 Canister Rinse Bogie Recovery System

8.2.6.1 The Seller shall ensure that, as a minimum, the following requirements are demonstrated and verified in accordance with the requirements identified in Section 5.2.6 of this specification:

- Proof load test the cable connection to the recovery block to 1.25 times the winch rating.
- Recovery of the bogie (with load), with a seized drive system, over the full operating travel of the bogie.
- Monitor and record the bogie recovery forces at incremental positions as the bogie moves along the rails. The recovery block, rails and cable shall be inspected following the test. The results shall be documented in the Inspection and Test Report.
- During the recovery test stop the bogie at a proximity switch target to demonstrate the stopping accuracy.
- Repositioning of the recovery block at the end of the rail using the bogie to push the recovery block into position.
- Decoupling of the recovery winch gearbox from the winch drum.

8.3 Temporary Structures

8.3.1 The Seller shall supply a test rig, as required, in the form of temporary structures that simulate the site conditions for the bogie and associated equipment. This shall include replicating key facility interfaces to verify equipment clearances.

8.3.2 The plant installation relationship between the bogie and associated equipment shall be maintained for the shop tests.

8.3.3 The structures provided shall be designed to allow safe access for viewing at equipment levels.

8.3.4 For in-cell equipment, which may lack conventional guarding, the Seller shall apply, as a minimum, the OSHA requirements to protect personnel from the danger of moving equipment during shop tests.

8.4 Cyclic Tests

8.4.1 Following satisfactory completion in all specific shop tests, cyclic testing shall be conducted on the bogie over the full operating travel. As a minimum requirement, 5 consecutive full cycles shall be completed within a period that shall not exceed 120% of the predicted nominal duration for such a program, subject to all duty restrictions.

8.4.2 The cyclic tests shall follow the on-site sequence of operations, with exception of the rinse cycle, as defined in Section 3 of this specification. For the rinse cycle the Seller shall demonstrate the operation of the inflatable seal and incorporate an appropriate time delay to replicate the rinse cycle. The "mock-up" canister shall be used to replicate normal service design load conditions.

8.4.3 Following completion of the cyclic tests a general visual inspection shall be performed on the equipment with results from the inspection being documented in the Inspection and Test Report.

8.5 Weld Inspections

8.5.1 Weld inspections and Non-Destructive Examinations (NDE) shall be performed in accordance with project specification 24590-WTP-3PS-SS00-T0001, excluding section 8.18, and in accordance with 24590-WTP-3PS-SS00-T0002, and welding standards AWS D1.1 and AWS D1.6, unless specified otherwise.

8.5.2 All welds shall be visually inspected.

8.5.3 As a minimum, all load-bearing welds shall be non-destructively examined by either liquid penetrant or magnetic particle examination as appropriate to the material and configuration.

8.5.4 All welds that maintain the structural integrity of the bogie in accordance with the Important to Safety (ITS) requirements identified in section 1.5.3 of this specification shall be non-destructively examined. Full penetration welds shall be examined by either radiographic or ultrasonic examination as appropriate to the material and configuration. Partial penetration and fillet welds shall be examined by magnetic particle or liquid penetrant examination, as appropriate to the material and configuration.

8.5.5 The Seller shall perform 100% radiographic examination of the vessel and associated piping in accordance with the applicable requirements identified in ASME B&PV Section VIII, Division 1 and ASME B31.3.

9 Preparation for Shipment

9.1 General

9.1.1 Packaging, shipping, handling, and storage shall be performed in accordance with Project Specification 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling and Storage Requirements*, and Section 7 of the Purchase Order.

9.2 Cleaning and Coating

9.2.1 Surfaces shall be cleaned and coated in accordance with 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and*

Equipment. The paint system to be used for the bogie and associated equipment shall be in accordance with System Code T as identified in 24590-WTP-3PS-AFPS-T0001.

9.2.2 The final paint color for all equipment as applicable shall be in accordance with Appendix E of 24590-WTP-3PS-AFPS-T0001.

9.2.3 All Manufacturers Standard Coating (Mfg. Std) must be identified on Appendix H of 24590-WTP-3PS-AFPS-T0001, and be submitted to the Buyer, along with technical data sheets and Material Safety Data Sheets (MSDS).

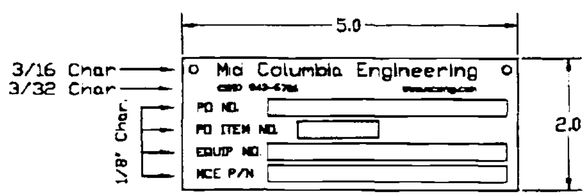
9.2.4 Stainless Steel shall not be coated.

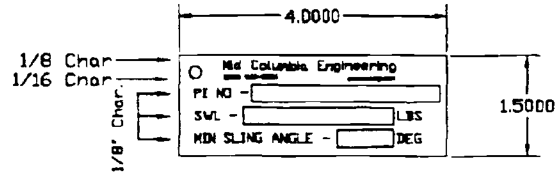
9.3 Tagging

9.3.1 The equipment shall be tagged in accordance with the following:

- A separate stainless steel nameplate shall be provided to include the Buyer's plant item number (identification number) and purchase order number.
- The separate stainless steel nameplate shall have the information impressed, stamped, or etched directly on the stainless steel surface with characters at least 1/8" inch high. The nameplate, where physically possible, shall be secured to the body of the equipment by corrosion resistant screws tapped into a low stress area of the assembly, or welded, so the structural integrity and functional capability of the assembly are not impaired. If it is not physically possible to secure the nameplate to the body of the equipment, then the nameplate shall be attached using a stainless steel wire.
- Instruments shall be tagged according to *Specification for Instrumentation for Package Systems*, 24590-WTP-3PS-JQ07-T0001, Rev 1, Section 8.

(Example)





10 Quality Assurance

10.1 QA requirements specific to item(s) or service

10.1.1 The Seller's Quality Assurance Program (QAP) requirements are specified in 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*, and in the Supplier Quality Assurance Program Requirements Data Sheet(s) included in the procurement documents.

10.1.2 The Seller's QAP Manual shall be submitted to Buyer for review in accordance with 24590-WTP-3PS-G000-T0001.

10.1.3 For SSCs indicated in this specification as ITS, the Seller shall have and maintain a Buyer approved Quality Assurance Program meeting the applicable sections of ASME NQA-1-1989, as per 24590-WTP-3PS-G000-T0001, and the Supplier Quality Assurance Program Requirements Data Sheet, 24590-WTP-3PD-MQTS-00002.

10.1.4 For SSCs indicated in this specification as Non-ITS, or Commercial Quality, the Seller shall have and maintain a Buyer approved Quality Assurance Program meeting the applicable sections of DOE Order O 414.1A, as per 24590-WTP-3PS-G000-T0001, and the Supplier Quality Assurance Program Requirements Data Sheet, 24590-WTP-3PD-MQTS-00004.

10.1.5 The Seller, including all sub-tier suppliers providing items or services, that affect, or may affect, nuclear safety of DOE nuclear facilities shall, as a minimum, have a quality assurance program in place that complies with the requirements of 10 CFR Part 830.122.

10.1.6 Should any portion of the work defined within this specification be subcontracted, these requirements shall be passed on to the sub-contractor as applicable to the work being performed.

10.2 Program QA Elements

10.2.1 The Seller's QAP as a minimum, shall contain the requirements detailed in the Supplier Quality Assurance Program Requirements Data Sheets listed in Section 2 of the Purchase Order.

11 Documentation and Submittals

11.1 General

11.1.1 Documentation shall be submitted to the Buyer in accordance with this specification, and as summarized on the G321-E and G321-V forms in section 3 of the Purchase Order. The G321-V form lists all the documents required for quality verification and the G321-E form lists those engineering documents required.

11.1.2 General requirements and submittal procedures are also covered in Section 3 of the Purchase Order. Each document to be submitted must be listed on the "Seller's Index/Schedule" (Form 15EX). This form tracks the scheduled and actual delivery of each submittal.

11.2 Quality Assurance Manual

11.2.1 The Offeror's Quality Assurance Manual shall be submitted to the Buyer with the Offeror's proposal in accordance with the G321-E form.

11.3 Design Compliance Matrix

11.3.1 The Seller shall develop a matrix that tabulates the design requirements of this specification and the applicable requirements in the referenced project specifications, identifying the method of compliance. The matrix shall describe how each requirement is met including narrative as well as references to drawings, calculations, and/or other specific documentation that demonstrates compliance.

11.3.2 The matrix shall be included as a preliminary document in the 50% design review package. The preliminary document shall form the template for the final document.

11.3.3 The matrix shall be included as a final document in the 90% design review package.

11.4 Safety Equipment List

11.4.1 The Safety Equipment List shall identify which components of the supplied equipment are to be provided as Important to Safety (ITS) or Commercial Quality (CM).

11.4.2 The Safety Equipment List shall be based on the requirements identified in Sections 1.5.3 and 10.1 of this specification.

11.4.3 The Offeror shall provide a Safety Equipment List with the Offeror's proposal that communicates the Offeror's understanding of which components of the equipment identified in this specification are to be provided as ITS and which components are to be provided as CM. The list shall be a detailed listing of components for the supplied equipment along with the designation of each item in the list as either CM or ITS.

11.4.4 The Safety Equipment List, or specific components of the Safety Equipment List, shall be submitted to the Buyer for review and permission to proceed prior to procurement of materials. The document shall be submitted with the 50% design review package as a preliminary document and at the 90% design review as a final document.

11.5 Software Requirements Document

11.5.1 The Seller shall develop a Software Requirements Document that describes the protocols and requirements for programming the bogie control system. The document shall be submitted with the 50% and 90% design review package as a preliminary document and as a final document following shop tests.

11.6 Drawings

11.6.1 General

11.6.1.1 The Seller shall prepare and submit drawings per Section 3 of the MR, Drawings and Data Requirements.

11.6.1.2 The Seller shall prepare drawings in accordance with American Society of Mechanical Engineers (ASME) Y14 series, Engineering Drawing and Related Document Practice. The drawings shall be assigned a unique number in accordance with Section 3 of the MR, Drawings and Data Requirements.

11.6.1.3 SELLER shall specify all dimensions, tolerances, materials, surface finishes, weld symbols, special filler material used, torque values, set points and special fabrication instructions on drawings supplied to BUYER.

11.6.1.4 SELLER drawings shall show critical interface dimensions and their tolerances as specified by BUYER on DPDs or MDSs. This information shall be identified by using an asterisk or another method and note shall be included that explains how to distinguish these dimensions.

11.6.1.5 Seller drawings shall include as a minimum, but not be limited to, the following:

- Descriptive title blocks that are relevant to the information on the drawing
- Notes that will clarify all vague or obscure details that would not otherwise be understandable without a note
- A drawing cross-reference section that will cross-reference other drawings/documents that are relevant to make drawings more complete or more understandable
- A bill of material that will list all items shown on an assembly drawing
- Legend of symbols. Symbols shall be used consistently throughout all drawings related to weld systems

11.6.1.6 Sufficient information shall be included on these drawings to permit manufacture of any replacement parts in the event that the original Seller is not able to supply parts at the time future needs may arise. All drawings shall be specific to the system addressed in this specification and shall be exact up to the time of delivery. The final set of drawings are to be "as-built" drawings. Drawings that are "typical" shall not be provided.

11.6.1.7 Where required, the Seller shall prepare MDSs on data sheets furnished by the Buyer.

11.6.2 Arrangement Drawings:

11.6.2.1 An arrangement drawing shall be submitted at all the design reviews for each piece of equipment. These drawings shall show all major dimensions, supports, arrangements, interfaces, and component identification numbers where appropriate. These drawings shall also show weight(s) and center of gravity (CG) location(s) for installation.

11.6.3 Assembly Drawings:

11.6.3.1 An assembly drawing shall be submitted at the formal, final design closeout meeting for each piece of equipment. These drawings shall show the arrangement of the equipment's components, junction boxes, and interfaces with existing systems/structures. These drawings shall identify utilities required to be supplied by the facility.

11.6.3.2 General assembly drawings shall identify sub-assemblies and drawings.

11.6.3.3 Bill of Materials shall contain the minimum following information:

- an item number for each individual part or material,
- quantity of an item or part,
- description of an item or part,
- reference code (ASTM, ANSI) of an item or part,
- material callout or SELLER part number.

11.6.3.4 Component identification numbers shall be included on drawings where appropriate.

11.6.4 Shop Fabrication/Detail Drawings:

11.6.4.1 Shop Fabrication/Detail drawings of all designed components shall be submitted for the formal, final design closeout meeting. Component identification numbers shall be included on drawings where appropriate.

11.6.4.2 All nameplates and labels shall be shown.

11.6.5 Installation Drawings:

11.6.5.1 An installation drawing shall be submitted for the formal, final design closeout meeting for each piece of equipment. These drawings shall detail modifications required to accommodate equipment installation. Component identification numbers shall be included on drawings where appropriate.

11.6.5.2 The installation drawings shall clearly indicate lifting and rigging points and safe lifting load at each for initial installation and any other lifting evolutions.

11.6.6 Any proposed changes to required elements identified on the Buyer's DPDs, as defined in Section 1.2 of this specification, shall be submitted to the Buyer via SDDR in accordance with Section 2 of the Purchase Order.

11.7 Calculations

11.7.1 Calculations shall be submitted to the Buyer to document engineering analysis performed to verify the adequacy of the supplied equipment designs, including calculations for stress, deflection, and fatigue, for seismic and normal service conditions, electrical loads and machine component selection (e.g., motors, bearings, gears, and drive shafts).

11.7.2 The Seller shall submit, as early as practical in the design process (but no later than as required by the Buyer approved schedule), an analysis of the reaction loads at all embeds and other support locations.

11.7.3 Stress reports and additional calculations affecting ITS components (including calculations for Non-ITS components that may affect ability of the ITS related component to perform the associated ITS function) shall be subject to the requirements of the applicable sections of ASME NQA-1-1989.

11.7.4 If commercial off the shelf computer software is used in performing calculations, it shall be validated before use in the documents it supports. The validation test report shall be provided to the Buyer and shall meet, as a minimum, the following requirements:

- Validation testing shall be performed to a Seller approved procedure
- The testing shall validate the functions and requirements relevant to calculations that it supports
- The test environment conditions shall be described
- Testing shall be performed on the same computer platform that the calculations will be performed.

11.7.5 Spreadsheet and mathematical program calculations shall be treated like hand calculations. Each equation used in the spreadsheet or program shall be presented in the calculation so the result can be reproduced by hand calculations. The title and version of the program shall also be provided. Evidence of hand calculation reproduction at all key steps in the spreadsheet or program shall be presented in the calculation.

11.7.6 English system units of measure shall be used.

11.7.7 Calculations and analyses shall be validated, checked, and approved by qualified personnel independent of the preparer. All calculations shall be provided as part of the design report. Independent reviewers shall be qualified in the subject area and shall not have participated in the calculations and analysis under review. Check review comments are subject to audit.

11.7.8 Seismic calculations and analyses shall be validated, checked, and approved by qualified personnel independent of the preparer. Evidence shall be provided that both the preparer, the checker, and the independent reviewer are fully qualified including a minimum of 10 years experience in structural seismic analysis. Preliminary seismic calculations shall be provided at the 50 % design review. Final seismic calculations shall be provided at the 90 % design review.

11.7.9 The Seller shall ensure that independent checking of critical calculations that bear on long-term performance and reliability are performed.

11.7.10 References shall be provided for all physical properties and/or derived physical quantity data and used as input to calculations or analysis.

11.7.11 References shall be provided for all formulas or references extracted from applicable codes and standards.

11.7.12 Checking shall be performed to confirm the accuracy of the calculations. The checker shall be capable of originating the document. The checker shall not be the originator. Calculations shall be checked and approved prior to use for design or other calculation input.

11.7.13 All calculations shall include headers (on all pages) with the following information:

- Calculation number
- Project name
- Revision
- Author
- Date Subject
- Pagination

11.7.14 All calculations shall include the following sections:

- Objective
- Inputs
- Background
- Applicable codes and standards
- Methodology
- Assumptions
- Calculations
- Results and discussions
- References
- Attachments

11.7.15 Attachments to calculations shall include the following information (on every page):

- Calculation number
- Revision
- Page numbering

11.8 Design Reviews

11.8.1 Contract Award Kick-Off Meeting

11.8.1.1 The contract award kick-off meeting will be an informal discussion conducted at the Seller's facility to ensure the newly awarded contract is clear and concise, and that the Seller has a clear understanding of the scope of the contract.

11.8.1.2 The Seller shall provide to the Buyer, a minimum of five (5) working days prior to the scheduled meeting, copies of documentation or information that is expected to be discussed and/or presented in the meeting. Documentation may be provided as either hard copies or as electronic files via email.

11.8.2 20% Design Review

11.8.2.1 The first interim review will be an informal review conducted at the Buyer's facility after approximately 20% of the design is completed. Preliminary design media, including arrangement and assembly drawings, calculations and analyses will be reviewed by the Buyer. The Seller shall be prepared to discuss any Seller recommended changes to the approaches indicated on the Buyer's proposal drawings and identify any conflicts with equipment envelope dimensions. The Seller shall participate in the design review and shall be prepared to discuss any comments.

11.8.2.2 The Seller shall be responsible for producing and submitting meeting minutes, as a formal document of record.

11.8.3 50% Design Review

11.8.3.1 The second interim review will be an informal review conducted at the Buyer's facility after approximately 50% of the design is completed. Preliminary design media, including arrangement and assembly drawings, calculations and analyses, Design Compliance Matrix, Software Requirements Document, and Safety Equipment List shall be provided to the Buyer for review. The preliminary design media shall be provided to the Buyer at a mutually agreed time prior to the scheduled meeting. The Seller shall participate in the design review and shall be prepared to discuss any comments.

11.8.3.2 Upon buyer's approval, Seller may be authorized to procure (at Buyer's risk) "specific long-lead items", upon satisfactory completion of 50% design review of these items. The Seller shall transmit a detailed list of the "specific long-lead items" that require procurement prior to obtaining code [1] status on the formal drawing submittal. The Seller shall provide sufficient reference documentation for the Buyer to review and authorize the early procurement of these "specific long-lead items".

11.8.3.3 The Seller shall be responsible for producing and submitting meeting minutes, as a formal document of record.

11.8.4 90% Design Review

11.8.4.1 At the conclusion of definitive design, a formal 90% design review will be conducted at the Buyer's facility in accordance with WTP procedures. The (draft) final design report, including all design media, supporting calculations and analyses, Design Compliance Matrix, Software Requirements Document, Safety Equipment List, and other required submittals that document the design, shall be provided to the Buyer.

11.8.4.2 The Seller is encouraged to provide to the Buyer copies of documentation or information that is expected to be discussed and presented at the design review approximately 5 working days prior to the scheduled meeting (if not previously submitted in accordance with the submittal schedule).

11.8.4.3 The Seller shall participate in the design review and present the design, including discussion of the provided submittals.

11.8.4.4 Following the design review meeting, the Buyer will formally transmit comments or other requests on the design submittals. The Seller is required to provide response/resolution to the Buyer's comments in accordance with the submittal schedule, or request deviation from the Buyer's requirements through use of the Buyer's SDDR form.

11.8.4.5 The resolved/corrected submittals shall be provided in the final design report in accordance with the submittal schedule.

11.8.4.6 The Seller shall be responsible for producing and submitting meeting minutes, as a formal document of record.

11.9 Deleted

11.9.1 Deleted.

11.9.2 Deleted.

11.10 Material Test Reports

11.10.1 The Seller shall submit to the Buyer, a complete package of Material Test Reports (MTRs) for all stock steel used for components designated as ITS in Section 1.5.3 of this specification, and as required per the applicable codes and standards referenced in this specification, validating critical parameters as applicable.

11.11 Spare Parts List

11.11.1 The Seller shall provide to the Buyer a recommended spare parts list for all equipment within the Seller's scope of supply for the preventive maintenance of three distinct classifications of spare parts. The Seller's recommendations are to address a startup and warranty period, operational spare parts, and capital spare parts. The recommendations shall also include intervals of replacement based on the operating life of the equipment subject to the duty cycles identified in this specification.

- Startup and warranty spare parts are those parts that may be required at any time during equipment installation, startup, testing, and unit operation through the warranty period.
- The operational spare parts are those parts that require replacement at regular intervals to maintain continuous operation of the supplied equipment and/or system.
- Capital spare parts are major parts or equipment that provide reliable equipment operation throughout the plant life and having a significant lead time for manufacture and delivery.

11.11.2 The spare parts list shall include names of manufacturers with appropriate model numbers and special ordering instructions (if applicable) for replaceable parts. The spare parts list shall also include pricing and delivery information valid for one year after delivery of the equipment.

11.12 Inspection and Test Plan

11.12.1 The Seller shall prepare a detailed Inspection and Test Plan including insertion of Buyer-designated source inspection/witness notification points in accordance with Section 5 of the Purchase Order.

11.12.2 Prior to starting work, the plan shall be submitted to the Buyer for review.

11.12.3 The plan shall include, but not be limited to, the following:

- Equipment to be inspected and tested
- Description of inspection and tests to be performed
- Sequential points for inspection and tests to be performed
- Each characteristic or attribute to be evaluated
- The inspection and test report form to be used
- Other requirements as required by Codes, Standards, or Purchase Order

11.12.4 The plan shall include provisions for increased hold and notification points as the project progresses.

11.12.5 The results of the inspections and tests shall be documented in the Inspection and Test Report.

11.12.6 The Seller shall provide an inspection and test procedure documenting the process followed for determining that specified requirements (dimensions, properties, performance results, etc.) are met.

11.13 Manuals

11.13.1 The Seller shall provide a clearly written instruction manual(s). The manual(s) shall include:

- Storage maintenance instructions
- Rigging instructions
- Installation instructions
- Spare parts list
- General description of the equipment identifying as applicable, significant technical characteristics, test and adjustment information, and safety and warning notices
- Instructions for equipment operation (start-up, shut down, normal, and abnormal), referencing drawings and diagrams as appropriate
- General maintenance instructions
- Recommended inspection points if any, with procedures and period for inspection
- Maintenance instructions for any required lubrication

11.14 Design Changes Incorporated by Reference

24590-WTP-SDDR-PROC-05-00180	Material Equivalency
24590-WTP-SDDR-M-05-00117	Material Equivalency of QL materials for the Canister Rinse Bogie equipment.
24590-WTP-SDDR-MH-07-00110	MR25 Canister Rinse Bogie Control Panel HDH-PNL-00001 -Wire Insulation Colors
24590-WTP-SDDR-MH-07-00111	MR25 Canister Rinse Bogie Control Panel HDH-PNL-00001 - Wire Splicing
24590-WTP-SDDR-MH-07-00114	MR25 Canister Rinse Bogie Control Panel HDH-PNL-00001 - Nameplates
24590-WTP-SDDR-MH-07-00117	MR25 Canister Rinse Bogie -Shim Packs

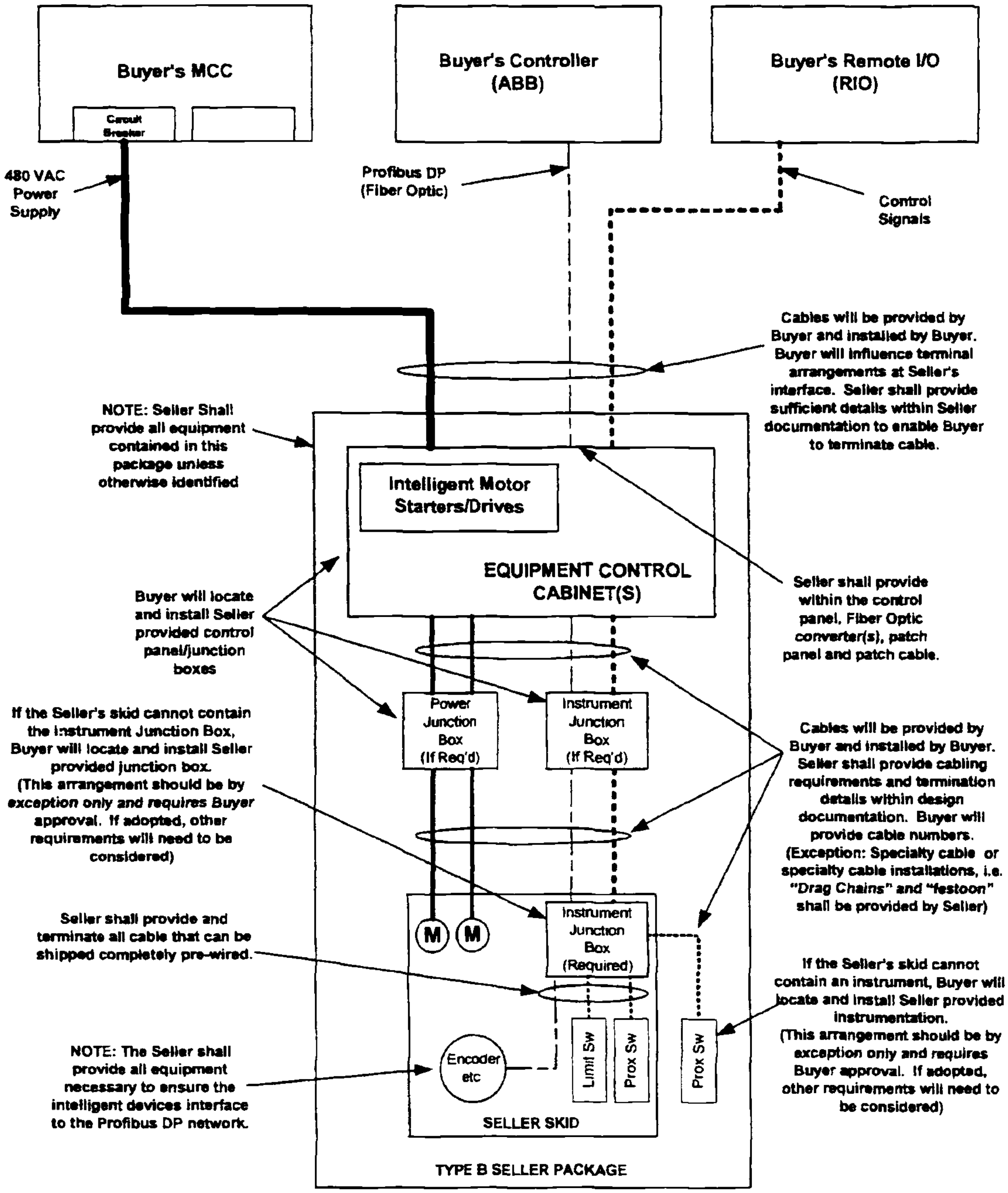
24590-WTP-SDDR-MH-07-00118	MR25 Canister Rinse Bogie - Factory Acceptance Cycle Testing & Recovery Positional Accuracy

Appendix A

Instrumentation and Control Interfaces

Appendix A
Instrumentation and Control Interfaces

Figure 1 "Type B" Package

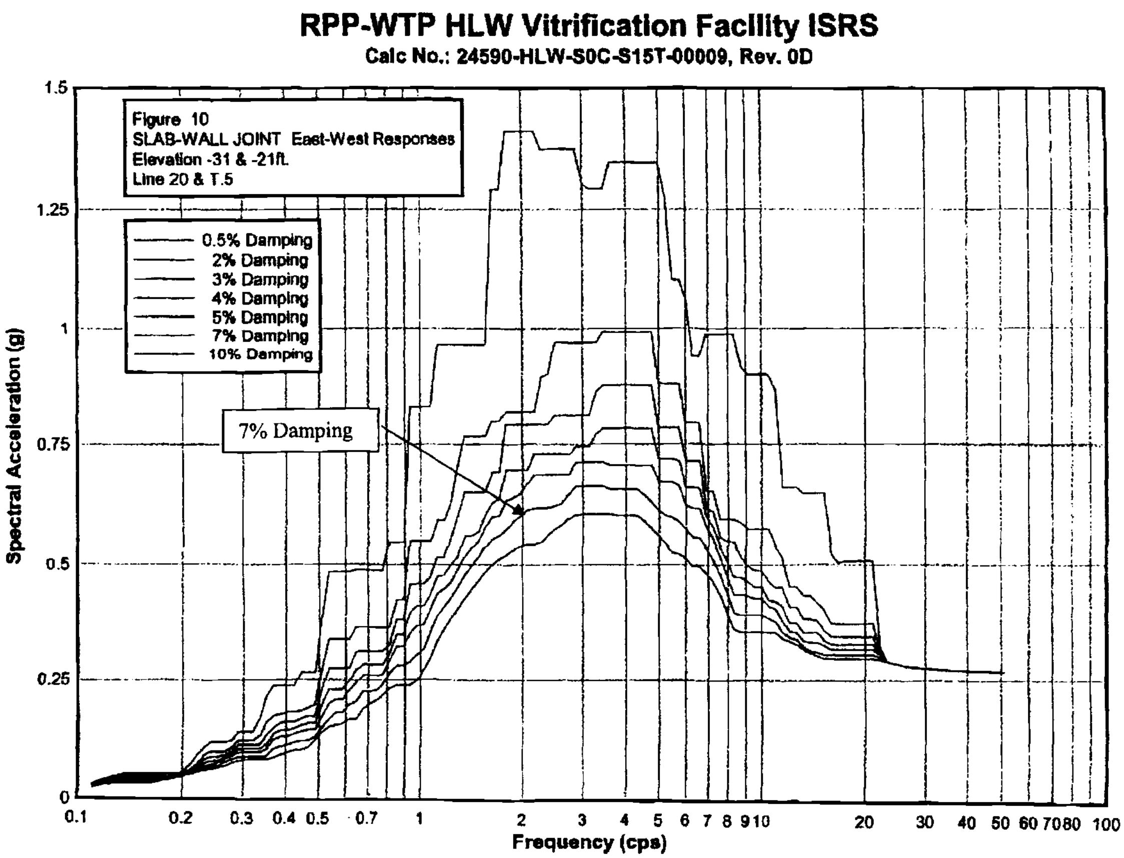


TYPE B - OPTION 1

DATE	REV.
05/06/03	D

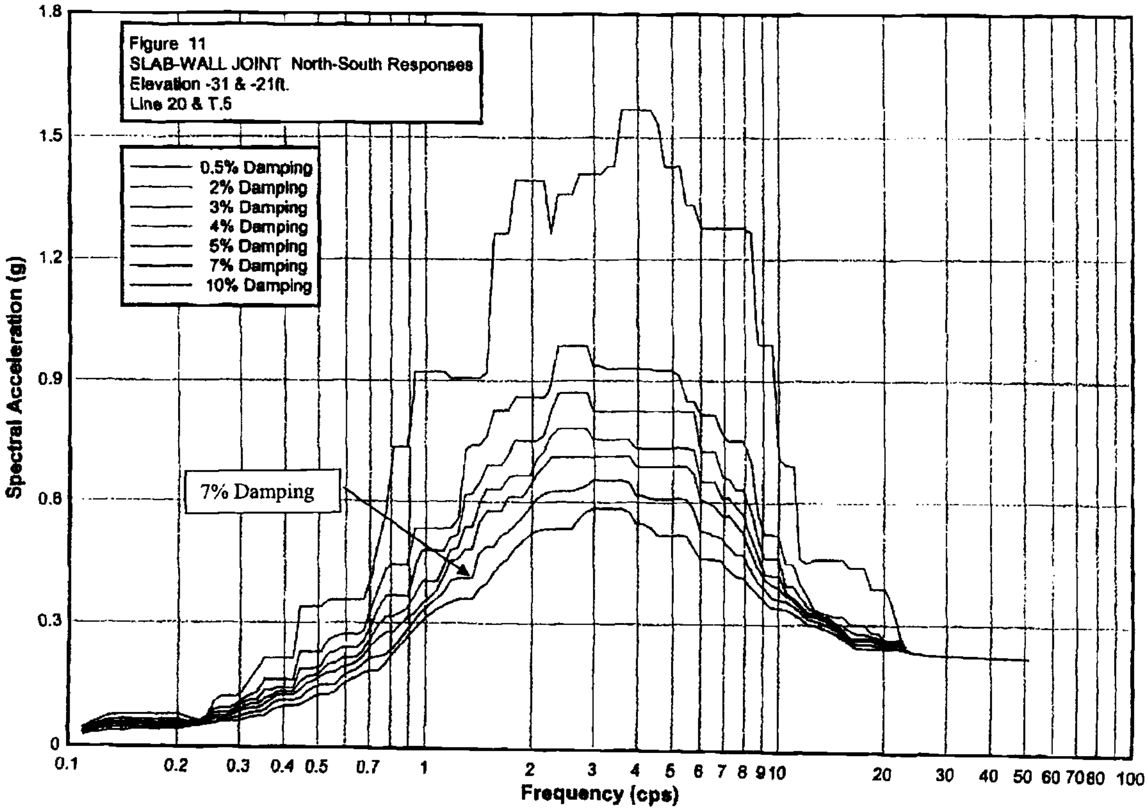
Appendix B

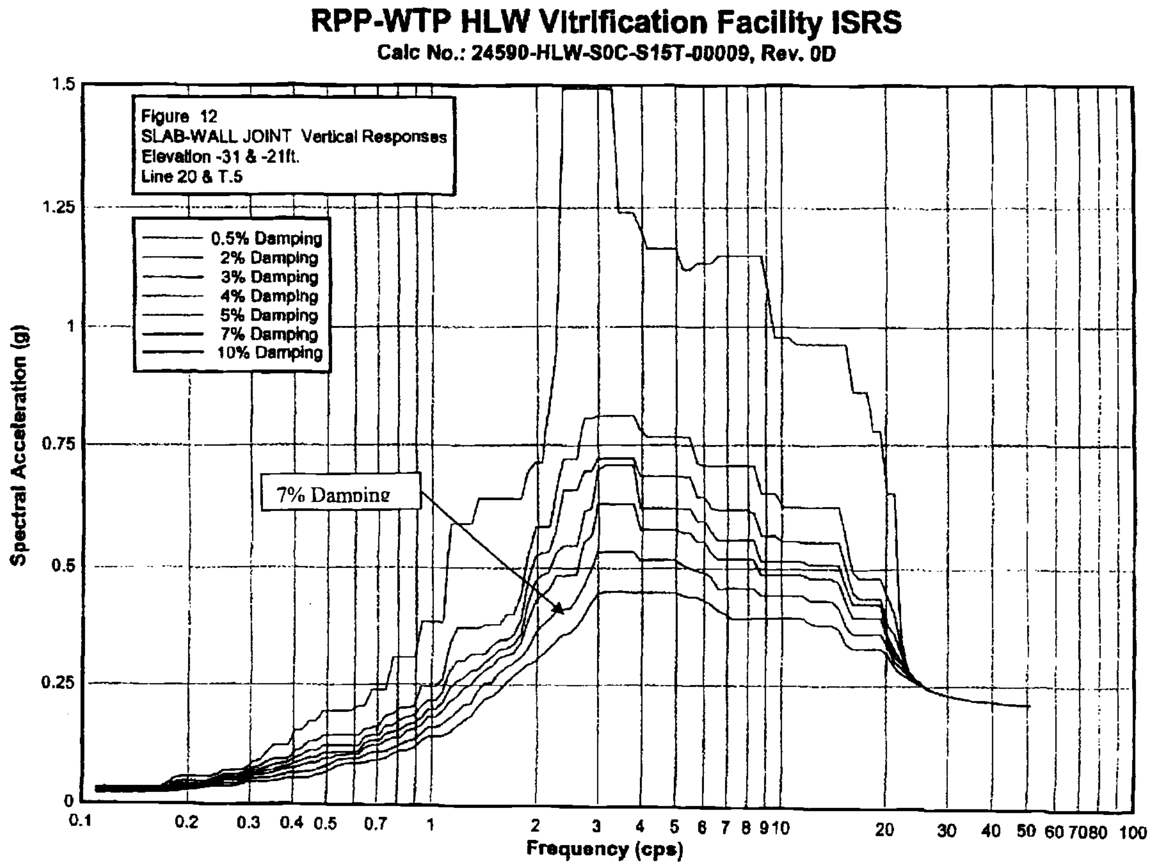
Seismic Response Spectra


RPP-WTP HLW Vitrification Facility ISRS
Calc No.: 24590-HLW-S0C-S15T-00009, Rev. 0D
Figure 10
SLAB-WALL JOINT East-West Responses
Elevation -31 & -21ft.
Line 20 & T.5
0.5% Damping
2% Damping
3% Damping
4% Damping
5% Damping
7% Damping
10% Damping
7% Damping
Spectral Acceleration (g)
Frequency (cps)
0
0.25
0.5
0.75
1
1.25
1.5
0.1
0.2
0.3
0.4
0.5
0.7
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
100

RPP-WTP HLW Vitrification Facility ISRS

Calc No.: 24590-HLW-S0C-S15T-00009, Rev. 0D



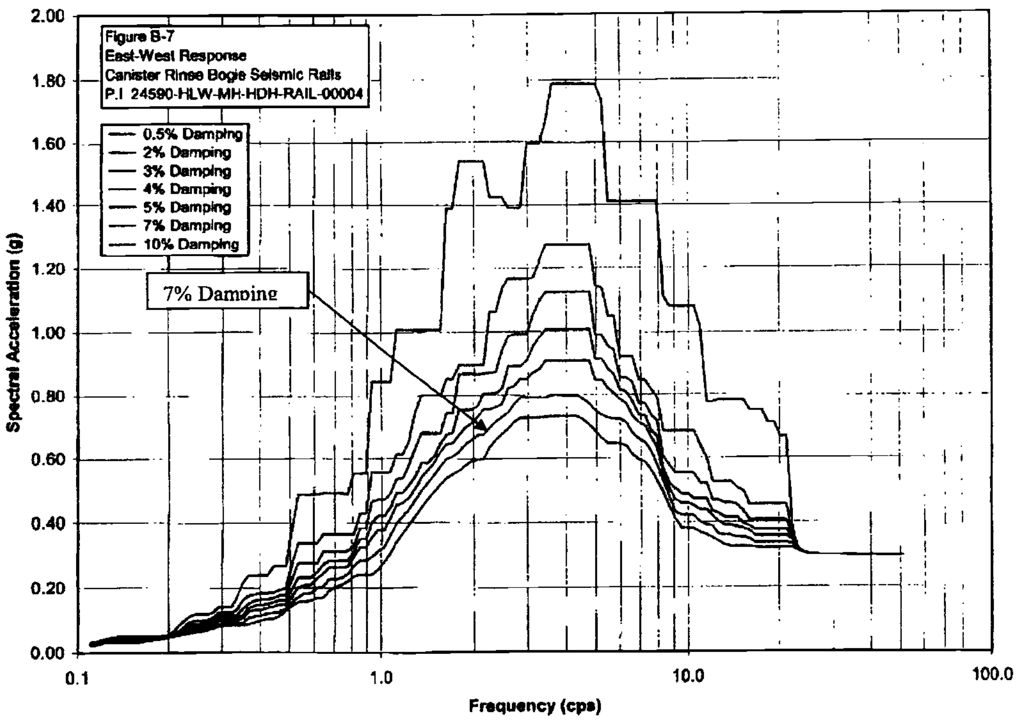

RPP-WTP HLW Vitrification Facility ISRS
Calc No.: 24590-HLW-S0C-S15T-00009, Rev. 0D
Figure 12
SLAB-WALL JOINT Vertical Responses
Elevation -31 & -21ft.
Line 20 & T.5
0.5% Damping
2% Damping
3% Damping
4% Damping
5% Damping
7% Damping
10% Damping
7% Damping
Spectral Acceleration (g)
Frequency (cps)
0
0.25
0.5
0.75
1
1.25
1.5
0.1
0.2
0.3
0.4
0.5
0.7
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
100

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-HLW-S0C-S15T-00039
SHEET REV: D
SHEET NO.: B-9

BY: Ed Ulle
DATE: 8/19/05

SUBJECT: HLW Vitrification Building Seismic Analysis – Enveloped In-Structure Response Spectra

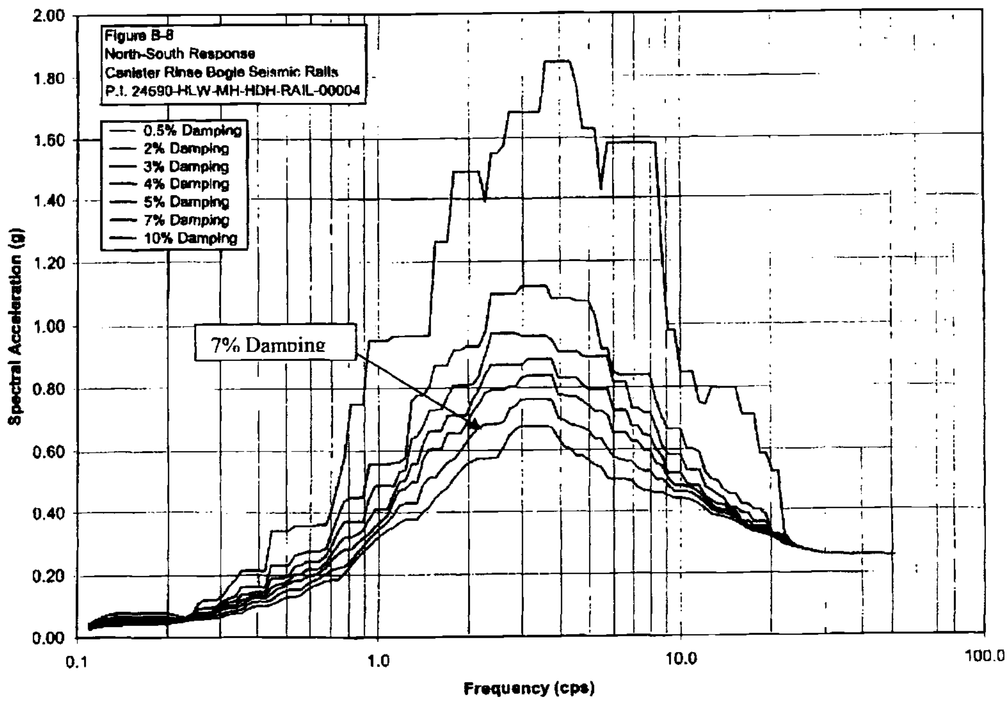


CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-HLW-S0C-S15T-00039
SHEET REV: D
SHEET NO.: B-10

BY: Ed Ulle
DATE: 8/19/05

SUBJECT: HLW Vitrification Building Seismic Analysis – Enveloped In-Structure Response Spectra

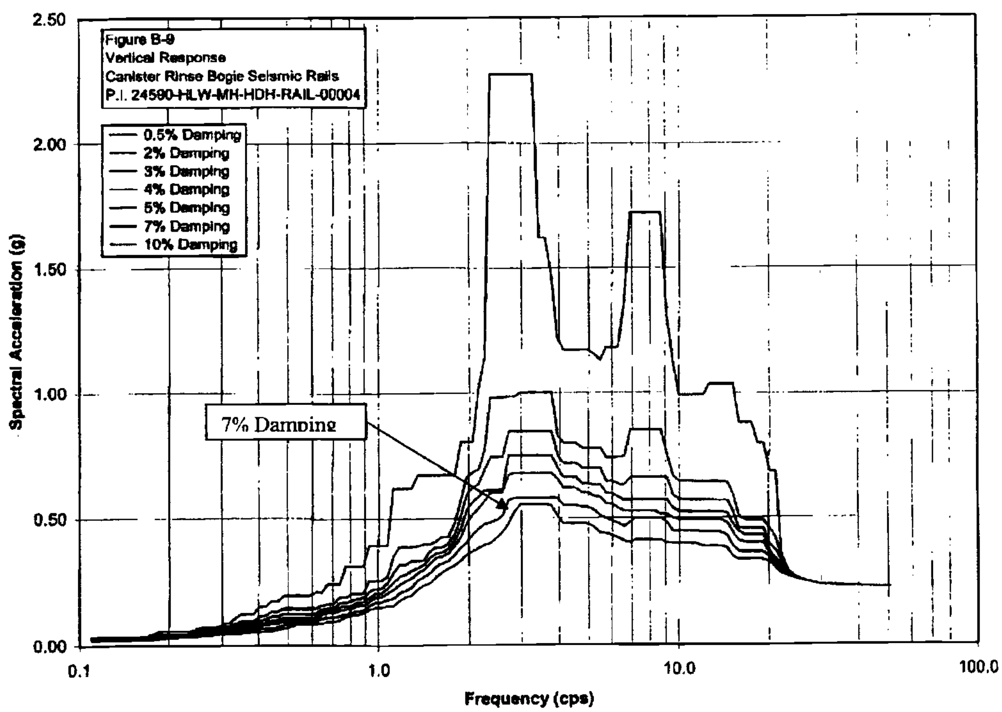


CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-HLW-S0C-S15T-00039
SHEET REV: D
SHEET NO.: B-11

BY: Ed Ulle
DATE: 8/19/05

SUBJECT: HLW Vitrification Building Seismic Analysis – Enveloped In-Structure Response Spectra



Appendix C

ALARA Design Review (ADRs)

24590-HLW-ADR-M-02-005	HLW Canister Rinse Bogie Services Design Evaluation, Rev. 1
24590-HLW-ADR-M-02-006	HLW Bogie Recovery Systems, Rev 1
24590-HLW-ADR-M-02-007	Rinse Bogie Energy Chain, Rev 1
24590-HLW-ADR-M-02-013	Power and Control Supplies for the Canister Rinse Bogie (System HDH), Drum Transfer Bogie (RWH) and Cask Transfer Bogie (RWH), Rev. 1
24590-HLW-ADR-M-02-048	ALARA Review of HLW System Bogies, Rev. 1
24590-HLW-ADR-M-02-050	ALARA Design Review for HLW System HDH & RWH Bogie Rails, Rev. 0

Appendix D

Deleted

Appendix E

Deleted

Appendix F

Deleted

Appendix G

Deleted

Appendix H

Human Factor Codes and Standards

Appendix H
Human Factor Codes and Standards

IEEE 1023-1988 Application Areas for Mechanical Handling	Applicable Human Factor Attributes	Applicable Code, Standard, or Requirement
3.0 Planning for Human Factors Engineering		
	HFE Program Management	NUREG-0711, Section 2
	Human Reliability Analysis	NUREG-0711, Sec. 7
	Functional Requirements Analysis and Function Allocation	NUREG-0711, Section 4
	Human Factors Engineering Program Review	NUREG-0711
	Human Engineering Information Display	Part 1 of NUREG-0700, Rev 1
4.1 Task considerations	Task Analysis	NUREG-0711, Section 5
4.2 Environmental considerations:		
	Environment, Internal Design Conditions	See Section 5.5 of this specification
	Acoustical Noise	MIL-STD-1472F, sec. 5.8.3
	Anthropometric Data	MIL-STD-1472F, sec. 5.6.3
	Illuminance & Illumination	MIL-STD-1472F, Sections 5.8.2, 5.10.5
4.3 Equipment considerations		
	Cranes, Material Handling and construction	MIL-STD-1472F, section 5.12.8
	Vibration	MIL-STD-1472F, Section 5.8.4
	Remote Handling Equipment	
	• Controls: General	DOE-STD-1140-2001 Section 2.5
	• Handle and Grasp Area Design	DOE-STD-1140-2001 Section 2.13
	• Remote Handling	MIL-STD-1472F Section 5.10
	• Self-Alignment	MIL-STD-1472F Section 5.10.1.1
	• Quick-Disconnect	MIL-STD-1472F Section 5.10.1.2
	• Fasteners	MIL-STD-1472F Section 5.10.1.3
	• Lock or Latching	MIL-STD-1472F Section 5.10.1.4
	• Feedback	MIL-STD-1472F Section 5.10.2
	• Manipulators	MIL-STD-1472F Section 5.10.3
	• Position Control	MIL-STD-1472F Section 5.10.3.2

IEEE 1023-1988 Application Areas for Mechanical Handling	**Applicable Human Factor Attributes**	**Applicable Code, Standard, or Requirement**
6.1 Program Plan		
	Training Program Development	NUREG-0711, Section 10
6.2 Documenting HFE in the Design, Operations, Testing and Maintenance Process		
	Verification and Validation	NUREG-0711, Section 11
	Maintenance/Maintainability	DOE-HDBK-1140-2001, Section 5.2 & Section 6.6
6.3 Operational Experience Review:		
	Operating Experience Review	NUREG-0711, Section 3
	Staffing & Qualifications	NUREG-0711, Section 6

This page intentionally left blank.

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-006

Hanford Facility RCRA Permit Modification Notification Form
Part III, Operating Unit 10
Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant

Replace mechanical data sheets for PJV HEPA Filters (PJV-HEPA-00004A/B and PJV-HEPA-00005A/B) in Appendix 10.6 of the Dangerous Waste Permit (DWP)

Replace mechanical data sheets for HOP HEPA Filters (HOP-HEPA-00001A/1B/2A/2B and HOP-HEPA-00007A/7B/8A/8B) in Appendix 10.6 of the DWP

Replace Engineering Specification for Nuclear Grade High Efficiency Particulate Air (HEPA) Filters 24590-WTP-3PS-MKH0-T0002 in Appendix 7.7 of the DWP

Submitted by Co-Operator: Reviewed by ORP Program Office:

D. M. Busche 11/9/10 Date D. L. Noyes 11/24/10 Date

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-006

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part:
Waste Treatment and Immobilization Plant	**Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update and replace the following Mechanical System Data Sheets and Specification currently in the DWP:

Appendix 10.6			
Replace:	24590-HLW-MAD-PJV-P0004, Rev. 0	With:	24590-HLW-MAD-PJV-00004, Rev. 8
	24590-HLW-MAD-PJV-P0005, Rev. 0		24590-HLW-MAD-PJV-00005, Rev. 8
	24590-HLW-MAD-PJV-P0006, Rev. 0		24590-HLW-MAD-PJV-00006, Rev. 8
	24590-HLW-MAD-PJV-P0007, Rev. 0		24590-HLW-MAD-PJV-00007, Rev. 8
	24590-HLW-MAD-HOP-P0010, Rev. 0		24590-HLW-MAD-HOP-00010, Rev. 5
	24590-HLW-MAD-HOP-P0011, Rev. 0		24590-HLW-MAD-HOP-00011, Rev. 5
	24590-HLW-MAD-HOP-P0012, Rev. 0		24590-HLW-MAD-HOP-00012, Rev. 5
	24590-HLW-MAD-HOP-P0013, Rev. 0		24590-HLW-MAD-HOP-00013, Rev. 5
	24590-HLW-MAD-HOP-P0014, Rev. 0		24590-HLW-MAD-HOP-00014, Rev. 5
	24590-HLW-MAD-HOP-P0015, Rev. 0		24590-HLW-MAD-HOP-00015, Rev. 5
	24590-HLW-MAD-HOP-P0016, Rev. 0		24590-HLW-MAD-HOP-00016, Rev. 5
	24590-HLW-MAD-HOP-P0017, Rev. 0		24590-HLW-MAD-HOP-00017, Rev. 5
Appendix 7.7			
Replace:		With:	
	24590-WTP-3PS-MKH0-T0002, Rev. 2		24590-WTP-3PS-MKH0-T0002, Rev. 3

This modification requests Ecology approval and incorporation into the permit the specific changes to the above DWP documents that are identified by revision bars indicating changes since the last revision of the permitted document. Changes to earlier revisions of source documents not captured by change bars are identified in the revision history summary. Revisions are the result of ongoing design (changes from vendor preliminary data to vendor detailed design) and incorporate general criteria from a design verification review. The following identifies the significant changes that have been incorporated:

PJV Mechanical System Data Sheets

- Re-configured Appendix 2 for nozzle location and orientation
- Revised filter housing efficiency
- Revised Note 7 shaker table test notification
- Added Appendix 2 for instrument tap nozzle locations
- Revised radioactive dose level, inlet temperature, leakage rate, and pressure drop
- Revised Note 2 service conditions
- Added Notes 3, 4, 11, and 12
- Added EQ datasheet and seismic criteria

The following outstanding change documents have not been incorporated into this modification:

- 24590-QL-MRA-MKH0-00002-T0003
- 24590-WTP-SDDR-HV-10-00040

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-006

HOP Mechanical Data Sheets

- Revised Note 7 shaker table test notification
- Revised in-structure response spectra data
- Added Appendix 2, Instrument tap location
- Added Notes 11 and 12
- Added Elevation, Manufacturer, Supporting Calculations, Specification for Remote Change HEPA Filter Housing, Environmental Qualification Level
- Updated Design Conditions, Performance Rating, Construction, Housing Accessories table values
- Revised Notes 2, 3, 4, 5, and 8
- Added EQ datasheet and seismic criteria

The following outstanding change document has not been incorporated into this modification:

- 24590-QL-MRA-MKH0-00002-T0003

24590-WTP-3PS-MKH0-T0002, Rev 3 (Engineering Specification for HEPA Filters)

- Administrative update that incorporates outstanding changes and supersedes permit document no longer required by Project
- Incorporated Specification Change Notice 24590-WTP-3PN-MKH0-00022

There are no outstanding change documents associated with this specification.

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: NA

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: ☑ Yes ☐ Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

Jeanne J. Wallace 12/20/10

J. J. Wallace Date

ISSUED BY
RPP-WTP PDC

R11152131

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00010

MR No. 24590-QL-MRA-MKH0-00002

Plant Item No. 24590-HLW-MK-HOP-HEPA-00001A | Rev No. 5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009 24590-HLW-M6C-HOP-00013	Manufacturer Part No:	*
4	Safety Classification	SC				
5	Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP			Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #1- Primary "Active" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 DESIGN CONDITIONS

10	Zone Design Temperature- Summer °F	113	db	Inlet Temp. Design/Normal inlet Air Temp. °F	187	143
11	Site Storage Conditions - Summer °F	113	db	NA	wb	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	db	Radiological Dose Level per Hr (See Note 2 & 4)	35.4 Rad/Hr	
14	Indoor Design Temperature - Winter °F	59	db	Radiological Dose Level for Facility Life-40yrs (See Note 2 & 4)	1.24×10^7 Rad	

15 PERFORMANCE RATING

16	Design Flow Rate (CFM)	4,000		Leakage Rate @ Design Flow &		4 SCFM
17	Min. Operating Pressure (in wc)	(-) 166"		Max Pressure (CFM)		
18	Min. Design Pressure (in wc)	(-) 249"		Assembly Clean Pressure Drop with Filters (in wc)		3.5"
19	Total Filter Openings Required	3		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	2		Weight without HEPA Filters (pounds)		*

21 CONSTRUCTION

22–25 NOTE: This housing unit is paired with 24590-HLW-MK-HOP-HEPA-00001B (Ref. datasheet 24590-HLW-MAD-HOP-00012), orientation as shown:

AIRFLOW »→

inlet | Housing 24590-HLW-MK-HOP-HEPA-00001B | outlet

inlet | Housing 24590-HLW-MK-HOP-HEPA-00001A | outlet

PLAN VIEW

26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*
27	Housing Construction Method:	All Welded	Max. Housing Dim.: (in.) See Note 8	L= * H= * W= *
28	Housing Material: See Note 12	Type 304L Stainless Steel	Housing Material Gauge:	*
29	Top Panel Material: See Note 12	Type 304L Stainless Steel	Top Panel Material Gauge:	*
30	Structural Frame Material: See Note 12	Type 304L Stainless Steel	Structural Frame Features:	*
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side
33	Inlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	Outlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal
34		See Note 5 & 8		See Note 5 & 8
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required:	N/A
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size:	N/A
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness	N/A

41 HOUSING ACCESSORIES

42	Accessory Provided	Yes	No	Accessory Information	
43	Test w/Inlet Isolation Damper:		X	Damper Provided By:	Others
44	See Note 7			Inlet Isolation Damper Type	N/A
45				Inlet Isolation Damper Size:	12" Nominal Diameter
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	NA
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	N/A
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	N/A
52	Inlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity:	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00010

MR No.	Plant Item No.	Rev No.
24590-QL-MRA-MKH0-00002	24590-HLW-MK-HOP-HEPA-00001A	5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #1- Primary "Active" Housing			Environmental Qualification: MILD See Appendix 1. EQ	

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/Outlet Isolation Damper:		X	Damper Provided By:	Others	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall	NA	
25				Length: (inches)		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension:(inches)	N/A	
28				Outlet Transition Largest Inside	N/A	
29				Dimension: (inches)	N/A	
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size:	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2-in. (See Note 3)	
39	Drain Connection: See Note 9	X		Drain Connection Size: (inches)	1 1/2-in. (See Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:		

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Intrumentation Taps:	3/4-inch SW	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	

48 NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection point located on Appendix 2 sketches. Aerosol lines shall be routed outside housing through box stiffeners, so as not to project outside the housing envelope. Aerosol injection and sampling lines shall be stainless steel pipe per specification 24590-WTP-3PB-P000-TS11Z, or equal.

51

52

53

BECHTEL	**REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00010**	MR No. **24590-QL-MRA-MKH0-00002**
		Plant Item No. **24590-HLW-MK-HOP-HEPA-00001A** / Rev No. **5**

Project:	RPP-WTP	Bldg./Rm #	**HLW / H-0104**	Manufacturer:	Flanders /CSC
Project No:	24590	Elevation	**0'-0"**		
Site:	DOE Hanford	Supporting Calculations	**24590-HLW-MKC-HOP-00009**	Manufacturer Part No:	*
Safety Classification	SC		**24590-HLW-M6C-HOP-00013**		
Seismic Category	SC-I	Associated Drawings	**24590-HLW-M6-HOP-00010**	Quantity Required	1
System No.	**HOP**			Quality Level	Q
System Desc.	**24590-HLW-3YD-HOP-00001**		**Spec. for Remote Change HEPA Filter Housing**	**24590-WTP-3PS-MKH0-T0003**	
Description:	**HLW Vessel Vent / Offgas Melter #1- Primary "Active" Housing**			Environmental Qualification: MILD See Appendix 1. EQ	

Notes:

1.) Vendor to fill in data with (*) asterisk.

2.) **Service Conditions, HOP OFF-GAS:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter Offgas and Liquid Effluent Definition, Stream No.HV232 (First HEPA Inlet Gas):

The constituents off-gas (Based on a 3.5 MT/day melter basis):

Chemicals:			Dose:	
N_2 = 69.6%	CO = 4.82E+01 mg/m^3	P = 2.21E-04 mg/m^3	Alpha = 2.26E-03 Bq/m^3	Temperature = 61°C
O_2= 18.5%	NO_x = 1.04E+03 mg/m^3	NH_3 = 3.60E+01 mg/m^3	Beta/Gamma[(1)]=3.41E+01 Bq/m^3	Dew Pt. Temp.= 43.9°C
Ar = 0.8%	SO_x = 1.64E+01 mg/m^3	Entrain of Solids = 3.95 mg/m^3	H-3 = 7.95E+03 Bq/m^3	Density = 0.881 kg/m^3
CO_2 = 0.6%	Cl = 5.52E-02 mg/m^3		C-14 = 3.87E+03 Bq/m^3	Therm.Conduct=27.81mW/m-c
H_2O = 10.4%	F = 8.07E-02 mg/m^3		I-129 = 4.32E-02 Bq/m^3	Heat Cap 1.07 kJ/kg-C
				Relative Humidity = 44.4%
				Ave. Mole Wt.= 27.9 g/mol
			(1) Beta/Gamma dose excludes	Viscosity = 19.54 uPa-s
			Tritium, Carbon-14, and Iodine.	Pressure = 875 mbar

3.) **Differential Pressure Tap**: 1/2" Socket Weld, T-304L SS Half Coupling. Size of the hole penetrating housing pressure boundary at 1/8" diameter.

4.) **Radiation Dose Rates** for HLW R5 room H-0104 (Filter Cave), See CCN: 152094, Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

5.) The thickness for the 12" dia. inlet / outlet connections on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.18" thick (pipe per ASTM A312 or rolled and welded plate per A240).

6.) N/A denotes "Not Applicable".

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >/ = 99.7% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300 and Equipment Qualification Data Sheet (Appendix 1 and Attachment A).

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 00111,00112 and 00118 for HOP HEPA Filter Housing end panel assembly details and overall dimension.

9.) **Drain connection**: 1 1/2-in. NPT T-304L SST pipe nipple with cap, drain at low point in the plenum.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) **Contents of this document are "Dangerous Waste Permit Affecting".**

12.) **Low carbon content alloy steel:** "L" designated materials, i.e., Type 304L stainless steel, with a maximum carbon content of 0.030% shall be used for pressure boundary materials (exposed to the offgas stream) that will be welded. Type 304 SST may be substituted for items such as fasteners that will not be welded. Alternate materials may be proposed and accepted by the Buyer using the design submittal process.

Remarks: **Modifications to the content of this datasheet shall be made by vendor submittal and are subject to Buyer's permission to proceed.**
FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.
Blank data fields are not required to be completed.

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
5	3/1/10	Revised note 7 and added shaker table test notification. Updated attached EEQ (Appendix 1) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. ~~Incorporated DCN: 24590-WTP-M6N-MS0T-00001~~ ADDED APPENDIX 2, FOR INSTRUMENT TAPS NOZZLE LOCATION. RKRamos 02-26-10	RRamos	CMeng	JATuck	PG / PETER G. SHEA	[illegible]
4	9/24/2009	Added note 11 per DCN 24590-HLW-MAN-HOP-00001 & note 12, attached EEQ (Appendix 1) with RRS curves from coupled analysis and Safety Screening Evaluation. Revised Safety Class to SC and Quality Level to Q. Consolidate attachment "B" into Note 2. Revised Note 3 and 4. and added housing overall dimensions. Revised note 8 per vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 111 and 112.	R.K. Ramos	C. Meng	J.Tuck	L.Solis	Gerard Garcia
3	4/4/2005	Revised note 5 to incorporate 24590-WTP-SDDR-PROC-05-00290 disposition, room no., calc. no., and radiological dose. Deleted Attachment A.	M.Ordona	_	A.Jocson	_	L.Solis
2	12/2/2003	Revised the Design Conditions. Performance Rating Sections and Seismic Category to SC-I and Quality Level	M.Ordona	_	DEG	_	Hadi Jalali
1	9/8/2003	Revised the Design Conditions and Performance Rating sections	M.Ordona	_	D.E.Green	_	J. Sanders
0	10/22/2002	Issued for Purchase	David Royer	_	A.C.Tan	_	J. Sanders
Rev	**Date**	**Description**	**Originator**	**E&NS**	**Checker**	**Reviewer**	**Approver**

APPENDIX 1
REMOTE CHANGE HEPA FILTER HOUSING
EQUIPMENT QUALIFICATION Data Sheet:
24590-HLW-MAD-HOP-00010

MR No. **24590-QL-MRA-MKH0-00002**

Plant Item No. **24590-HLW-MK-HOP-HEPA-00001A** | Rev No. 5

1	**EQUIPMENT IDENTIFICATION:**		
2	**Full Component Tag Number or BNI Stock Code Number**	24590-HLW-MK-HOP-HEPA-00001A	**Safety Classification**
3	**Equipment Datasheet Number**	24590-HLW-MKD-HOP-00010	[X] SC [ ] SS
4			[ ] APC-PAM
5	**Description**	HLW Vessel Vent / Melter #1 OffGas Vent is a Primary and	**Seismic Category**
6		Secondary HEPA Filter Housing configuration with a remote operated	[X] SC-I [ ] SC-II
7		Inlet / Outlet dampers (By Others). There are two parallel assemblies of offgas filters containing two stages of HEPA filters in series to perform	[ ] SC-III [ ] SC-IV
8		high efficiency removal of sub-micron particulates from the heated offgas.	[ ] SC-III Seismic Interaction only
9	**Location (Facility / Building and Room No.)**	HLW HOP Primary HEPA Filter Housing 24590-HLW-MK-HOP-HEPA-00001A is located inside Room **H-104. at EL. 0'-0"**.	
10	**Safety Function(s)**	Provide confinement and protection against crush/impact events.	
11		To provide filtration of the offgas to prevent releases that may result in consequences to the public, co-worker, and facility worker above RES (Rad. Exposure Std.) in the SRD (Safety Requirement Doc.).	
12		Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.3.20.1	
13	Equipment Safety Function Type	[X] Passive Mechanical [ ] Active Mechanical [ ] Electrical	
14	Seismic Safety Function	Seismic Operability Requirements	
15	[X] Yes [ ] No	[X] During Seismic Event [X] After Seismic Event [ ] None	
16			

17	**EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)** **(Parameter values stated in this section do not include process conditions or operationally induced conditions)**				
18	Classification of Environment	[X] Mild	[ ] Harsh	Qualified Life (years)	[X] 40 [ ] Other
19–20	**Parameters Type / Units**	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
21	**Normal Ambients**				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
29	Plant / Process Induced Vibration	[ ] Yes [X] No			
30	Additional Normal Information:	None			
31					
32	**Abnormal Ambients**				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
40	Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
41	Additional Abnormal Information:	None			
42					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00010	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00001A**	Rev No. 5

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					
18	**DBE Chemical Exposure Details**				
19	DBE Chemical Types/Concentration		NONE		
20					
21					
22					
23	**Electrical Interfaces Supporting the Safety Function**				
24	Power Supply Voltage (VAC, VDC)		NA		
25	Power Supply Frequency (Hz)		NA		
26	Power Connection Method		NA		
27	I / O Signals to /from Equipment		NA		
28	I / O Connection Method		NA		
29					
30	**Mechanical Interfaces**				
31	Mounting Configuration (orientation)		* Note 13		
32	Mounting Method (bolts, welds, etc)		* Note 13		
33	Auxiliary Devices		* Note 13		
34					
35	**Equipment Seismic Qualification (ESQ)**				

36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37 38	WTP Seismic Design Specification	Seismic Qualification of Seismic Category I/II Equip. and Tanks	24590-WTP-3PS-SS90-T0001	2	N/A
39 40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00010**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00001A**	Rev No. 5

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.

14. Note Deleted.

15. Note Deleted See Note 24 A & B.

16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.

17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents. See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr) that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.

18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

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

20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.

22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

24 A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

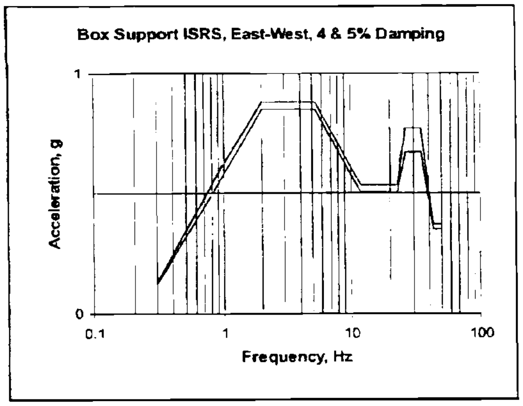
ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00010	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00001A	Rev No. 5

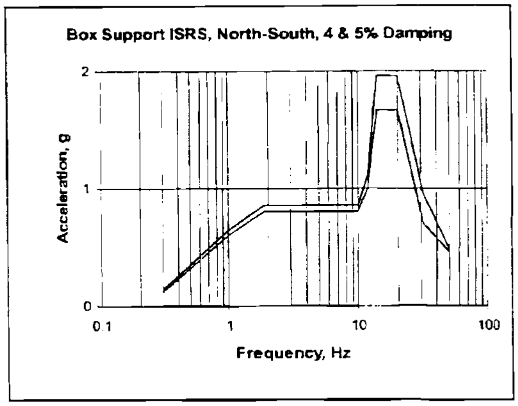
In-Structure Response Spectra (ISRS) and Nozzle Load: Based on 24590-HLW-S0C-S15T-00108, Rev. B

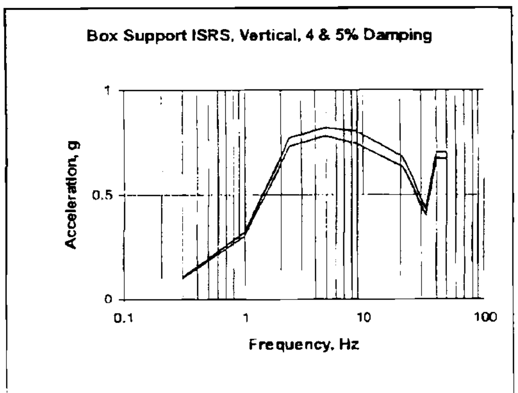
System	Load Case	P / Kip	V2 / Kip	V3 / Kip	T / Kip-in	M2 / Kip-in	M3 / Kip-in
Nozzle Load for HOP HEPA Housing	DL (Dead + Live)	0.12	2.94	0.04	6.7	1.2	5.4
	To (thermal, normal)	0.86	1.87	0.22	13.2	1.8	5.3
	Ta (thermal, off-normal & Post DBE)	2.19	3.92	0.38	28.0	2.7	11.5
	E (Seismic)	0.56	1.13	0.51	8.7	2.4	3.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS:



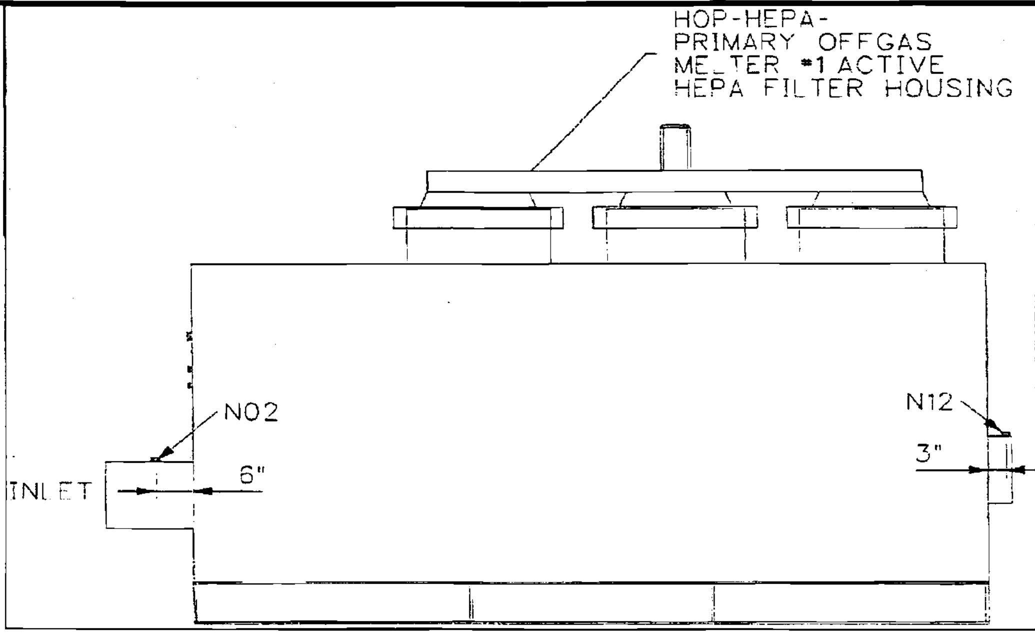




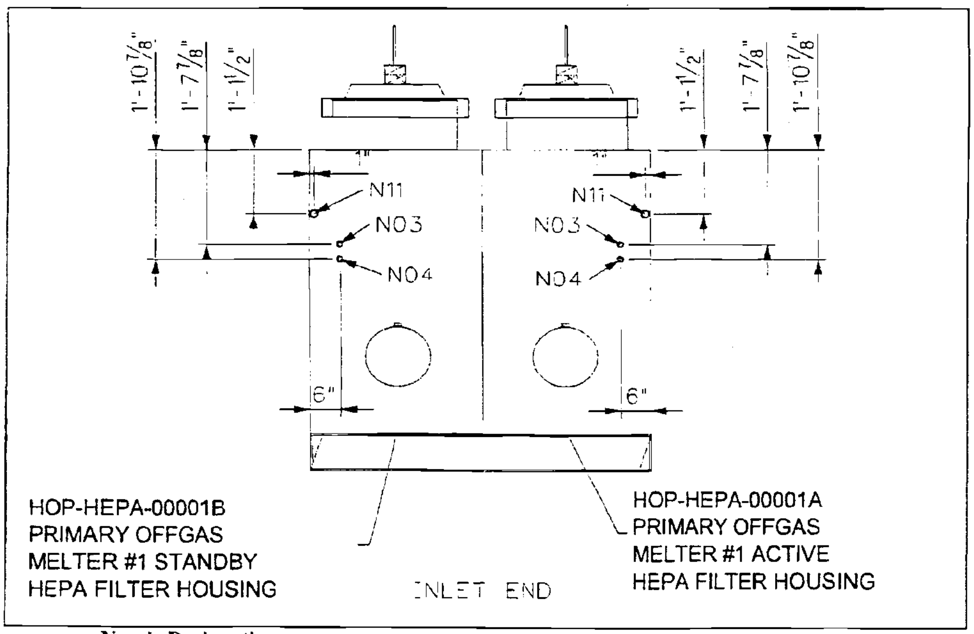
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MKD-HOP-00010	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00001A	Rev No. 5



ELEVATION VIEW OF HOP-HEPA-00001A



Nozzle Designations:
NO1: Housing inlet
NO2: Injection port
NO3: Upstream static pressure.
NO4: Downstream static pressure
NO11: Upstream sample
NO12: Downstream sample

ISSUED BY
RPP-WTP PDC

R11152132

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00011	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00002A	Rev No. 5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #1- Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1. EQ	

9	**DESIGN CONDITIONS**					
10	Zone Design Temperature- Summer °F	113	db	Inlet Temp. Design/Normal inlet Air Temp. °F	187	143
11	Site Storage Conditions - Summer °F	113	db	NA	wb	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	db	Radiological Dose Level per Hr (See Note 2 & 4)	35.4 Rad/Hr	
14	Indoor Design Temperature - Winter °F	59	db	Radiological Dose Level for Facility Life-40yrs (See Note 2 & 4)	1.24×10^7 Rad	
15	**PERFORMANCE RATING**					
16	Design Flow Rate (CFM)	4,000		Leakage Rate @ Design Flow &		4 SCFM
17	Min. Operating Pressure (in wc)	(-) 166"		Max Pressure (CFM)		
18	Min. Design Pressure (in wc)	(-) 249"		Assembly Clean Pressure Drop with Filters (in wc)		3.5"
19	Total Filter Openings Required	3		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	2		Weight without HEPA Filters (pounds)		*
21	**CONSTRUCTION**					

22–25	NOTE: This housing unit is paired with 24590-HLW-MK-HOP-HEPA-00002B (Ref datasheet 24590-HLW-MAD-HOP-00013), orientation as shown:	AIRFLOW »→ inlet | Housing 24590-HLW-MK-HOP-HEPA-00002A | outlet inlet | Housing 24590-HLW-MK-HOP-HEPA-00002B | outlet PLAN VIEW

26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*
27	Housing Construction Method:	All Welded	Max. Housing Dim.: (in.) See Note 8	L= * H= * W= *
28	Housing Material: See Note 12	Type 304L Stainless Steel	Housing Material Gauge:	*
29	Top Panel Material: See Note 12	Type 304L Stainless Steel	Top Panel Material Gauge:	*
30	Structural Frame Material: See Note 12	Type 304L Stainless Steel	Structural Frame Features:	*
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side
33	Inlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	Outlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal
34		See Note 5 & 8		See Note 5 & 8
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required:	N/A
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size:	N/A
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness:	N/A

41	**HOUSING ACCESSORIES**				
42	**Accessory Provided**	Yes	No	Accessory Information	
43	Test w/Inlet Isolation Damper:		X	Damper Provided By:	Others
44	**See Note 7**			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	12" Nominal Diameter
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	NA
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	N/A
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	N/A
52	Inlet Aerosol Test Port Criteria	X		Challenge Aerosol Connection Type:	*
53	**See Note 8**			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity:	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00011	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00002A	Rev No. 5

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009	Manufacturer Part No:	*
Safety Classification	SC		24590-HLW-M6C-HOP-00013		
Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
System No.	HOP			Quality Level	Q
System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
Description:	HLW Vessel Vent / Offgas Melter #1- Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1. EQ	

HOUSING ACCESSORIES (continued)

Accessory Provided	Yes	No			
Inlet Viewing Ports		X	Total Number of Viewing Ports Required:	N/A	
			Inlet Viewing Port Type:	N/A	
			Inlet Viewing Port Locations:	N/A	
			Inlet Viewing Port Dimensions: (inches)	N/A	Width
				N/A	Length
Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
			Accessory Information	1 per bank	
Vacuum-Relief Vent Assembly:	X		Number Required:	*	
			Vacuum-Relief Vent Assembly Setpoint:	*	
			Vacuum-Relief Vent Assembly Manufacturer:	*	
			Vacuum-Relief Vent Model Number:	N/A	
Test w/Outlet Isolation Damper:		X	Damper Provided By:	Others	
See Note 7			Outlet Isolation Damper Type:	N/A	
			Outlet Isolation Damper Size:	N/A	
Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall Length: (inches)	NA	
			Outlet Transition Smallest Inside Dimension:(inches)	N/A	
				N/A	
			Outlet Transition Largest Inside Dimension: (inches)	N/A	
				N/A	
Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
See Note 8			Challenge Aerosol Connection Size:	*	
			Challenge Aerosol Connection Quantity:	N/A	
Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
			Outlet Viewing Port Type:	N/A	
			Outlet Viewing Port Locations:	N/A	Width
			Outlet Viewing Port Dimensions: (inches)	N/A	Length
				N/A	
Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2-in. (See Note 3)	
Drain Connection: See Note 9	X		Drain Connection Size: (inches)	1 1/2-in. (See Note 9)	
Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
			PVC Safe Change Bag Type:		

UTILITY REQUIREMENTS

Electrical: (volts/phase/hertz)	N/A
Compressed Air:	N/A
Intrumentation Taps:	3/4-inch SW
Pressure/Leak Test Ports	*
Air/Aerosol Mixing Test Ports	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00011

MR No.		Plant Item No.	Rev No.
24590-QL-MRA-MKH0-00002		24590-HLW-MK-HOP-HEPA-00002A	5

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009 24590-HLW-M6C-HOP-00013	Manufacturer Part No:	*
Safety Classification	SC				
Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
System No.	HOP			Quality Level	Q
System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
Description:	HLW Vessel Vent / Offgas Melter #1- Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

Notes:

1.) Vendor to fill in data with (*) asterisk.

2.) **Service Conditions, HOP OFF-GAS:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter Offgas and Liquid Effluent Definition. Stream No.HV232 (First HEPA Inlet Gas):

The constituents off-gas (Based on a 3.5 MT/day melter basis):

Chemicals:			Dose:	
N_2 = 69.6%	CO = 4.82E+01 mg/m^3	P = 2.21E-04 mg/m^3	Alpha = 2.26E-03 Bq/m^3	Temperature = 61°C
O_2 = 18.5%	NO_x = 1.04E+03 mg/m^3	NH_3 = 3.60E+01 mg/m^3	Beta/Gamma$^{(1)}$=3.41E+01 Bq/m^3	Dew Pt. Temp.= 43.9°C
Ar = 0.8%	SO_x = 1.64E+01 mg/m^3	Entrain of Solids = 3.95 mg/m^3	H-3 = 7.95E+03 Bq/m^3	Density = 0.881 kg/m^3
CO_2 = 0.6%	Cl = 5.52E-02 mg/m^3		C-14 = 3.87E+03 Bq/m^3	Therm.Conduct=27.81mW/m-c
H_2O = 10.4%	F = 8.07E-02 mg/m^3		I-129 = 4.32E-02 Bq/m^3	Heat Cap 1.07 kJ/kg-C
				Relative Humidity = 44.4%
				Ave. Mole Wt.= 27.9 g/mol
			(1) Beta/Gamma dose excludes Tritium, Carbon-14, and Iodine.	Viscosity = 19.54 uPa-s
				Pressure = 875 mbar

3.) **Differential Pressure Tap:** 1/2" Socket Weld, T-304L SS Half Coupling. Size of the hole penetrating housing pressure boundary at 1/8" diameter.

4.) **Radiation Dose Rates** for HLW R5 room H-0104 (Filter Cave), See CCN: 152094. Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

5.) The thickness for the 12" dia. inlet / outlet connections on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.18" thick (pipe per ASTM A312 or rolled and welded plate per A240).

6.) N/A denotes "Not Applicable".

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >/ = 99.7% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test.

Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300 and Equipment Qualification Data Sheet (Appendix 1 and Attachment A).

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-P0A-MKH0-00002-07-00100, 00111, 00112 and 00118 for HOP HEPA Filter Housing end panel assembly details and overall dimension.

9.) **Drain connection**: 1 1/2-in. NPT T-304L SST pipe nipple with cap, drain at low point in the plenum.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) **Contents of this document are "Dangerous Waste Permit Affecting".**

12.) **Low carbon content alloy steel:** "L" designated materials, i.e., Type 304L stainless steel, with a maximum carbon content of 0.030% shall be used for pressure boundary materials (exposed to the offgas stream) that will be welded. Type 304 SST may be substituted for items such as fasteners that will not be welded. Alternate materials may be proposed and accepted by the Buyer using the design submittal process.

Remarks: **Modifications to the content of this datasheet shall be made by vendor submittal and are subject to Buyer's permission to proceed.**
FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.
Blank data fields are not required to be completed.

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
5	3/1/10	Revised note 7 and added shaker table test notification. Updated attached EEQ (Appendix 1) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. ~~Incorporated DCN 24590-WTP-M6N-M00T-00001~~ ADDED APPENDIX 2, FOR INSTRUMENT TAPS NOZZLE LOCATION. RKRamos 02-26-10	RKRamos	CMeng	JATuck	PEDRO G. SHED	[signature]
4	9/24/2009	Added note 11 per DCN 24590-HLW-MAN-HOP-00001 & note 12, attached EEQ (Appendix 1) with RRS curves from coupled analysis and Safety Screening Evaluation. Revised Safety Class to SC and Quality Level to Q. Consolidate attachment "B" into Note 2. Revised Note 3 and 4, and added housing overall dimensions. Revised note 8 per vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 111 and 112.	R.K. Ramos	C. Meng	J.Tuck	L.Solis	Gerard Garcia
3	4/4/2005	Revised note 5 to incorporate 24590-WTP-SDDR-PROC-05-00290 disposition, room no., calc. no., and radiological dose. Deleted Attachment A.	M.Ordona	_	A.Jocson	_	L.Solis
2	12/2/2003	Revised the Design Conditions, Performance Rating Sections and Seismic Category to SC-I and Quality Level	M.Ordona	_	DEG	_	Hadi Jalali
1	9/8/2003	Revised the Design Conditions and Performance Rating sections	M.Ordona	_	D.E.Green	_	J. Sanders
0	10/22/2002	Issued for Purchase	David Royer	_	A.C.Tan	_	J. Sanders
Rev	Date	Description	Originator	E&NS	Checker	Reviewer	Approver

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00011**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00002A**	Rev No. 5

1	**EQUIPMENT IDENTIFICATION:**				
2	**Full Component Tag Number or BNI Stock Code Number**	**24590-HLW-MK-HOP-HEPA-00002A**			**Safety Classification**
3	**Equipment Datasheet Number**	**24590-HLW-MAD-HOP-00011**			[X] **SC** [ ] **SS**
4					[ ] **APC-PAM**
5	**Description**	HLW Vessel Vent / Melter #1 OffGas Vent is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet / Outlet dampers (By Others). There are two parallel assemblies of offgas filters containing two stages of HEPA filters in series to perform high efficiency removal of sub-micron particulates from the heated offgas.			**Seismic Category**
6					[X] **SC-I** [ ] **SC-II**
7					[ ] **SC-III** [ ] **SC-IV**
8					[ ] **SC-III** Seismic Interaction only
9	**Location (Facility / Building and Room No.)**	HLW HOP Primary HEPA Filter Housing 24590-HLW-MK-HOP-HEPA-00002A is located inside Room **H-104**, at **EL. 0'-0"**.			
10	**Safety Function(s)**	Provide confinement and protection against crush/impact events.			
11		To provide filtration of the offgas to prevent releases that may result in consequences to the public, co-worker, and facility worker above RES (Rad. Exposure Std.) in the SRD (Safety Requirement Doc.).			
12		Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.3.20.1			
13	Equipment Safety Function Type	[X] Passive Mechanical	[ ] Active Mechanical		[ ] Electrical
14	Seismic Safety Function	Seismic Operability Requirements			
15	[X] Yes [ ] No	[X] During Seismic Event	[X] After Seismic Event		[ ] None
16					
17	**EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)** **(Parameter values stated in this section do not include process conditions or operationally induced conditions)**				
18	Classification of Environment	[X] Mild	[ ] Harsh	Qualified Life (years)	[X] 40 [ ] Other
19–20	**Parameters Type / Units**	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
21	**Normal Ambients**				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
29	Plant / Process Induced Vibration	[ ] Yes [X] No			
30	Additional Normal Information:	None			
31					
32	**Abnormal Ambients**				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
40	Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
41	Additional Abnormal Information:	None			
42					

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00011**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00002A**	Rev No. 5

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					

18	**DBE Chemical Exposure Details**	
19	DBE Chemical Types/Concentration	
20		NONE
21		
22		
23	**Electrical Interfaces Supporting the Safety Function**	
24	Power Supply Voltage (VAC, VDC)	NA
25	Power Supply Frequency (Hz)	NA
26	Power Connection Method	NA
27	I / O Signals to /from Equipment	NA
28	I / O Connection Method	NA
29		
30	**Mechanical Interfaces**	
31	Mounting Configuration (orientation)	* Note 13
32	Mounting Method (bolts, welds, etc)	* Note 13
33	Auxiliary Devices	* Note 13
34		
35	**Equipment Seismic Qualification (ESQ)**	

36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37 38	WTP Seismic Design Specification	Seismic Qualification of Seismic Category I/II Equip. and Tanks	24590-WTP-3PS-SS90-T0001	2	N/A
39 40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00180	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

	APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00011	MR No. **24590-QL-MRA-MKH0-00002**	
		Plant Item No. **24590-HLW-MK-HOP-HEPA-00002A**	Rev No. **5**

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.

14. Note Deleted.

15. Note Deleted See Note 24 A & B.

16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.

17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents, See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr) that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.

18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att.A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

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

20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.

22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

24 A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

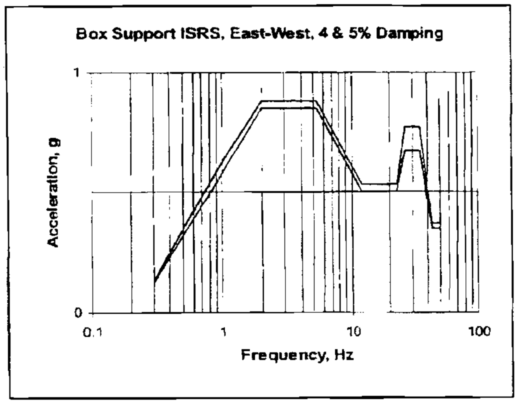
ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00011	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00002A	Rev No. 5

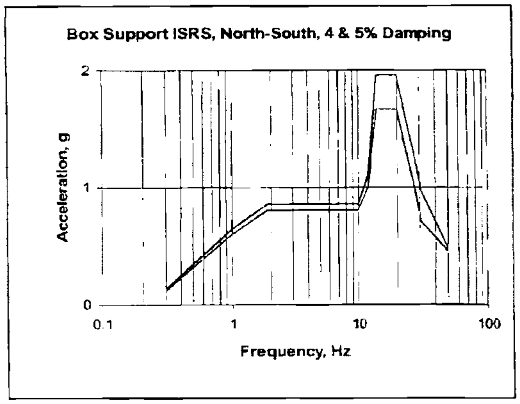
In-Structure Response Spectra (ISRS) and Nozzle Load: Based on 24590-HLW-S0C-S15T-00108, Rev. B

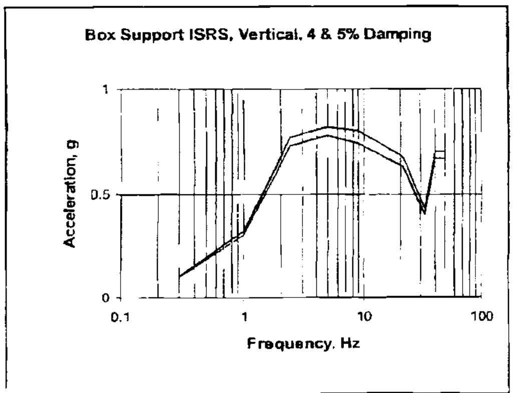
System	Load Case	P / Kip	V2 / Kip	V3 / Kip	T / Kip-in	M2 / Kip-in	M3 / Kip-in
Nozzle Load for HOP HEPA Housing	DL (Dead + Live)	0.12	2.94	0.04	6.7	1.2	5.4
	To (thermal, normal)	0.86	1.87	0.22	13.2	1.8	5.3
	Ta (thermal, off-normal & Post DBE)	2.19	3.92	0.38	28.0	2.7	11.5
	E (Seismic)	0.56	1.13	0.51	8.7	2.4	3.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS



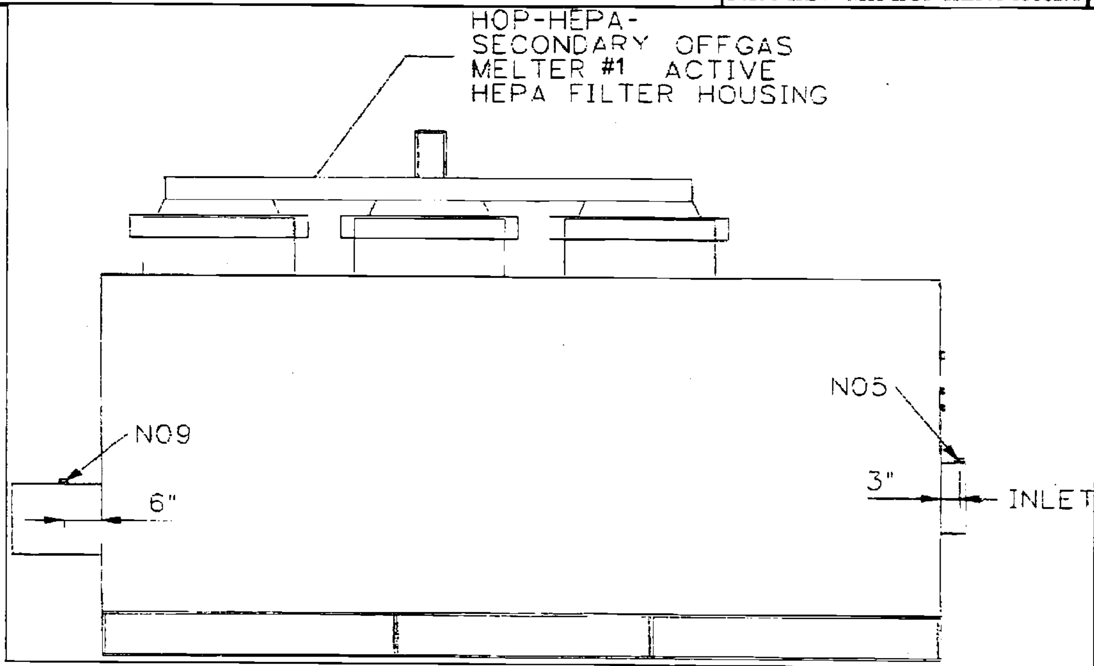




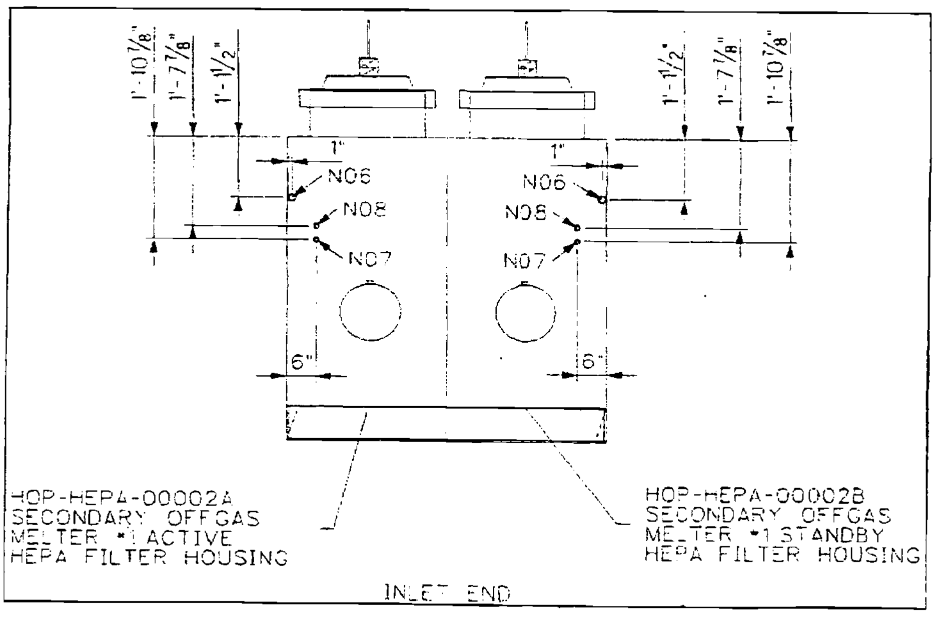
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MKD-HOP-00011	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00002A	Rev No. 5



ELEVATION VIEW OF HOP-HEPA-00002A



<u>Nozzle Designations:</u>

NO5: Injection port
NO6: Upstream sample
NO7: Upstream static pressure
NO8: Downstream static pressure
NO9: Downstream sample
NO10: Housing Outlet

ISSUED BY
RPP-WTP PDC

R11152133

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00012	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00001B	Rev No. 5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #1- Primary "Standby" Housing			Environmental Qualification: MILD See Appendix 1. EQ	
9	**DESIGN CONDITIONS**					
10	Zone Design Temperature- Summer °F	113	db	Inlet Temp. Design/Normal inlet Air Temp. °F	187	143
11	Site Storage Conditions - Summer °F	113	db	NA	wb	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	db	Radiological Dose Level per Hr (See Note 2 & 4)	35.4 Rad/Hr	
14	Indoor Design Temperature - Winter °F	59	db	Radiological Dose Level for Facility Life-40yrs (See Note 2 & 4)	1.24×10^7 Rad	
15	**PERFORMANCE RATING**					
16	Design Flow Rate (CFM)	4,000		Leakage Rate @ Design Flow &		4 SCFM
17	Min. Operating Pressure (in wc)	(-) 166"		Max Pressure (CFM)		
18	Min. Design Pressure (in wc)	(-) 249"		Assembly Clean Pressure Drop with Filters (in wc)		3.5"
19	Total Filter Openings Required	3		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	2		Weight without HEPA Filters (pounds)		*
21	**CONSTRUCTION**					
22	NOTE: This housing unit is paired with 24590-HLW-MK-HOP-HEPA-00001A (Ref. datasheet 24590-HLW-MAD-HOP-00010), orientation as shown:			AIRFLOW »→		
23			inlet	Housing 24590-HLW-MK-HOP-HEPA-00001B	outlet	
24			inlet	Housing 24590-HLW-MK-HOP-HEPA-00001A	outlet	
25				PLAN VIEW		
26	Design Housing Manufacturer:	Flanders/CSC		Design Housing Model Number:	*	
27	Housing Construction Method:	All Welded		Max. Housing Dim.: (in.) See Note 8	L= *	H= * W= *
28	Housing Material: See Note 12	Type 304L Stainless Steel		Housing Material Gauge:	*	
29	Top Panel Material: See Note 12	Type 304L Stainless Steel		Top Panel Material Gauge:	*	
30	Structural Frame Material: See Note 12	Type 304L Stainless Steel		Structural Frame Features:	*	
31	Inlet Plenum Total Volume:	*		Outlet Plenum Total Volume	*	
32	Inlet Position: (Top/Side)	Side		Outlet Position: (Top/Side)	Side	
33	Inlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal		Outlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	
34		See Note 5 & 8			See Note 5 & 8	
35	Inlet Connection Type:	Welded		Outlet Connection Type:	Welded	
36	Inlet Flange Bolt Required:	N/A		Outlet Flange Bolts Required:	N/A	
37	Inlet Flange Bolt Size:	N/A		Outlet Flange Bolt Size:	N/A	
38	Inlet Flange Bolt Material:	N/A		Outlet Flange Bolt Material:	N/A	
39	Inlet Flange Gasket Material:	N/A		Outlet Flange Gasket Material:	N/A	
40	Paint and Finish Material:	N/A		Paint and Finish Material Minimum Thickness:		N/A
41	**HOUSING ACCESSORIES**					
42	**Accessory Provided**	Yes	No	Accessory Information		
43	Test w/Inlet Isolation Damper:		X	Damper Provided By:	Others	
44	See Note 7			Inlet Isolation Damper Type:	N/A	
45				Inlet Isolation Damper Size:	12" Nominal Diameter	
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	NA	
47				Overall Length: (inches)		
48				Inlet Transition Smallest	N/A	
49				Inside Dimension: (inches)	N/A	
50				Inlet Transition Largest	N/A	
51				Inside Dimension: (inches)	N/A	
52	Inlet Aerosol Test Port Criteria.	X		Challenge Aerosol Connection Type	*	
53	See Note 8			Challenge Aerosol Connection Size	*	
54				Challenge Aerosol Connection Quantity	*	

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00012	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00001B	Rev No. 5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #1- Primary "Standby" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/Outlet Isolation Damper:		X	Damper Provided By:	Others	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall	NA	
25				Length: (inches)		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension:(inches)	N/A	
28				Outlet Transition Largest Inside	N/A	
29				Dimension: (inches)	N/A	
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size:	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2-in. (See Note 3)	
39	Drain Connection: See Note 9	X		Drain Connection Size: (inches)	1 1/2-in. (See Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:		

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Instrumentation Taps:	3/4-inch SW	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	

48 NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection
49 point located on Appendix 2 sketches. Aerosol lines shall be routed outside housing through box stiffeners, so as not to project outside the
50 housing envelope. Aerosol injection and sampling lines shall be stainless steel pipe per specification 24590-WTP-3PB-P000-TS11Z, or equal.
51
52
53

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00012

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-HOP-HEPA-00001B
Rev No.	5

Project:	RPP-WTP	Bldg/Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009 24590-HLW-M6C-HOP-00013	Manufacturer Part No:	*
Safety Classification	SC				
Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
System No.	HOP			Quality Level	Q
System Desc.	24590-HLW-3YD-HOP-00001	Spec. for Remote Change HEPA Filter Housing		24590-WTP-3PS-MKH0-T0003	
Description:	HLW Vessel Vent / Offgas Melter #1- Primary "Standby" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

Notes:

1.) Vendor to fill in data with (*) asterisk.

2.) **Service Conditions. HOP OFF-GAS:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter Offgas and Liquid Effluent Definition, Stream No.HV232 (First HEPA Inlet Gas):

The constituents off-gas (Based on a 3.5 MT/day melter basis):

Chemicals:			Dose:	
N_2 = 69.6%	CO = 4.82E+01 mg/m^3	P = 2.21E-04 mg/m^3	Alpha = 2.26E-03 Bq/m^3	Temperature = 61°C
O_2 = 18.5%	NO_x = 1.04E+03 mg/m^3	NH_3 = 3.60E+01 mg/m^3	Beta/Gamma[(1)]=3.41E+01 Bq/m^3	Dew Pt. Temp = 43.9°C
Ar = 0.8%	SO_x = 1.64E-01 mg/m^3	Entrain of Solids = 3.95 mg/m^3	H-3 = 7.95E+03 Bq/m^3	Density = 0.881 kg/m^3
CO_2 = 0.6%	Cl = 5.52E-02 mg/m^3		C-14 = 3.87E+03 Bq/m^3	Therm.Conduct=27.81mW/m-c
H_2O = 10.4%	F = 8.07E-02 mg/m^3		I-129 = 4.32E-02 Bq/m^3	Heat Cap 1.07 kJ/kg-C
				Relative Humidity = 44.4%
				Ave. Mole Wt. = 27.9 g/mol
			(1) Beta/Gamma dose excludes	Viscosity = 19.54 uPa-s
			Tritium, Carbon-14, and Iodine.	Pressure = 875 mbar

3.) **Differential Pressure Tap**: 1/2" Socket Weld, T-304L SS Half Coupling. Size of the hole penetrating housing pressure boundary at 1/8" diameter.

4.) **Radiation Dose Rates** for HLW R5 room H-0104 (Filter Cave). See CCN: 152094. Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

5.) The thickness for the 12" dia. inlet / outlet connections on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.18" thick (pipe per ASTM A312 or rolled and welded plate per A240).

6.) N/A denotes "Not Applicable".

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >/= 99.7% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300 and Equipment Qualification Data Sheet (Appendix 1 and Attachment A).

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 00111,00112 and 00118 for HOP HEPA Filter Housing end panel assembly details and overall dimension.

9.) **Drain connection**: 1 1/2-in. NPT T-304L SST pipe nipple with cap, drain at low point in the plenum.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) **Contents of this document are "Dangerous Waste Permit Affecting".**

12.) **Low carbon content alloy steel:** "L" designated materials, i.e., Type 304L stainless steel, with a maximum carbon content of 0.030% shall be used for pressure boundary materials (exposed to the offgas stream) that will be welded. Type 304 SST may be substituted for items such as fasteners that will not be welded. Alternate materials may be proposed and accepted by the Buyer using the design submittal process.

Remarks: **Modifications to the content of this datasheet shall be made by vendor submittal and are subject to Buyer's permission to proceed.**
FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.
Blank data fields are not required to be completed.

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
Rev	Date	Description	Originator	E&NS	Checker	Reviewer	Approver
5	3/1/10	Revised note 7 and added shaker table test notification. Updated attached EEQ (Appendix 1) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. ~~Incorporated DCN-24590-WTP-M6N-M86T-0000~~ → ADDED APPENDIX 2 FOR INSTRUMENT TAPS NOZZLE LOCATION. RKRamos 02-26-10	[signature]	CMeng	JATuck	PETER G.SNED	[signature]
4	9/24/2009	Added note 11 per DCN 24590-HLW-MAN-HOP-00001 & note 12, attached EEQ (Appendix 1) with RRS curves from coupled analysis and Safety Screening Evaluation. Revised Safety Class to SC and Quality Level to Q. Consolidate attachment "B" into Note 2. Revised Note 3 and 4, and added housing overall dimensions. Revised note 8 per vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 111 and 112	R.K. Ramos	C. Meng	J.Tuck	L.Solis	Gerard Garcia
3	4/4/2005	Revised note 5 to incorporate 24590-WTP-SDDR-PROC-05-00290 disposition, room no., calc. no., and radiological dose. Deleted Attachment A.	M.Ordona	-	A.Jocson	-	L.Solis
2	12/2/2003	Revised the Design Conditions, Performance Rating Sections and Seismic Category to SC-I and Quality Level	M.Ordona	-	DEG	-	Hadi Jalali
1	9/8/2003	Revised the Design Conditions and Performance Rating sections	M.Ordona	-	D.E.Green	-	J. Sanders
0	10/22/2002	Issued for Purchase	David Koyer		A.C.Tan	-	J. Sanders

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00012**	MR No. **24590-QL-MRA-MKH0-00002** Plant Item No. **24590-HLW-MK-HOP-HEPA-00001B**	Rev No. 5

1	**EQUIPMENT IDENTIFICATION:**		
2	**Full Component Tag Number or BNI Stock Code Number**	**24590-HLW-MK-HOP-HEPA-00001B**	**Safety Classification**
3	**Equipment Datasheet Number**	**24590-HLW-MKD-HOP-00012**	[X] SC [ ] SS
4			[ ] APC-PAM
5–8	**Description**	HLW Vessel Vent / Melter #1 OffGas Vent is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet / Outlet dampers (By Others). There are two parallel assemblies of offgas filters containing two stages of HEPA filters in series to perform high efficiency removal of sub-micron particulates from the heated offgas.	**Seismic Category** [X] SC-I [ ] SC-II [ ] SC-III [ ] SC-IV [ ] SC-III Seismic Interaction only
9	**Location (Facility / Building and Room No.)**	HLW HOP Primary HEPA Filter Housing 24590-HLW-MK-HOP-HEPA-00001B is located inside Room **H-104**, at **EL. 0'-0"**.	
10–12	**Safety Function(s)**	Provide confinement and protection against crush/impact events. To provide filtration of the offgas to prevent releases that may result in consequences to the public, co-worker, and facility worker above RES (Rad. Exposure Std.) in the SRD (Safety Requirement Doc.). Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.3.20.1	
13	Equipment Safety Function Type	[X] Passive Mechanical [ ] Active Mechanical [ ] Electrical	
14	Seismic Safety Function	Seismic Operability Requirements	
15	[X] Yes [ ] No	[X] During Seismic Event [X] After Seismic Event [ ] None	
16			

17	**EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)** **(Parameter values stated in this section do not include process conditions or operationally induced conditions)**				
18	Classification of Environment	[X] Mild [ ] Harsh	Qualified Life (years) [X] 40 [ ] Other		
19–20	**Parameters Type / Units**	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
21	**Normal Ambients**				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0N-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
29	Plant / Process Induced Vibration	[ ] Yes [X] No			
30	Additional Normal Information:	None			
31					
32	**Abnormal Ambients**				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0N-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
40	Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
41	Additional Abnormal Information:	None			
42					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00012	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00001B	Rev No. 5

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00005
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0N-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					
18	**DBE Chemical Exposure Details**				
19	DBE Chemical Types/Concentration		NONE		
20					
21					
22					
23	**Electrical Interfaces Supporting the Safety Function**				
24	Power Supply Voltage (VAC, VDC)		NA		
25	Power Supply Frequency (Hz)		NA		
26	Power Connection Method		NA		
27	I / O Signals to /from Equipment		NA		
28	I / O Connection Method		NA		
29					
30	**Mechanical Interfaces**				
31	Mounting Configuration (orientation)		* Note 13		
32	Mounting Method (bolts, welds, etc)		* Note 13		
33	Auxiliary Devices		* Note 13		
34					
35	**Equipment Seismic Qualification (ESQ)**				

36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37 38	WTP Seismic Design Specification	Seismic Qualification of Seismic Category I/II Equip. and Tanks	24590-WTP-3PS-SS90-T0001	2	N/A
39 40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00012	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00001B**	Rev No. 5

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.
14. Note Deleted.
15. Note Deleted See Note 24 A & B.
16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.
17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents. See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr) that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.
18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

19. **DOE Radioactive Materials Disclaimer:**

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

20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.
21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.
22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.
23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.
24. A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."
    B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."
25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.
26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.
27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

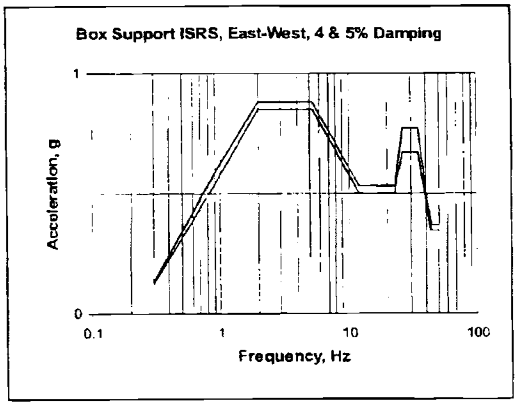
ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00012	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00001B	Rev No. 5

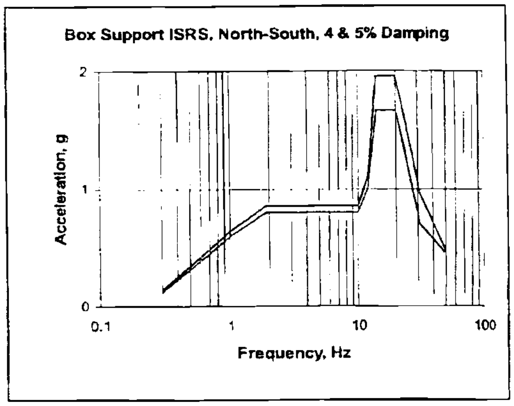
In-Structure Response Spectra (ISRS) and Nozzle Load: Based on 24590-HLW-S0C-S15T-00108, Rev. B

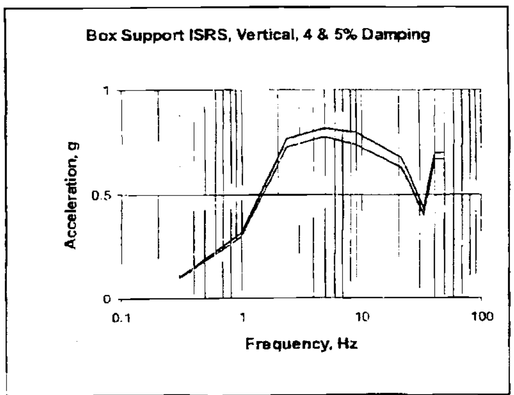
System	Load Case	P / Kip	V2 / Kip	V3 / Kip	T / Kip-in	M2 / Kip-in	M3 / Kip-in
Nozzle Load for HOP HEPA Housing	DL (Dead + Live)	0.12	2.94	0.04	6.7	1.2	5.4
	To (thermal, normal)	0.86	1.87	0.22	13.2	1.8	5.3
	Ta (thermal, off-normal & Post DBE)	2.19	3.92	0.38	28.0	2.7	11.5
	E (Seismic)	0.56	1.13	0.51	8.7	2.4	3.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS



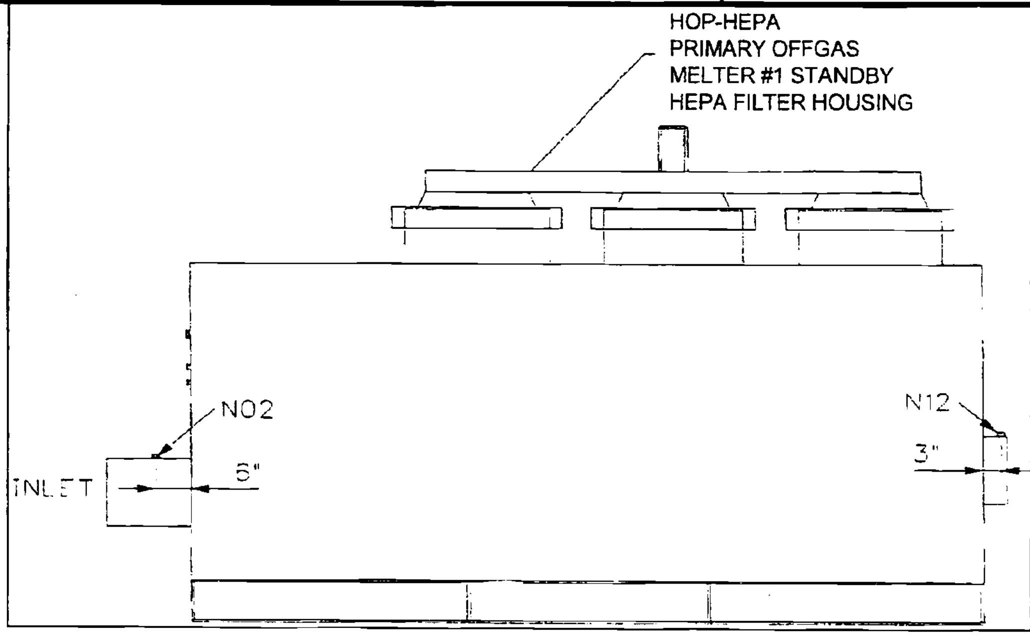




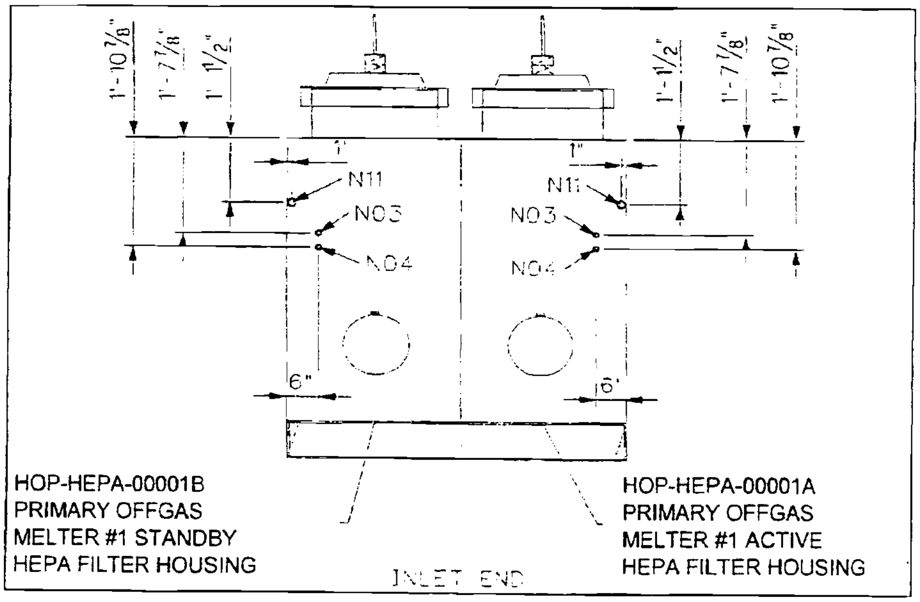
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MKD-HOP-00012	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00001B	Rev No. 5



ELEVATION VIEW OF HOP-HEPA-00001B



Nozzle Designations:

NO1: Housing inlet
NO2: Injection port
NO3: Upstream static pressure.
NO4: Downstream static pressure
NO11: Upstream sample
NO12: Downstream sample

ISSUED BY RPP-WTP PDC

R11152134

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00013

MR No.	24590-QL-MRA-MKH0-00002				
Plant Item No.	24590-HLW-MK-HOP-HEPA-00002B	Rev No.	5		

1	Project:	RPP-WTP	Bldg/Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #1- Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1. EQ	

9 DESIGN CONDITIONS

10	Zone Design Temperature- Summer °F	113	db	Inlet Temp. Design/Normal inlet Air Temp. °F	187	143
11	Site Storage Conditions - Summer °F	113	db	NA	wb	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	db	Radiological Dose Level per Hr (See Note 2 & 4)	35.4 Rad/Hr	
14	Indoor Design Temperature - Winter °F	59	db	Radiological Dose Level for Facility Life-40yrs (See Note 2 & 4)	1.24×10^7 Rad	

15 PERFORMANCE RATING

16	Design Flow Rate (CFM)	4,000		Leakage Rate @ Design Flow &		4 SCFM
17	Min. Operating Pressure (in wc)	(-) 166"		Max Pressure (CFM)		
18	Min. Design Pressure (in wc)	(-) 249"		Assembly Clean Pressure Drop with Filters (in wc)		3.5"
19	Total Filter Openings Required	3		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	2		Weight without HEPA Filters (pounds)		*

21 CONSTRUCTION

22–25 NOTE: This housing unit is paired with 24590-HLW-MK-HOP-HEPA-00002A (Ref. datasheet 24590-HLW-MAD-HOP-00011), orientation as shown:

AIRFLOW »→

inlet | Housing 24590-HLW-MK-HOP-HEPA-00002A | outlet

inlet | Housing 24590-HLW-MK-HOP-HEPA-00002B | outlet

PLAN VIEW

26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*
27	Housing Construction Method:	All Welded	Max. Housing Dim.: (in.) See Note 8	L= * H= * W= *
28	Housing Material: See Note 12	Type 304L Stainless Steel	Housing Material Gauge:	*
29	Top Panel Material: See Note 12	Type 304L Stainless Steel	Top Panel Material Gauge:	*
30	Structural Frame Material: See Note 12	Type 304L Stainless Steel	Structural Frame Features:	*
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side
33	Inlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	Outlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal
34		See Note 5 & 8		See Note 5 & 8
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required:	N/A
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size:	N/A
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness:	N/A

41 HOUSING ACCESSORIES

42	Accessory Provided	Yes	No	Accessory Information:	
43	Test w/Inlet Isolation Damper:		X	Damper Provided By:	Others
44	See Note 7			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	12" Nominal Diameter
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	NA
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	N/A
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	N/A
52	Inlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity:	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00013	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00002B	Rev No. 5

Project:	RPP-WTP	Bldg./Rm #	HLW / B-0104	Manufacturer: Flanders /CSC	
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009 24590-HLW-M6C-HOP-00013	Manufacturer Part No:	*
Safety Classification	SC				
Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
System No.	HOP			Quality Level	Q
System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
Description:	HLW Vessel Vent / Offgas Melter #1- Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

HOUSING ACCESSORIES (continued)

Accessory Provided	Yes	No		
Inlet Viewing Ports		X	Total Number of Viewing Ports Required:	N/A
			Inlet Viewing Port Type:	N/A
			Inlet Viewing Port Locations:	N/A
			Inlet Viewing Port	N/A Width
			Dimensions: (inches)	N/A Length
Internal Fire Suppression:		X	Fire Suppression System Description:	N/A
			Accessory Information	1 per bank
Vacuum-Relief Vent Assembly:	X		Number Required:	*
			Vacuum-Relief Vent Assembly Setpoint:	*
			Vacuum-Relief Vent Assembly Manufacturer:	*
			Vacuum-Relief Vent Model Number:	N/A
Test w/Outlet Isolation Damper:		X	Damper Provided By:	Others
See Note 7			Outlet Isolation Damper Type:	N/A
			Outlet Isolation Damper Size:	N/A
Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall Length: (inches)	NA
			Outlet Transition Smallest Inside	N/A
			Dimension:(inches)	N/A
			Outlet Transition Largest Inside	N/A
			Dimension: (inches)	N/A
Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*
See Note 8			Challenge Aerosol Connection Size:	*
			Challenge Aerosol Connection Quantity:	N/A
Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A
			Outlet Viewing Port Type:	N/A
			Outlet Viewing Port Locations:	N/A Width
			Outlet Viewing Port	N/A Length
			Dimensions: (inches)	N/A
Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2-in. (See Note 3)
Drain Connection: See Note 9	X		Drain Connection Size: (inches)	1 1/2-in. (See Note 9)
Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A
			PVC Safe Change Bag Type:	

UTILITY REQUIREMENTS

Electrical: (volts/phase/hertz)	N/A	
Compressed Air:	N/A	
Intrumentation Taps:	3/4-inch SW	
Pressure/Leak Test Ports	*	
Air/Aerosol Mixing Test Ports	*	

NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection point located on Appendix 2 sketches. Aerosol lines shall be routed outside housing through box stiffeners, so as not to project outside the housing envelope. Aerosol injection and sampling lines shall be stainless steel pipe per specification 24590-WTP-3PB-P000-TS11Z, or equal.

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00013

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-HOP-HEPA-00002B
Rev No.	5

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009 24590-HLW-M6C-HOP-00013	Manufacturer Part No:	*
Safety Classification	SC				
Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
System No.	HOP			Quality Level	Q
System Desc.	24590-HLW-3YD-HOP-00001	Spec. for Remote Change HEPA Filter Housing		24590-WTP-3PS-MKH0-T0003	
Description:	HLW Vessel Vent / Offgas Melter #1- Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

Notes:

1.) Vendor to fill in data with (*) asterisk.

2.) **Service Conditions. HOP OFF-GAS:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter Offgas and Liquid Effluent Definition. Stream No.HV232 (First HEPA Inlet Gas):

The constituents off-gas (Based on a 3.5 MT/day melter basis):

Chemicals:			Dose:	
N_2 = 69.6%	CO = 4.82E+01 mg/m^3	P = 2.21E-04 mg/m^3	Alpha = 2.26E-03 Bq/m^3	Temperature = 61°C
O_2 = 18.5%	NO_x = 1.04E+03 mg/m^3	NH_3 = 3.60E+01 mg/m^3	Beta/Gamma$^{(1)}$=3.41E+01 Bq/m^3	Dew Pt. Temp.= 43.9°C
Ar = 0.8%	SO_x = 1.64E+01 mg/m^3	Entrain of Solids = 3.95 mg/m^3	H-3 = 7.95E+03 Bq/m^3	Density = 0.881 kg/m^3
CO_2 = 0.6%	Cl = 5.52E-02 mg/m^3		C-14 = 3.87E+03 Bq/m^3	Therm.Conduct=27.81mW/m-c
H_2O = 10.4%	F = 8.07E-02 mg/m^3		I-129 = 4.32E-02 Bq/m^3	Heat Cap 1.07 kJ/kg-C
				Relative Humidity = 44.4%
				Ave. Mole Wt.= 27.9 g/mol
			(1) Beta/Gamma dose excludes Tritium, Carbon-14, and Iodine.	Viscosity = 19.54 uPa-s
				Pressure = 875 mbar

3.) **Differential Pressure Tap**: 1/2" Socket Weld, T-304L SS Half Coupling. Size of the hole penetrating housing pressure boundary at 1/8" diameter.

4.) **Radiation Dose Rates** for HLW R5 room H-0104 (Filter Cave). See CCN: 152094. Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

5.) The thickness for the 12" dia. inlet / outlet connections on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.18" thick (pipe per ASTM A312 or rolled and welded plate per A240).

6.) N/A denotes "Not Applicable".

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >= 99.7% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300 **and Equipment Qualification Data Sheet (Appendix 1 and Attachment A).**

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 00111, 00112 and 00118 for HOP HEPA Filter Housing end panel assembly details and overall dimension.

9.) **Drain connection**: 1 1/2-in. NPT T-304L SST pipe nipple with cap, drain at low point in the plenum.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) **Contents of this document are "Dangerous Waste Permit Affecting".**

12.) **Low carbon content alloy steel:** "L" designated materials, i.e., Type 304L stainless steel, with a maximum carbon content of 0.030% shall be used for pressure boundary materials (exposed to the offgas stream) that will be welded. Type 304 SST may be substituted for items such as fasteners that will not be welded. Alternate materials may be proposed and accepted by the Buyer using the design submittal process.

Remarks: **Modifications to the content of this datasheet shall be made by vendor submittal and are subject to Buyer's permission to proceed.**
FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.
Blank data fields are not required to be completed.

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
5	3/1/10	Revised note 7 and added shaker table test notification. Updated attached EEQ (Appendix 1) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. ~~Incorporated DCN-24590-WTP-M5N-M80T-00001.~~ ADDED APPENDIX 2, FOR INSTRUMENT TAPS NOZZLE LOCATION. [illegible] 02-26-10	[illegible]	CMeng	JATuck	[illegible]	[illegible]
4	9/24/2009	Added note 11 per DCN 24590-HLW-MAN-HOP-00001 & note 12, attached EEQ (Appendix 1) with RRS curves from coupled analysis and Safety Screening Evaluation. Revised Safety Class to SC and Quality Level to Q. Consolidate attachment "B" into Note 2. Revised Note 3 and 4, and added housing overall dimensions. Revised note 8 per vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 111 and 112	R.K. Ramos	C. Meng	J.Tuck	L.Solis	Gerard Garcia
3	4/4/2005	Revised note 5 to incorporate 24590-WTP-SDDR-PROC-05-00290 disposition, room no., calc. no., and radiological dose. Deleted Attachment A.	M.Ordona	-	A.Jocson	-	L.Solis
2	12/2/2003	Revised the Design Conditions, Performance Rating Sections and Seismic Category to SC-I and Quality Level	M.Ordona	-	DEG	-	Hadi Jalali
1	9/8/2003	Revised the Design Conditions and Performance Rating sections	M.Ordona	-	D.E.Green	-	J. Sanders
0	10/22/2002	Issued for Purchase	David Rover	-	A.C.Tan	-	J. Sanders
Rev	**Date**	**Description**	**Originator**	**E&NS**	**Checker**	**Reviewer**	**Approver**

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00013	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00002B**	Rev No. 5

1	**EQUIPMENT IDENTIFICATION:**				
2	**Full Component Tag Number or BNI Stock Code Number**	**24590-HLW-MK-HOP-HEPA-00002B**			**Safety Classification**
3	**Equipment Datasheet Number**	**24590-HLW-MAD-HOP-00013**			[X] SC [ ] SS
4					[ ] APC-PAM
5–8	**Description**	HLW Vessel Vent / Melter #1 OffGas Vent is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet / Outlet dampers (By Others). There are two parallel assemblies of offgas filters containing two stages of HEPA filters in series to perform high efficiency removal of sub-micron particulates from the heated offgas.			**Seismic Category** [X] SC-I [ ] SC-II [ ] SC-III [ ] SC-IV [ ] SC-III Seismic Interaction only
9	**Location (Facility / Building and Room No.)**	HLW HOP Primary HEPA Filter Housing 24590-HLW-MK-HOP-HEPA-00002B is located inside Room **H-104**, at **EL. 0'-0"**.			
10–12	**Safety Function(s)**	Provide confinement and protection against crush/impact events. To provide filtration of the offgas to prevent releases that may result in consequences to the public, co-worker, and facility worker above RES (Rad. Exposure Std.) in the SRD (Safety Requirement Doc.). Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.3.20.1			
13	Equipment Safety Function Type	[X] Passive Mechanical	[ ] Active Mechanical		[ ] Electrical
14	Seismic Safety Function	Seismic Operability Requirements			
15	[X] Yes [ ] No	[X] During Seismic Event	[X] After Seismic Event		[ ] None
16					
17	**EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)** **(Parameter values stated in this section do not include process conditions or operationally induced conditions)**				
18	Classification of Environment	[X] Mild	[ ] Harsh	Qualified Life (years)	[X] 40 [ ] Other
19–20	**Parameters Type / Units**	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
21	**Normal Ambients**				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
29	Plant / Process Induced Vibration	[ ] Yes [X] No			
30	Additional Normal Information:	None			
31					
32	**Abnormal Ambients**				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See. 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
40	Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
41	Additional Abnormal Information:	None			
42					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00013	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00002B	Rev No. 5

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00005
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					
18	**DBE Chemical Exposure Details**				
19	DBE Chemical Types/Concentration	NONE			
20					
21					
22					
23	**Electrical Interfaces Supporting the Safety Function**				
24	Power Supply Voltage (VAC, VDC)	NA			
25	Power Supply Frequency (Hz)	NA			
26	Power Connection Method	NA			
27	I / O Signals to /from Equipment	NA			
28	I / O Connection Method	NA			
29					
30	**Mechanical Interfaces**				
31	Mounting Configuration (orientation)	* Note 13			
32	Mounting Method (bolts, welds, etc)	* Note 13			
33	Auxiliary Devices	* Note 13			
34					
35	**Equipment Seismic Qualification (ESQ)**				

	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
36	**Parameters**	**Title**	**References/Documents Number**	**Version/ Revision**	**Remarks**
37-38	WTP Seismic Design Specification	Seismic Qualification of Seismic Category I/II Equip. and Tanks	24590-WTP-3PS-SS90-T0001	2	N/A
39-40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-PTF-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00013	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00002B**	Rev No. **5**

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.
14. Note Deleted.
15. Note Deleted See Note 24 A & B.
16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.
17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents, See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr, that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.
18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

19. **DOE Radioactive Materials Disclaimer:**
Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.
20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.
21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.
22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.
23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.
24. A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."
    B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."
25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.
26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.
27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

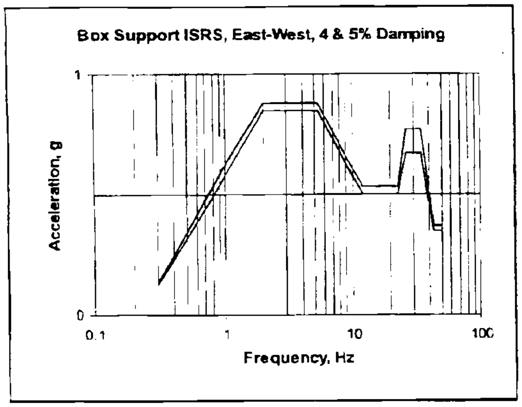
	ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00013	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-HOP-HEPA-00002B	Rev No. 5

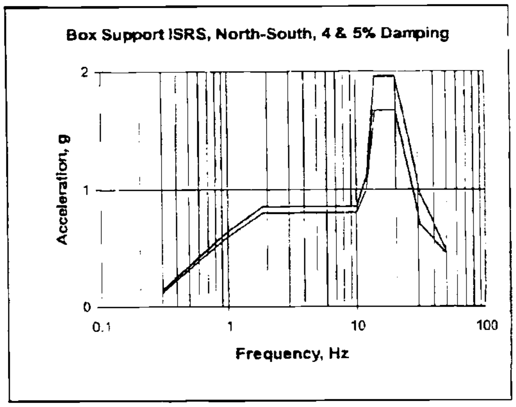
In-Structure Response Spectra (ISRS) and Nozzle Load: Based on 24590-HLW-S0C-S15T-00108, Rev. B

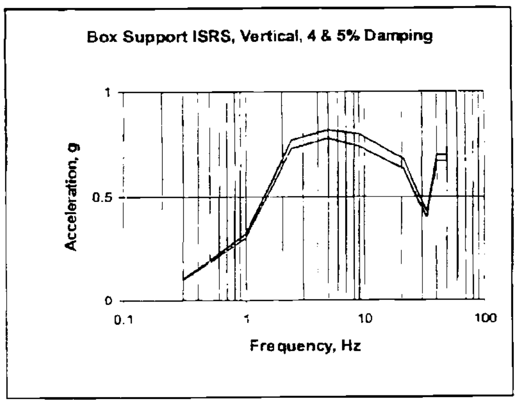
System	Load Case	P / Kip	V2 / Kip	V3 / Kip	T / Kip-in	M2 / Kip-in	M3 / Kip-in
Nozzle Load for HOP HEPA Housing	DL (Dead + Live)	0.12	2.94	0.04	6.7	1.2	5.4
	To (thermal, normal)	0.86	1.87	0.22	13.2	1.8	5.3
	Ta (thermal, off-normal & Post DBE)	2.19	3.92	0.38	28.0	2.7	11.5
	E (Seismic)	0.56	1.13	0.51	8.7	2.4	3.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS



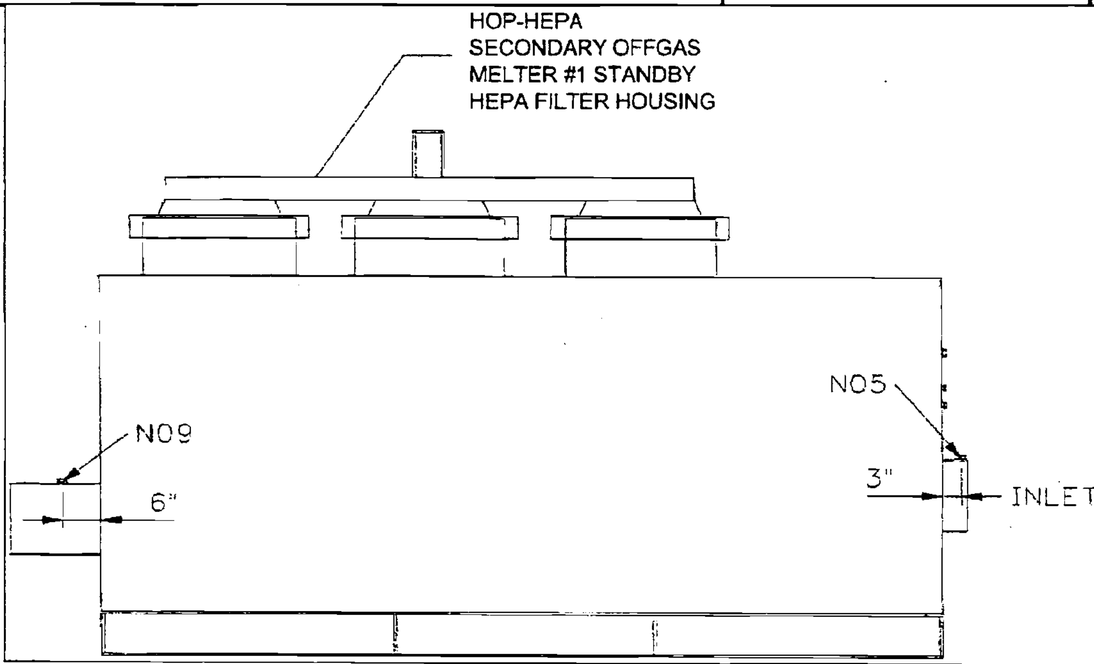




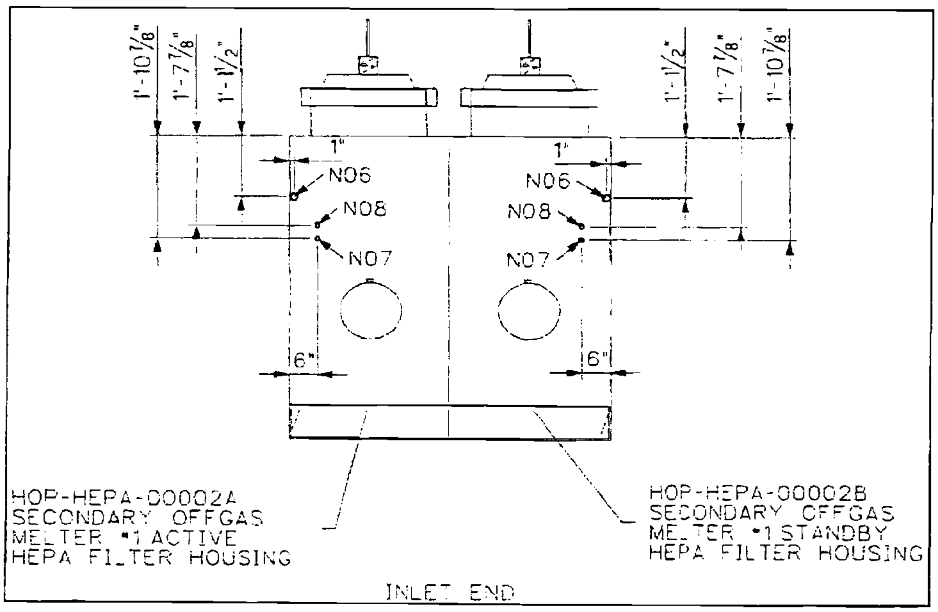
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq. Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MKD-HOP-00013	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00002B**	Rev No. **5**



ELEVATION VIEW OF HOP-HEPA-00002B



Nozzle Designations:

NO5: Injection port
NO6: Upstream sample
NO7: Upstream static pressure
NO8: Downstream static pressure
NO9: Downstream sample
NO10: Housing Outlet

ISSUED BY
RPP-WTP PDC

R11152135

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00014

MR No. 24590-QL-MRA-MKH0-00002

Plant Item No. 24590-HLW-MK-HOP-HEPA-00007A

Rev No. 5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No.	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Primary "Active" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 DESIGN CONDITIONS

10	Zone Design Temperature- Summer °F	113	db	Inlet Temp. Design/Normal inlet Air Temp. °F	187	143
11	Site Storage Conditions - Summer °F	113	db	NA	wb	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	db	Radiological Dose Level per Hr (See Note 2 & 4)	35.4 Rad/Hr	
14	Indoor Design Temperature - Winter °F	59	db	Radiological Dose Level for Facility Life-40yrs (See Note 2 & 4)	1.24×10^7 Rad	

15 PERFORMANCE RATING

16	Design Flow Rate (CFM)	4,000		Leakage Rate @ Design Flow &		4 SCFM
17	Min Operating Pressure (in wc)	(-) 166"		Max Pressure (CFM)		
18	Min. Design Pressure (in wc)	(-) 249"		Assembly Clean Pressure Drop with Filters (in wc)		3.5"
19	Total Filter Openings Required	3		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	2		Weight without HEPA Filters (pounds)		*

21 CONSTRUCTION

22–25 NOTE: This housing unit is paired with 24590-HLW-MK-HOP-HEPA-00007B (Ref. datasheet 24590-HLW-MAD-HOP-00016), orientation as shown:

AIRFLOW »→

inlet	Housing 24590-HLW-MK-HOP-HEPA-00007B	outlet
inlet	Housing 24590-HLW-MK-HOP-HEPA-00007A	outlet

PLAN VIEW

26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*
27	Housing Construction Method:	All Welded	Max. Housing Dim.: (in.) See Note 8	L= * H= * W= *
28	Housing Material: See Note 12	Type 304L Stainless Steel	Housing Material Gauge:	*
29	Top Panel Material: See Note 12	Type 304L Stainless Steel	Top Panel Material Gauge:	*
30	Structural Frame Material: See Note 12	Type 304L Stainless Steel	Structural Frame Features:	*
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side
33	Inlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	Outlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal
34		See Note 5 & 8		See Note 5 & 8
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required:	N/A
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size:	N/A
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness:	N/A

41 HOUSING ACCESSORIES

42	Accessory Provided	Yes	No	Accessory Information	
43	Test w/Inlet Isolation Damper:		X	Damper Provided By:	Others
44	See Note 7			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	12" Nominal Diameter
46	Inlet Transition Ductwork		X	Inlet Transition Ductwork	NA
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	N/A
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	N/A
52	Inlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size	*
54				Challenge Aerosol Connection Quantity:	*

BECHTEL	**REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00014**	MR No. **24590-QL-MRA-MKH0-00002**
		Plant Item No. **24590-HLW-MK-HOP-HEPA-00007A** — Rev No. **5**

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Primary "Active" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/Outlet Isolation Damper:		X	Damper Provided By:	Others	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall	NA	
25				Length: (inches)		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension:(inches)	N/A	
28				Outlet Transition Largest Inside	N/A	
29				Dimension: (inches)	N/A	
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size:	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2-in. (See Note 3)	
39	Drain Connection: See Note 9	X		Drain Connection Size: (inches)	1 1/2-in. (See Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:		

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Intrumentation Taps:	3/4-inch SW	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	

48 NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection
49 point located on Appendix 2 sketches. Aerosol lines shall be routed outside housing through box stiffeners, so as not to project outside the
50 housing envelope. Aerosol injection and sampling lines shall be stainless steel pipe per specification 24590-WTP-3PB-P000-TS11Z, or equal.
51
52
53

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00014

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-HOP-HEPA-00007A
Rev No.	5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC		24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP			Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Primary "Active" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 Notes:

10 1.) Vendor to fill in data with (*) asterisk.

11 2.) **Service Conditions, HOP OFF-GAS:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter Offgas and Liquid Effluent Definition, Stream No.HV232 (First HEPA Inlet Gas):

12 **The constituents off-gas** (Based on a 3.5 MT/day melter basis):

Row	Chemicals:			Dose:	
13					Temperature = 61°C
14	N_2 = 69.6%	CO = 4.82E+01 mg/m^3	P = 2.21E-04 mg/m^3	Alpha = 2.26E-03 Bq/m^3	Dew Pt. Temp = 43.9°C
15	O_2 = 18.5%	NO_x = 1.04E+03 mg/m^3	NH_3 = 3.60E+01 mg/m^3	Beta/Gamma$^{(1)}$=3.41E+01 Bq/m^3	Density = 0.881 kg/m^3
16	Ar = 0.8%	SO_x = 1.64E+01 mg/m^3	Entrain of Solids = 3.95 mg/m^3	H-3 = 7.95E+03 Bq/m^3	Therm.Conduct=27.81mW/m-c
17	CO_2 = 0.6%	Cl = 5.52E-02 mg/m^3		C-14 = 3.87E+03 Bq/m^3	Heat Cap 1.07 kJ/kg-C
18	H_2O = 10.4%	F = 8.07E-02 mg/m^3		I-129 = 4.32E-02 Bq/m^3	Relative Humidity = 44.4%
19					Ave. Mole Wt.= 27.9 g/mol
20				(1) Beta/Gamma dose excludes	Viscosity = 19.54 uPa-s
21				Tritium, Carbon-14, and Iodine.	Pressure = 875 mbar

22 3.) **Differential Pressure Tap:** 1/2" Socket Weld, T-304L SS Half Coupling. Size of the hole penetrating housing pressure boundary at 1/8" diameter.

23 4.) **Radiation Dose Rates** for HLW R5 room H-0104 (Filter Cave), See CCN: 152094, Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

24 5.) The thickness for the 12" dia. inlet / outlet connections on the filter housing and the ductwork supplied between the primary and secondary
25 filter housings shall be 0.18" thick (pipe per ASTM A312 or rolled and welded plate per A240).

26 6.) N/A denotes "Not Applicable".

27 7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test)
28 in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

29 **Min. Housing Filter System Efficiency:** >/ = 99.7% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test.

30 Observe and note efficiency reading on photometer during test.

31 **HEPA Filter Seismic Qualification: ASME AG-1 FK-4300 and Equipment Qualification Data Sheet (Appendix 1 and Attachment A).**

32 **Pressure Boundary and Filter Sealing Surface Allowable Leakage:** < 0.0005 scfm/cu. ft of test volume following seismic test.

33 8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 00111,00112 and 00118
34 for HOP HEPA Filter Housing end panel assembly details and overall dimension.

35 9.) **Drain connection:** 1 1/2-in. NPT T-304L SST pipe nipple with cap, drain at low point in the plenum.

36 10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

37 11.) **Contents of this document are "Dangerous Waste Permit Affecting".**

38 12.) **Low carbon content alloy steel:** "L" designated materials, i.e., Type 304L stainless steel, with a maximum carbon content of 0.030% shall be used for
39 pressure boundary materials (exposed to the offgas stream) that will be welded. Type 304 SST may be substituted for items such as fasteners that will not
40 be welded. Alternate materials may be proposed and accepted by the Buyer using the design submittal process.

41 Remarks: **Modifications to the content of this datasheet shall be made by vendor submittal and are subject to Buyer's permission to proceed.**
42 **FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.**
43 Blank data fields are not required to be completed.

Row	Rev	Date	Description	Originator	E&NS	Checker	Reviewer	Approver
44–45	SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
46–47	5	3/1/10	Revised note 7 and added shaker table test notification. Updated attached EEQ (Appendix 1) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. ~~Incorporated DCN-24590-WTP-MON-MH0T-00001.~~ → ADDED APPENDIX 2, FOR INSTRUMENT TAPS NOZZLE LOCATION. [illegible] 02-26-10	[illegible]	CMeng	JATuck	[illegible]	[illegible]
48–49	4	9/24/2009	Added note 11 per DCN 24590-HLW-MAN-HOP-00001 & note 12, attached EEQ (Appendix 1) with RRS curves from coupled analysis and Safety Screening Evaluation. Revised Safety Class to SC and Quality Level to Q. Consolidate attachment "B" into Note 2. Revised Note 3 and 4, and added housing overall dimensions. Revised note 8 per vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 111 and 112.	R.K. Ramos	C. Meng	J.Tuck	L.Solis	Gerard Garcia
50	3	4/4/2005	Revised note 5 to incorporate 24590-WTP-SDDR-PROC-05-00290 disposition, room no., calc. no., and radiological dose. Deleted Attachment A.	M.Ordona	_	A.Jocson	_	L.Solis
51	2	12/2/2003	Revised the Design Conditions, Performance Rating Sections and Seismic Category to SC-I and Quality Level	M.Ordona	_	DEG	_	Hadi Jalali
52	1	9/8/2003	Revised the Design Conditions and Performance Rating sections	M.Ordona	_	D.E.Green	_	J. Sanders
53	0	10/22/2002	Issued for Purchase	David Royer	_	A.C.Tan		J. Sanders
54	Rev	Date	Description	Originator	E&NS	Checker	Reviewer	Approver

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00014	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00007A	Rev No. 5

EQUIPMENT IDENTIFICATION:

Full Component Tag Number or BNI Stock Code Number	24590-HLW-MK-HOP-HEPA-00007A	**Safety Classification**
Equipment Datasheet Number	24590-HLW-MKD-HOP-00014	[X] SC [ ] SS [ ] APC-PAM
Description	HLW Vessel Vent / Melter #2 Offgas Vent is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet / Outlet dampers (By Others). There are two parallel assemblies of offgas filters containing two stages of HEPA filters in series to perform high efficiency removal of sub-micron particulates from the heated offgas.	**Seismic Category** [X] SC-I [ ] SC-II [ ] SC-III [ ] SC-IV [ ] SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	HLW HOP Primary HEPA Filter Housing 24590-HLW-MK-HOP-HEPA-00007A is located inside Room H-104, at EL. 0'-0".	
Safety Function(s)	Provide confinement and protection against crush/impact events. To provide filtration of the offgas to prevent releases that may result in consequences to the public, co-worker, and facility worker above RES (Rad. Exposure Std.) in the SRD (Safety Requirement Doc.). Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.3.20.1	
Equipment Safety Function Type	[X] Passive Mechanical [ ] Active Mechanical	[ ] Electrical
Seismic Safety Function [X] Yes [ ] No	Seismic Operability Requirements [X] During Seismic Event [X] After Seismic Event	[ ] None

EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)

(Parameter values stated in this section do not include process conditions or operationally induced conditions)

Classification of Environment [X] Mild [ ] Harsh — Qualified Life (years) [X] 40 [ ] Other

Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
Plant / Process Induced Vibration	[ ] Yes [X] No			
Additional Normal Information:	None			
Abnormal Ambients				
High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
Additional Abnormal Information:	None			

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00014	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00007A	Rev No. 5

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001. 1 4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					

18	DBE Chemical Exposure Details	
19	DBE Chemical Types/Concentration	
20		NONE
21		
22		
23	**Electrical Interfaces Supporting the Safety Function**	
24	Power Supply Voltage (VAC, VDC)	NA
25	Power Supply Frequency (Hz)	NA
26	Power Connection Method	NA
27	I / O Signals to /from Equipment	NA
28	I / O Connection Method	NA
29		
30	**Mechanical Interfaces**	
31	Mounting Configuration (orientation)	* Note 13
32	Mounting Method (bolts, welds, etc)	* Note 13
33	Auxiliary Devices	* Note 13
34		
35	**Equipment Seismic Qualification (ESQ)**	

36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37-38	WTP Seismic Design Specification	Seismic Qualification of Seismic Category I/II Equip. and Tanks	24590-WTP-3PS-SS90-T0001	2	N/A
39-40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00014	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00007A	Rev No. 5

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.
14. Note Deleted.
15. Note Deleted See Note 24 A & B.
16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.
17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents. See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr) that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.
18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

19. <u>DOE Radioactive Materials Disclaimer:</u>
    Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.
20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.
21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.
22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions
23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.
24. A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."
    B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."
25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.
26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.
27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

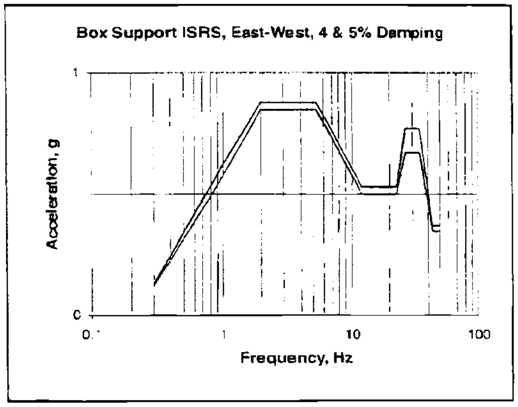
	ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00014	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-HOP-HEPA-00007A	Rev No. 5

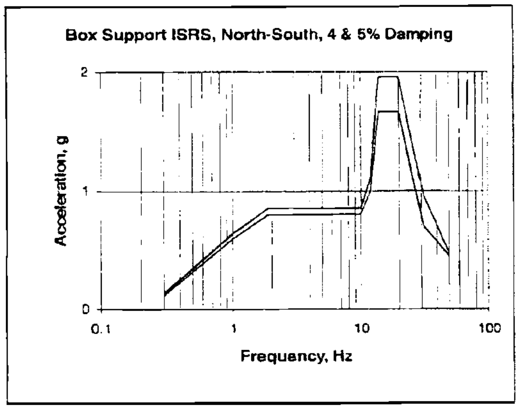
In-Structure Response Spectra (ISRS) and Nozzle Load: Based on 24590-HLW-S0C-S15T-00108, Rev. B

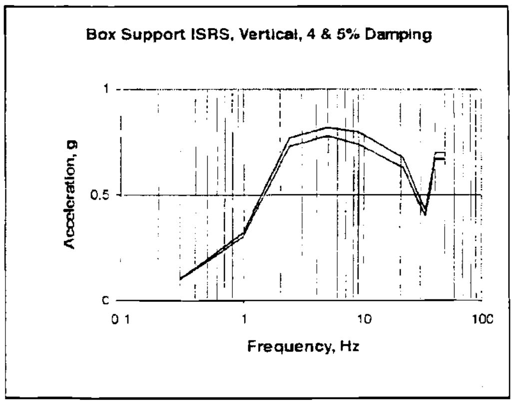
System	Load Case	P / Kip	V2 / Kip	V3 / Kip	T / Kip-in	M2 / Kip-in	M3 / Kip-in
Nozzle Load for HOP HEPA Housing	DL (Dead + Live)	0.12	2.94	0.04	6.7	1.2	5.4
	To (thermal, normal)	0.86	1.87	0.22	13.2	1.8	5.3
	Ta (thermal, off-normal & Post DBE)	2.19	3.92	0.38	28.0	2.7	11.5
	E (Seismic)	0.56	1.13	0.51	8.7	2.4	3.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS



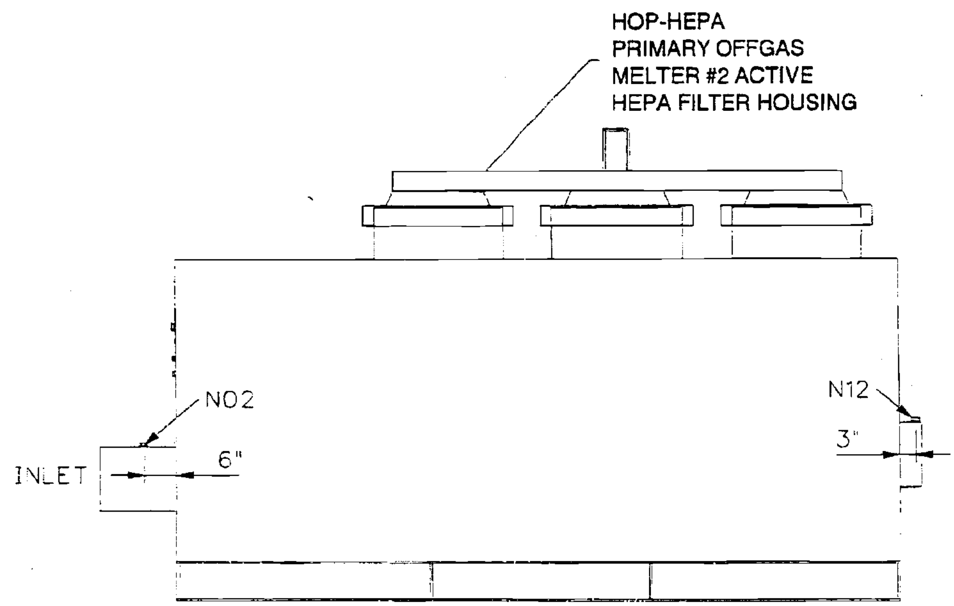




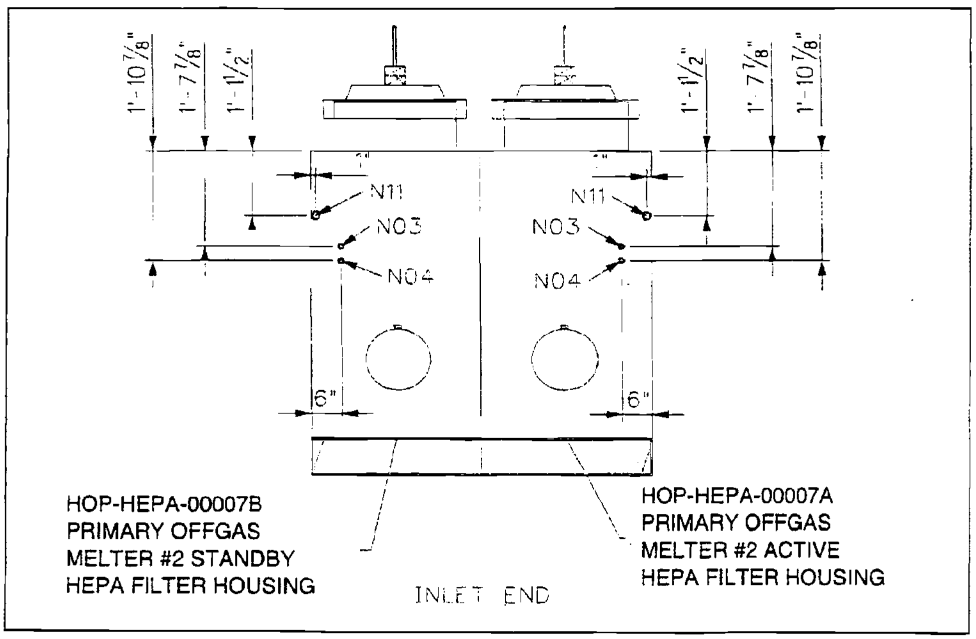
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

	APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MKD-HOP-00014	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-HOP-HEPA-00007A	Rev No. 5



ELEVATION VIEW OF HOP-HEPA-00007A



Nozzle Designations:

NO1: Housing inlet
NO2: Injection port
NO3: Upstream static pressure
NO4: Downstream static pressure
NO11: Upstream sample
NO12: Downstream sample

ISSUED BY
RPP-WTP PDC

R11152136

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00015	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00008A	Rev No. 5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009	Manufacturer Part No:	*
4	Safety Classification	SC		24590-HLW-M6C-HOP-00013		
5	Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP			Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9	**DESIGN CONDITIONS**					
10	Zone Design Temperature- Summer °F	113	db	Inlet Temp. Design/Normal inlet Air Temp. °F	187	143
11	Site Storage Conditions - Summer °F	113	db	NA	wb	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	db	Radiological Dose Level per Hr (See Note 2 & 4)	35.4 Rad/Hr	
14	Indoor Design Temperature - Winter °F	59	db	Radiological Dose Level for Facility Life-40yrs (See Note 2 & 4)	1.24×10^7 Rad	
15	**PERFORMANCE RATING**					
16	Design Flow Rate (CFM)	4,000		Leakage Rate @ Design Flow &		4 SCFM
17	Min. Operating Pressure (in wc)	(-) 166"		Max Pressure (CFM)		
18	Min. Design Pressure (in wc)	(-) 249"		Assembly Clean Pressure Drop with Filters (in wc)		3.5"
19	Total Filter Openings Required	3		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	2		Weight without HEPA Filters (pounds)		*

21	**CONSTRUCTION**				
22–25	NOTE: This housing unit is paired with 24590-HLW-MK-HOP-HEPA-00008B (Ref. datasheet 24590-HLW-MAD-HOP-00017), orientation as shown:	AIRFLOW »→ inlet Housing 24590-HLW-MK-HOP-HEPA-00008A outlet inlet Housing 24590-HLW-MK-HOP-HEPA-00008B outlet PLAN VIEW			
26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*	
27	Housing Construction Method:	All Welded	Max. Housing Dim.: (in.) See Note 8	L= *	H= * W= *
28	Housing Material: See Note 12	Type 304L Stainless Steel	Housing Material Gauge:	*	
29	Top Panel Material: See Note 12	Type 304L Stainless Steel	Top Panel Material Gauge:	*	
30	Structural Frame Material: See Note 12	Type 304L Stainless Steel	Structural Frame Features:	*	
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*	
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side	
33	Inlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	Outlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	
34		See Note 5 & 8		See Note 5 & 8	
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded	
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required:	N/A	
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size:	N/A	
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A	
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A	
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness:		N/A

41	**HOUSING ACCESSORIES**				
42	**Accessory Provided**	Yes	No	Accessory Information	
43	Test w/Inlet Isolation Damper:		X	Damper Provided By:	Others
44	See Note 7			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	12" Nominal Diameter
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	NA
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	N/A
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	N/A
52	Inlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity:	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00015

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-HOP-HEPA-00008A
Rev No.	5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC		24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP			Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001	Spec. for Remote Change HEPA Filter Housing		24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/Outlet Isolation Damper:		X	Damper Provided By:	Others	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall	NA	
25				Length: (inches)		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension:(inches)	N/A	
28				Outlet Transition Largest Inside	N/A	
29				Dimension: (inches)	N/A	
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size:	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2-in. (See Note 3)	
39	Drain Connection: See Note 9	X		Drain Connection Size: (inches)	1 1/2-in. (See Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:		

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Intrumentation Taps:	3/4-inch SW	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	

48 NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection point located on Appendix 2 sketches. Aerosol lines shall be routed outside housing through box stiffeners, so as not to project outside the housing envelope. Aerosol injection and sampling lines shall be stainless steel pipe per specification 24590-WTP-3PB-P000-TS11Z, or equal.

51

52

53

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00015

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-HOP-HEPA-00008A
Rev No.	5

Project:	RPP-WTP	Bldg/Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009 24590-HLW-M6C-HOP-00013	Manufacturer Part No:	*
Safety Classification	SC				
Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
System No.	HOP			Quality Level	Q
System Desc.	24590-HLW-3YD-HOP-00001	Spec. for Remote Change HEPA Filter Housing		24590-WTP-3PS-MKH0-T0003	
Description:	HLW Vessel Vent / Offgas Melter #2- Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1. EQ	

Notes:

1.) Vendor to fill in data with (*) asterisk.

2.) **Service Conditions, HOP OFF-GAS:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter Offgas and Liquid Effluent Definition, Stream No.HV232 (First HEPA Inlet Gas):

The constituents off-gas (Based on a 3.5 MT/day melter basis):

Chemicals:			Dose:	
N_2 = 69.6%	CO = 4.82E+01 mg/m^3	P = 2.21E-04 mg/m^3	Alpha = 2.26E-03 Bq/m^3	Temperature = 61°C
O_2 = 18.5%	NO_x = 1.04E+03 mg/m^3	NH_3 = 3.60E+01 mg/m^3	Beta/Gamma(1)=3.41E+01 Bq/m^3	Dew Pt. Temp.= 43.9°C
Ar = 0.8%	SO_x = 1.64E+01 mg/m^3	Entrain of Solids = 3.95 mg/m^3	H-3 = 7.95E+03 Bq/m^3	Density = 0.881 kg/m^3
CO_2 = 0.6%	Cl = 5.52E-02 mg/m^3		C-14 = 3.87E+03 Bq/m^3	Therm.Conduct=27.81mW/m-c
H_2O = 10.4%	F = 8.07E-02 mg/m^3		I-129 = 4.32E-02 Bq/m^3	Heat Cap 1.07 kJ/kg-C
				Relative Humidity = 44.4%
				Ave. Mole Wt.= 27.9 g/mol
			(1) Beta/Gamma dose excludes Tritium, Carbon-14, and Iodine.	Viscosity = 19.54 uPa-s
				Pressure = 875 mbar

3.) **Differential Pressure Tap**: 1/2" Socket Weld. T-304L SS Half Coupling. Size of the hole penetrating housing pressure boundary at 1/8" diameter.

4.) **Radiation Dose Rates** for HLW R5 room H-0104 (Filter Cave). See CCN: 152094, Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

5.) The thickness for the 12" dia. inlet / outlet connections on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.18" thick (pipe per ASTM A312 or rolled and welded plate per A240).

6.) N/A denotes "Not Applicable".

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >/ = 99.7% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300 and Equipment Qualification Data Sheet (Appendix 1 and Attachment A).

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-P0A-MKH0-00002-07-00100, 00111, 00112 and 00118 for HOP HEPA Filter Housing end panel assembly details and overall dimension.

9.) **Drain connection**: 1 1/2-in. NPT T-304L SST pipe nipple with cap, drain at low point in the plenum.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) **Contents of this document are "Dangerous Waste Permit Affecting".**

12.) **Low carbon content alloy steel:** "L" designated materials, i.e., Type 304L stainless steel, with a maximum carbon content of 0.030% shall be used for pressure boundary materials (exposed to the offgas stream) that will be welded. Type 304 SST may be substituted for items such as fasteners that will not be welded. Alternate materials may be proposed and accepted by the Buyer using the design submittal process.

Remarks: **Modifications to the content of this datasheet shall be made by vendor submittal and are subject to Buyer's permission to proceed.**
FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.
Blank data fields are not required to be completed.

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002. E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
5	3/1/10	Revised note 7 and added shaker table test notification. Updated attached EEQ (Appendix 1) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. ~~Incorporated DCN 24590-WTP-M6N-M80T-00014~~ ADDED APPENDIX 2, FOR INSTRUMENT TAPS NOZZLE LOCATION. 02-26-10	[signature]	CMeng	JATuck	[signature] PETER G SHED	[signature]
4	9/24/2009	Added note 11 per DCN 24590-HLW-MAN-HOP-00001 & note 12, attached EEQ (Appendix 1) with RRS curves from coupled analysis and Safety Screening Evaluation. Revised Safety Class to SC and Quality Level to Q. Consolidate attachment "B" into Note 2. Revised Note 3 and 4, and added housing overall dimensions. Revised note 8 per vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 111 and 112.	R.K. Ramos	C. Meng	J.Tuck	L.Solis	Gerard Garcia
3	4/4/2005	Revised note 5 to incorporate 24590-WTP-SDDR-PROC-05-00290 disposition, room no., calc. no., and radiological dose. Deleted Attachment A.	M.Ordona	_	A.Jocson	_	L.Solis
2	12/2/2003	Revised the Design Conditions, Performance Rating Sections and Seismic Category to SC-I and Quality Level	M.Ordona	_	DEG	_	Hadi Jalali
1	9/8/2003	Revised the Design Conditions and Performance Rating sections	M.Ordona	_	D.E.Green	_	J. Sanders
0	10/22/2002	Issued for Purchase	David Royer	_	A.C.Tan	_	J. Sanders
Rev	**Date**	**Description**	**Originator**	**E&NS**	**Checker**	**Reviewer**	**Approver**

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00015	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00008A	Rev No. 5

#					
1	EQUIPMENT IDENTIFICATION:				
2	Full Component Tag Number or BNI Stock Code Number	24590-HLW-MK-HOP-HEPA-00008A			Safety Classification
3	Equipment Datasheet Number	24590-HLW-MAD-HOP-00015			[X] SC [ ] SS
4					[ ] APC-PAM
5	Description	HLW Vessel Vent / Melter #2 Offgas Vent is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet / Outlet dampers (By Others). There are two parallel assemblies of offgas filters containing two stages of HEPA filters in series to perform high efficiency removal of sub-micron particulates from the heated offgas.			Seismic Category
6					[X] SC-I [ ] SC-II
7					[ ] SC-III [ ] SC-IV
8					[ ] SC-III Seismic Interaction only
9	Location (Facility / Building and Room No.)	HLW HOP Primary HEPA Filter Housing 24590-HLW-MK-HOP-HEPA-00008A is located inside Room **H-104**, at EL. 0'-0".			
10	Safety Function(s)	Provide confinement and protection against crush/impact events.			
11		To provide filtration of the offgas to prevent releases that may result in consequences to the public, co-worker, and facility worker above RES (Rad. Exposure Std.) in the SRD (Safety Requirement Doc.).			
12		Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.3.20.1			
13	Equipment Safety Function Type	[X] Passive Mechanical	[ ] Active Mechanical		[ ] Electrical
14	Seismic Safety Function	Seismic Operability Requirements			
15	[X] Yes [ ] No	[X] During Seismic Event	[X] After Seismic Event		[ ] None
16					
17	EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ) (Parameter values stated in this section do not include process conditions or operationally induced conditions)				
18	Classification of Environment	[X] Mild	[ ] Harsh	Qualified Life (years) [X] 40	[ ] Other
19/20	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
21	Normal Ambients				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
29	Plant / Process Induced Vibration	[ ] Yes [X] No			
30	Additional Normal Information:	None			
31					
32	Abnormal Ambients				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
40	Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
41	Additional Abnormal Information:	None			
42					

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00015**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00008A**	Rev No. 5

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in -w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					
18	**DBE Chemical Exposure Details**				
19	DBE Chemical Types/Concentration	NONE			
20					
21					
22					
23	**Electrical Interfaces Supporting the Safety Function**				
24	Power Supply Voltage (VAC, VDC)	NA			
25	Power Supply Frequency (Hz)	NA			
26	Power Connection Method	NA			
27	I / O Signals to /from Equipment	NA			
28	I / O Connection Method	NA			
29					
30	**Mechanical Interfaces**				
31	Mounting Configuration (orientation)	* Note 13			
32	Mounting Method (bolts, welds, etc)	* Note 13			
33	Auxiliary Devices	* Note 13			
34					
35	**Equipment Seismic Qualification (ESQ)**				

36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37-38	WTP Seismic Design Specification	Seismic Qualification of Seismic Category I/II Equip. and Tanks	24590-WTP-3PS-SS90-T0001	2	N/A
39-40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.
14. Note Deleted.
15. Note Deleted See Note 24 A & B.
16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heighs of 1.58 ft.
17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents. See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr) that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.
18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial Load	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

19. <u>DOE Radioactive Materials Disclaimer:</u>
Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.
20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.
21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.
22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.
23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.
24. A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."
    B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."
25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.
26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.
27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

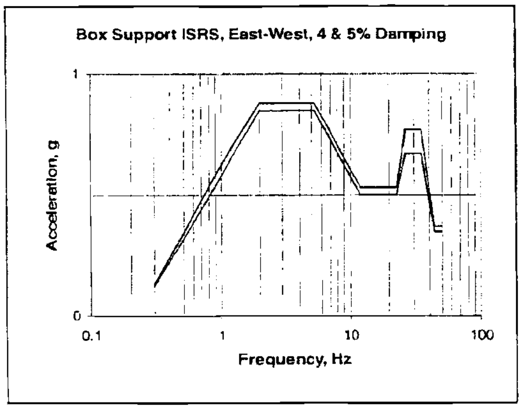
ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00015	MR No. 24590-QL-MRA-MKH0-00002		
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00008A	Rev No. 5	

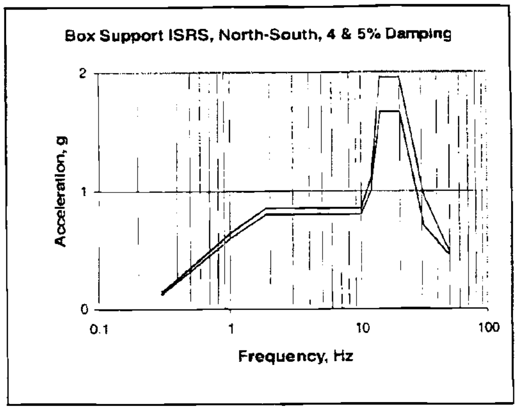
In-Structure Response Spectra (ISRS) and Nozzle Load: Based on 24590-HLW-S0C-S15T-00108, Rev. B

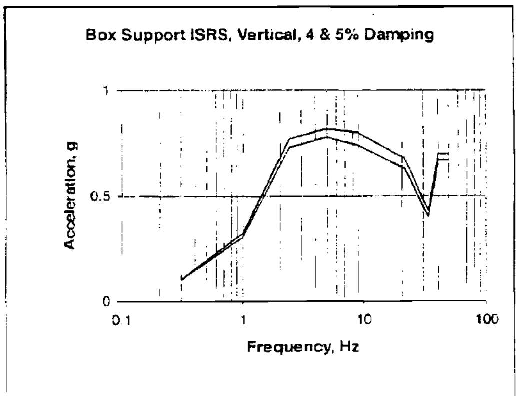
System	Load Case	P / Kip	V2 / Kip	V3 / Kip	T / Kip-in	M2 / Kip-in	M3 / Kip-in
Nozzle Load for HOP HEPA Housing	DL (Dead + Live)	0.12	2.94	0.04	6.7	1.2	5.4
	To (thermal, normal)	0.86	1.87	-0.22	13.2	1.8	5.3
	Ta (thermal, off-normal & Post DBE)	2.19	3.92	0.38	28.0	2.7	11.5
	E (Seismic)	0.56	1.13	0.51	8.7	2.4	3.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS



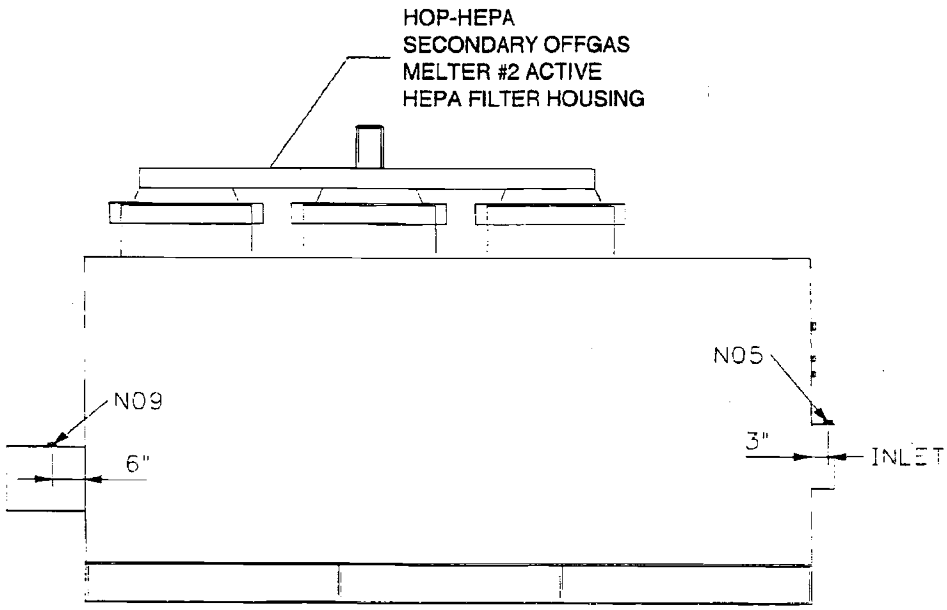




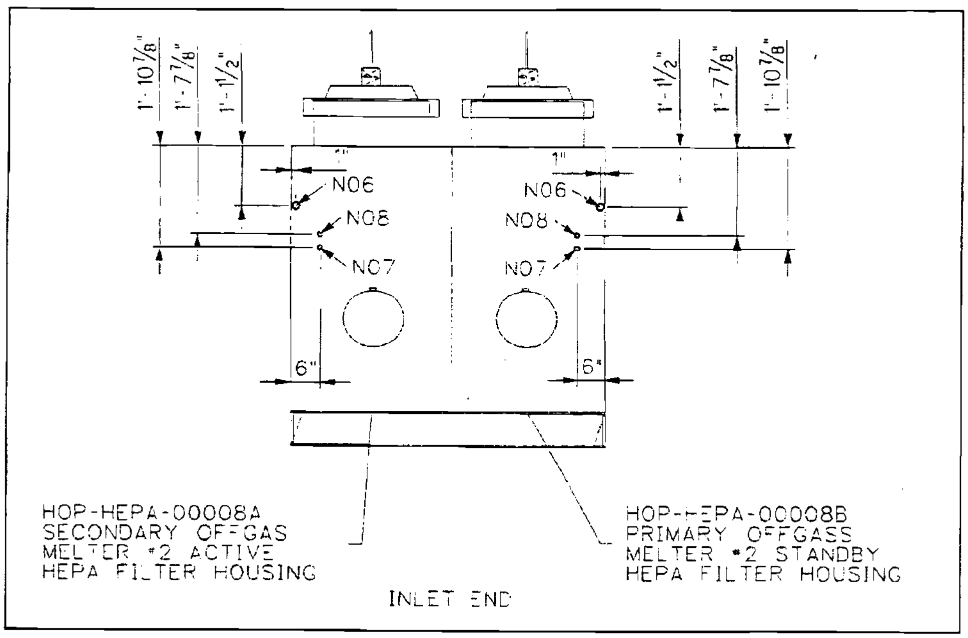
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

	APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MKD-HOP-00015	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-HOP-HEPA-00008A	Rev No. 5



ELEVATION VIEW OF HOP-HEPA-00008A



Nozzle Designations:

NO5: Injection port
NO6: Upstream sample
NO7: Upstream static pressure.
NO8: Downstream static pressure
NO9: Downstream sample
NO10: Housing outlet

ISSUED BY
RPP-WTP PDC
R11152137

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00016

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-HOP-HEPA-00007B
Rev No.	5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Primary "Standby" Housing			Environmental Qualification: MILD See Appendix I. EQ	

9 DESIGN CONDITIONS

10	Zone Design Temperature- Summer °F	113	db	Inlet Temp. Design/Normal inlet Air Temp. °F	187	143
11	Site Storage Conditions - Summer °F	113	db	NA	wb	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	db	Radiological Dose Level per Hr (See Note 2 & 4)	35.4 Rad/Hr	
14	Indoor Design Temperature - Winter °F	59	db	Radiological Dose Level for Facility Life-40yrs (See Note 2 & 4)	1.24×10^7 Rad	

15 PERFORMANCE RATING

16	Design Flow Rate (CFM)	4,000		Leakage Rate @ Design Flow &		4 SCFM
17	Min. Operating Pressure (in wc)	(-) 166"		Max Pressure (CFM)		
18	Min. Design Pressure (in wc)	(-) 249"		Assembly Clean Pressure Drop with Filters (in wc)		3.5"
19	Total Filter Openings Required	3		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	2		Weight without HEPA Filters (pounds)		*

21 CONSTRUCTION

22 NOTE: This housing unit is paired with 24590-HLW-MK-HOP-HEPA-00007A (Ref. datasheet 24590-HLW-MAD-HOP-00014), orientation as shown:

AIRFLOW »→

inlet	Housing 24590-HLW-MK-HOP-HEPA-00007B	outlet
inlet	Housing 24590-HLW-MK-HOP-HEPA-00007A	outlet

PLAN VIEW

26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*		
27	Housing Construction Method:	All Welded	Max. Housing Dim.: (in.) See Note 8	L= *	H= *	W= *
28	Housing Material: See Note 12	Type 304L Stainless Steel	Housing Material Gauge:	*		
29	Top Panel Material: See Note 12	Type 304L Stainless Steel	Top Panel Material Gauge:	*		
30	Structural Frame Material: See Note 12	Type 304L Stainless Steel	Structural Frame Features:	*		
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*		
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side		
33	Inlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	Outlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal		
34		See Note 5 & 8		See Note 5 & 8		
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded		
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required:	N/A		
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size:	N/A		
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A		
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A		
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness:	N/A		

41 HOUSING ACCESSORIES

42	Accessory Provided	Yes	No	Accessory Information	
43	Test w/Inlet Isolation Damper:		X	Damper Provided By:	Others
44	See Note 7			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	12" Nominal Diameter
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	NA
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	N/A
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	N/A
52	Inlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size	*
54				Challenge Aerosol Connection Quantity:	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00016

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-HOP-HEPA-00007B
Rev No.	5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Primary "Standby" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/Outlet Isolation Damper:		X	Damper Provided By:	Others	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork		X	Outlet Transition Ductwork Overall	NA	
25				Length: (inches)		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension:(inches)	N/A	
28				Outlet Transition Largest Inside	N/A	
29				Dimension: (inches)	N/A	
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size:	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2-in. (See Note 3)	
39	Drain Connection: See Note 9	X		Drain Connection Size: (inches)	1 1/2-in. (See Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:		

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Intrumentation Taps:	3/4-inch SW	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	

48 NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection
49 point located on Appendix 2 sketches. Aerosol lines shall be routed outside housing through box stiffeners, so as not to project outside the
50 housing envelope. Aerosol injection and sampling lines shall be stainless steel pipe per specification 24590-WTP-3PB-P000-TS11Z, or equal.
51
52
53

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00016

MR No. 24590-QL-MRA-MKH0-00002		
Plant Item No. 24590-HLW-MK-HOP-HEPA-00007B	Rev No. 5	

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009 24590-HLW-M6C-HOP-00013	Manufacturer Part No:	*
Safety Classification	SC				
Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
System No.	HOP			Quality Level	Q
System Desc.	24590-HLW-3YD-HOP-00001	Spec. for Remote Change HEPA Filter Housing		24590-WTP-3PS-MKH0-T0003	
Description:	HLW Vessel Vent / Offgas Melter #2- Primary "Standby" Housing			Environmental Qualification: MILD See Appendix 1. EQ	

Notes:

1.) Vendor to fill in data with (*) asterisk.

2.) **Service Conditions, HOP OFF-GAS:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter Offgas and Liquid Effluent Definition, Stream No.HV232 (First HEPA Inlet Gas):

The constituents off-gas (Based on a 3.5 MT/day melter basis):

Chemicals:			Dose:	
N_2 = 69.6%	CO = 4.82E+01 mg/m^3	P = 2.21E-04 mg/m^3	Alpha = 2.26E-03 Bq/m^3	Temperature = 61°C
O_2= 18.5%	NO_x = 1.04E+03 mg/m^3	NH_3 = 3.60E-01 mg/m^3	Beta/Gamma[(1)]=3.41E+01 Bq/m^3	Dew Pt. Temp = 43.9°C
Ar = 0.8%	SO_x = 1.64E+01 mg/m^3	Entrain of Solids = 3.95 mg/m^3	H-3 = 7.95E+03 Bq/m^3	Density = 0.881 kg/m^3
CO_2 = 0.6%	Cl = 5.52E-02 mg/m^3		C-14 = 3.87E+03 Bq/m^3	Therm.Conduct=27.81mW/m-c
H_2O = 10.4%	F = 8.07E-02 mg/m^3		I-129 = 4.32E-02 Bq/m^3	Heat Cap 1.07 kJ/kg-C
				Relative Humidity = 44.4%
				Ave. Mole Wt = 27.9 g/mol
			(1) Beta/Gamma dose excludes Tritium, Carbon-14, and Iodine.	Viscosity = 19.54 uPa-s
				Pressure = 875 mbar

3.) **Differential Pressure Tap**: 1/2" Socket Weld, T-304L SS Half Coupling. Size of the hole penetrating housing pressure boundary at 1/8" diameter.

4.) **Radiation Dose Rates** for HLW R5 room H-0104 (Filter Cave), See CCN: 152094, Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

5.) The thickness for the 12" dia. inlet / outlet connections on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.18" thick (pipe per ASTM A312 or rolled and welded plate per A240).

6.) N/A denotes "Not Applicable".

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >/ = 99.7% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300 and Equipment Qualification Data Sheet (Appendix 1 and Attachment A).

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 00111,00112 and 00118 for HOP HEPA Filter Housing end panel assembly details and overall dimension.

9.) **Drain connection**: 1 1/2-in. NPT T-304L SST pipe nipple with cap, drain at low point in the plenum.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) **Contents of this document are "Dangerous Waste Permit Affecting".**

12.) **Low carbon content alloy steel:** "L" designated materials, i.e., Type 304L stainless steel, with a maximum carbon content of 0.030% shall be used for pressure boundary materials (exposed to the offgas stream) that will be welded. Type 304 SST may be substituted for items such as fasteners that will not be welded. Alternate materials may be proposed and accepted by the Buyer using the design submittal process.

Remarks: **Modifications to the content of this datasheet shall be made by vendor submittal and are subject to Buyer's permission to proceed.**
FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.
Blank data fields are not required to be completed.

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
5	3/1/10	Revised note 7 and added shaker table test notification. Updated attached EEQ (Appendix 1) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. ~~Incorporated DCN-24590-WTP-M0N-M80T-00001.~~	[illegible]	C Meng	J A Tuck	[illegible] R.G. [illegible]	[illegible]
		→ ADDED APPENDIX 2, FOR INSTRUMENT TAPS NOZZLE LOCATION. [illegible] 02-26-10					
4	9/24/2009	Added note 11 per DCN 24590-HLW-MAN-HOP-00001 & note 12, attached EEQ (Appendix 1) with RRS curves from coupled analysis and Safety Screening Evaluation. Revised Safety Class to SC and Quality Level to Q. Consolidate attachment "B" into Note 2. Revised Note 3 and 4, and added housing overall dimensions. Revised note 8 per vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 111 and 112.	R.K. Ramos	C. Meng	J.Tuck	L.Solis	Gerard Garcia
3	4/4/2005	Revised note 5 to incorporate 24590-WTP-SDDR-PROC-05-00290 disposition, room no., calc. no., and radiological dose. Deleted Attachment A.	M.Ordona	_	A.Jocson	_	L.Solis
2	12/2/2003	Revised the Design Conditions, Performance Rating Sections and Seismic Category to SC-I and Quality Level	M.Ordona	_	DEG	_	Hadi Jalali
1	9/8/2003	Revised the Design Conditions and Performance Rating sections	M.Ordona	_	D.E.Green	_	J. Sanders
0	10/22/2002	Issued for Purchase	David Royer		A.C.Tan	_	J. Sanders
Rev	**Date**	**Description**	**Originator**	**E&NS**	**Checker**	**Reviewer**	**Approver**

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00016**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00007B**	Rev No. 5

#			
1	**EQUIPMENT IDENTIFICATION:**		
2	**Full Component Tag Number or BNI Stock Code Number**	**24590-HLW-MK-HOP-HEPA-00007B**	**Safety Classification**
3	**Equipment Datasheet Number**	**24590-HLW-MKD-HOP-00016**	[X] **SC** [ ] **SS**
4			[ ] **APC-PAM**
5	**Description**	HLW Vessel Vent / Melter #2 Offgas Vent is a Primary and Secondary	**Seismic Category**
6		HEPA Filter Housing configuration with a remote operated Inlet / Outlet dampers (By Others). There are two parallel assemblies of	[X] **SC-I** [ ] **SC-II**
7		offgas filters containing two stages of HEPA filters in series to perform	[ ] **SC-III** [ ] **SC-IV**
8		high efficiency removal of sub-micron particulates from the heated offgas.	[ ] **SC-III** Seismic Interaction only
9	**Location (Facility / Building and Room No.)**	HLW HOP Primary HEPA Filter Housing 24590-HLW-MK-HOP-HEPA-00007B is located inside Room **H-104**, at **EL. 0'-0"**.	
10	**Safety Function(s)**	Provide confinement and protection against crush/impact events.	
11		To provide filtration of the offgas to prevent releases that may result in consequences to the public, co-worker, and facility worker above RES (Rad. Exposure Std.) in the SRD (Safety Requirement Doc.).	
12		Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.3.20.1	
13	Equipment Safety Function Type	[X] Passive Mechanical [ ] Active Mechanical [ ] Electrical	
14	Seismic Safety Function	Seismic Operability Requirements	
15	[X] Yes [ ] No	[X] During Seismic Event [X] After Seismic Event [ ] None	
16			

#					
17	**EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)** **(Parameter values stated in this section do not include process conditions or operationally induced conditions)**				
18	Classification of Environment	[X] Mild [ ] Harsh	Qualified Life (years)	[X] 40 [ ] Other	
19-20	**Parameters Type / Units**	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
21	**Normal Ambients**				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
29	Plant / Process Induced Vibration	[ ] Yes [X] No			
30	Additional Normal Information:	None			
31					
32	**Abnormal Ambients**				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
40	Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
41	Additional Abnormal Information:	None			
42					

	APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00016	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-HOP-HEPA-00007B	Rev No. 5

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					

18	**DBE Chemical Exposure Details**	
19	DBE Chemical Types/Concentration	NONE
20		
21		
22		
23	**Electrical Interfaces Supporting the Safety Function**	
24	Power Supply Voltage (VAC, VDC)	NA
25	Power Supply Frequency (Hz)	NA
26	Power Connection Method	NA
27	I / O Signals to /from Equipment	NA
28	I / O Connection Method	NA
29		
30	**Mechanical Interfaces**	
31	Mounting Configuration (orientation)	* Note 13
32	Mounting Method (bolts, welds, etc)	* Note 13
33	Auxiliary Devices	* Note 13
34		
35	**Equipment Seismic Qualification (ESQ)**	

36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37 38	WTP Seismic Design Specification	Seismic Qualification of Seismic Category I/II Equip. and Tanks	24590-WTP-3PS-SS90-T0001	2	N/A
39 40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-PTF-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00016**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00007B**	Rev No. 5

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.

14. Note Deleted.

15. Note Deleted See Note 24 A & B.

16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.

17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents, See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr) that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.

18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial Load	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

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

20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.

22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

24. A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."
B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

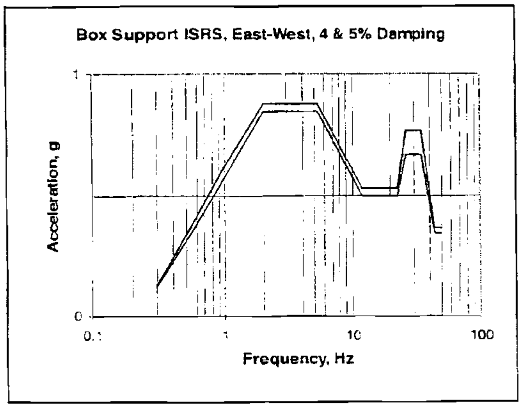
	ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00016	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-HOP-HEPA-00007B	Rev No. 5

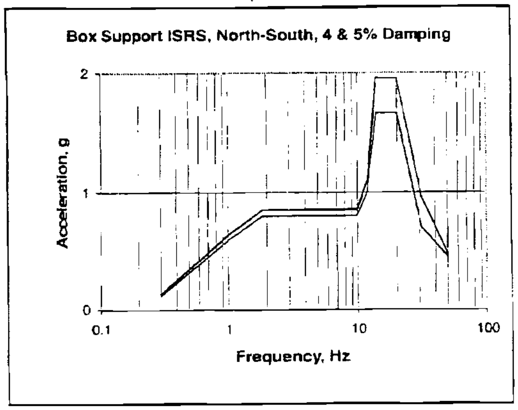
In-Structure Response Spectra (ISRS) and Nozzle Load: Based on 24590-HLW-S0C-S15T-00108, Rev. B

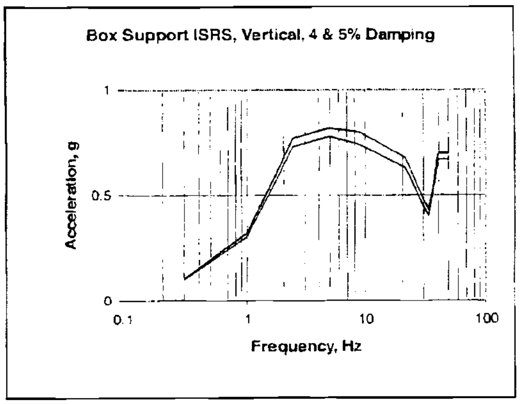
System	Load Case	P / Kip	V2 / Kip	V3 / Kip	T / Kip-in	M2 / Kip-in	M3 / Kip-in
Nozzle Load for HOP HEPA Housing	DL (Dead + Live)	0.12	2.94	0.04	6.7	1.2	5.4
	To (thermal, normal)	0.86	1.87	0.22	13.2	1.8	5.3
	Ta (thermal. off-normal & Post DBE)	2.19	3.92	0.38	28.0	2.7	11.5
	E (Seismic)	0.56	1.13	0.51	8.7	2.4	3.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS



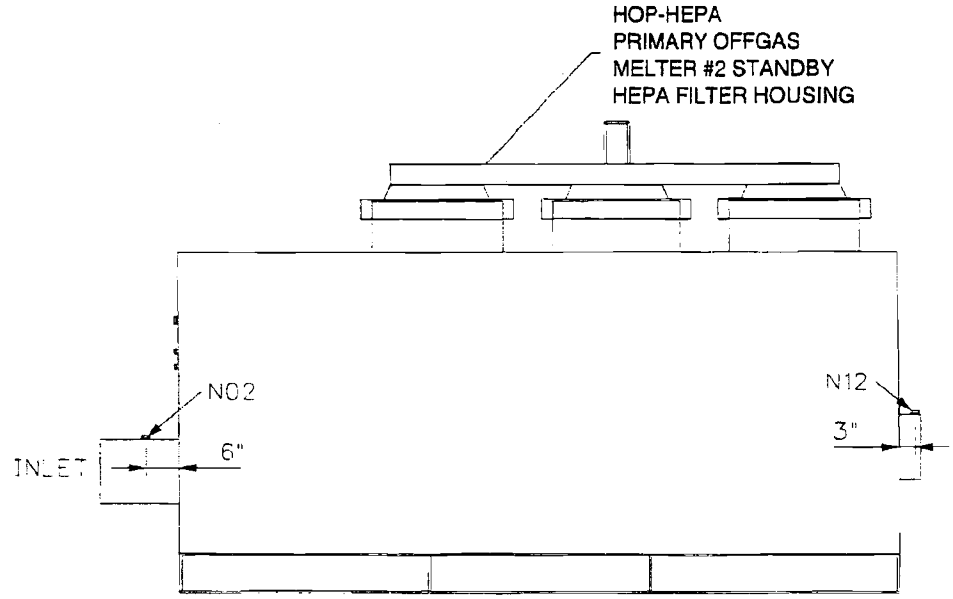




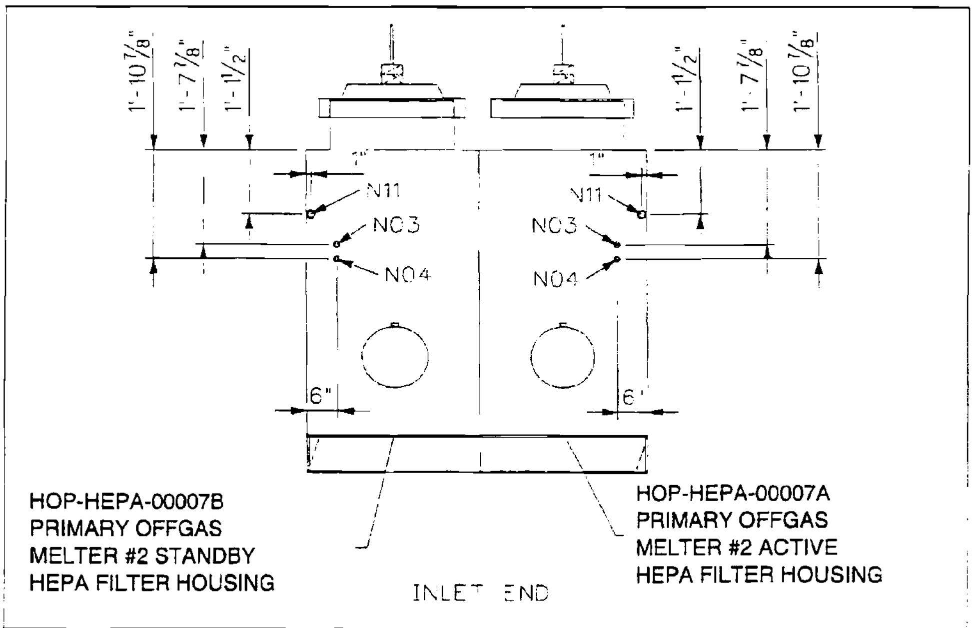
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 **REMOTE CHANGE HEPA FILTER HOUSING** **Nozzle Location Sketch for Datasheet:** **24590-HLW-MKD-HOP-00016**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00007B**	Rev No. 5



ELEVATION VIEW OF HOP-HEPA-00007B



Nozzle Designations:

NO1: Housing inlet
NO2: Injection port
NO3: Upstream static pressure
NO4: Downstream static pressure
NO11: Upstream sample
NO12: Downstream sample

ISSUED BY
RPP-WTP PDC

R11152138

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00017

MR No. 24590-QL-MRA-MKH0-00002

Plant Item No. 24590-HLW-MK-HOP-HEPA-00008B | Rev No. 5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009	Manufacturer Part No:	*
4	Safety Classification	SC		24590-HLW-M6C-HOP-00013		
5	Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP			Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001	Spec. for Remote Change HEPA Filter Housing		24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 DESIGN CONDITIONS

10	Zone Design Temperature- Summer °F	113	db	Inlet Temp. Design/Normal inlet Air Temp. °F	187	143
11	Site Storage Conditions - Summer °F	113	db	NA	wb	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	db	Radiological Dose Level per Hr (See Note 2 & 4)	35.4 Rad/Hr	
14	Indoor Design Temperature - Winter °F	59	db	Radiological Dose Level for Facility Life-40yrs (See Note 2 & 4)	1.24×10^7 Rad	

15 PERFORMANCE RATING

16	Design Flow Rate (CFM)	4,000		Leakage Rate @ Design Flow &		4 SCFM
17	Min. Operating Pressure (in wc)	(-) 166"		Max Pressure (CFM)		
18	Min. Design Pressure (in wc)	(-) 249"		Assembly Clean Pressure Drop with Filters (in wc)		3.5"
19	Total Filter Openings Required	3		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	2		Weight without HEPA Filters (pounds)		*

21 CONSTRUCTION

22–25 NOTE: This housing unit is paired with 24590-HLW-MK-HOP-HEPA-00008A (Ref. datasheet 24590-HLW-MAD-HOP-00015), orientation as shown:

AIRFLOW »→

inlet | Housing 24590-HLW-MK-HOP-HEPA-00008A | outlet

inlet | Housing 24590-HLW-MK-HOP-HEPA-00008B | outlet

PLAN VIEW

26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*
27	Housing Construction Method:	All Welded	Max. Housing Dim.: (in.) See Note 8	L= * H= * W= *
28	Housing Material: See Note 12	Type 304L Stainless Steel	Housing Material Gauge:	*
29	Top Panel Material: See Note 12	Type 304L Stainless Steel	Top Panel Material Gauge:	*
30	Structural Frame Material: See Note 12	Type 304L Stainless Steel	Structural Frame Features:	*
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side
33	Inlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal	Outlet Nozzle Dimensions: (inches)	12 in. Diameter, nominal
34		See Note 5 & 8		See Note 5 & 8
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required:	N/A
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size:	N/A
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness:	N/A

41 HOUSING ACCESSORIES

42	Accessory Provided	Yes	No	Accessory Information	
43	Test w/Inlet Isolation Damper:		X	Damper Provided By:	Others
44	See Note 7			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	12" Nominal Diameter
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	NA
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	N/A
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	N/A
52	Inlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00017	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00008B	Rev No. 5

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MKC-HOP-00009	Manufacturer	*
4	Safety Classification	SC	Calculations	24590-HLW-M6C-HOP-00013	Part No:	
5	Seismic Category	SC-I	Associated	24590-HLW-M6-HOP-00010	Quantity Required	1
6	System No.	HOP	Drawings		Quality Level	Q
7	System Desc.	24590-HLW-3YD-HOP-00001		Spec. for Remote Change HEPA Filter Housing	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Vessel Vent / Offgas Melter #2- Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1, EQ	

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/Outlet Isolation Damper:		X	Damper Provided By:	Others	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall	NA	
25				Length: (inches)		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension:(inches)	N/A	
28				Outlet Transition Largest Inside	N/A	
29				Dimension: (inches)	N/A	
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size:	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2-in. (See Note 3)	
39	Drain Connection: See Note 9	X		Drain Connection Size: (inches)	1 1/2-in. (See Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:		

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Intrumentation Taps:	3/4-inch SW	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	

48 NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection point located on Appendix 2 sketches. Aerosol lines shall be routed outside housing through box stiffeners, so as not to project outside the housing envelope. Aerosol injection and sampling lines shall be stainless steel pipe per specification 24590-WTP-3PB-P000-TS11Z, or equal.

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-HOP-00017

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-HOP-HEPA-00008B
Rev No.	5

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders /CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MKC-HOP-00009 24590-HLW-M6C-HOP-00013	Manufacturer Part No:	*
Safety Classification	SC				
Seismic Category	SC-I	Associated Drawings	24590-HLW-M6-HOP-00010	Quantity Required	1
System No.	HOP			Quality Level	Q
System Desc.	24590-HLW-3YD-HOP-00001	Spec. for Remote Change HEPA Filter Housing		24590-WTP-3PS-MKH0-T0003	
Description:	HLW Vessel Vent / Offgas Melter #2- Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1. EQ	

Notes:

1.) Vendor to fill in data with (*) asterisk.

2.) **Service Conditions, HOP OFF-GAS:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter Offgas and Liquid Effluent Definition. Stream No.HV232 (First HEPA Inlet Gas)·
The constituents off-gas (Based on a 3.5 MT/day melter basis):

Chemicals:			**Dose:**	
N_2 = 69.6%	CO = 4.82E+01 mg/m^3	P = 2.21E-04 mg/m^3	Alpha = 2.26E-03 Bq/m^3	Temperature = 61°C
O_2 = 18.5%	NO_x = 1.04E+03 mg/m^3	NH_3 = 3.60E+01 mg/m^3	Beta/Gamma$^{(1)}$=3.41E+01 Bq/m^3	Dew Pt. Temp = 43.9°C
Ar = 0.8%	SO_x = 1.64E+01 mg/m^3	Entrain of Solids = 3.95 mg/m^3	H-3 = 7.95E+03 Bq/m^3	Density = 0.881 kg/m^3
CO_2 = 0.6%	Cl = 5.52E-02 mg/m^3		C-14 = 3.87E+03 Bq/m^3	Therm.Conduct=27.81mW/m-c
H_2O = 10.4%	F = 8.07E-02 mg/m^3		I-129 = 4.32E-02 Bq/m^3	Heat Cap 1.07 kJ/kg-C
				Relative Humidity = 44.4%
				Ave. Mole Wt.= 27.9 g/mol
			(1) Beta/Gamma dose excludes	Viscosity = 19.54 uPa-s
			Tritium, Carbon-14, and Iodine.	Pressure = 875 mbar

3.) **Differential Pressure Tap**: 1/2" Socket Weld. T-304L SS Half Coupling. Size of the hole penetrating housing pressure boundary at 1/8" diameter.

4.) **Radiation Dose Rates** for HLW R5 room H-0104 (Filter Cave). See CCN: 152094. Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

5.) The thickness for the 12" dia. inlet / outlet connections on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.18" thick (pipe per ASTM A312 or rolled and welded plate per A240).

6.) N/A denotes "Not Applicable".

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.
Min. Housing Filter System Efficiency: >/ = 99.7% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.
HEPA Filter Seismic Qualification: ASME AG-1 FK-4300 and Equipment Qualification Data Sheet (Appendix 1 and Attachment A).
Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-P0A-MKH0-00002-07-00100, 00111, 00112 and 00118 for HOP HEPA Filter Housing end panel assembly details and overall dimension.

9.) **Drain connection**: 1 1/2-in. NPT T-304L SST pipe nipple with cap, drain at low point in the plenum.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) **Contents of this document are "Dangerous Waste Permit Affecting".**

12.) **Low carbon content alloy steel:** "L" designated materials, i.e., Type 304L stainless steel, with a maximum carbon content of 0.030% shall be used for pressure boundary materials (exposed to the offgas stream) that will be welded. Type 304 SST may be substituted for items such as fasteners that will not be welded. Alternate materials may be proposed and accepted by the Buyer using the design submittal process.

Remarks: **Modifications to the content of this datasheet shall be made by vendor submittal and are subject to Buyer's permission to proceed.**
FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.
Blank data fields are not required to be completed.

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			**YES = X**		**NO =**		
5	3/1/10	Revised note 7 and added shaker table test notification. Updated attached EEQ (Appendix 1) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. ~~Incorporated DCN-24590-WTP-M6N-M80T-00001.~~ ADDED APPENDIX 2, FOR INSTRUMENT TAPS NOZZLE LOCATION. 02-26-10	[signature]	CMeng	JATuck	[signature]	[signature]
4	9/24/2009	Added note 11 per DCN 24590-HLW-MAN-HOP-00001 & note 12, attached EEQ (Appendix 1) with RRS curves from coupled analysis and Safety Screening Evaluation. Revised Safety Class to SC and Quality Level to Q. Consolidate attachment "B" into Note 2. Revised Note 3 and 4. and added housing overall dimensions. Revised note 8 per vendor submittal 24590-QL-POA-MKH0-00002-07-00100, 111 and 112.	R.K. Ramos	C. Meng	J.Tuck	L.Solis	Gerard Garcia
3	4/4/2005	Revised note 5 to incorporate 24590-WTP-SDDR-PROC-05-00290 disposition, room no., calc. no., and radiological dose. Deleted Attachment A.	M.Ordona	_	A.Jocson	_	L.Solis
2	12/2/2003	Revised the Design Conditions. Performance Rating Sections and Seismic Category to SC-I and Quality Level	M.Ordona	_	DEG	_	Hadi Jalali
1	9/8/2003	Revised the Design Conditions and Performance Rating sections	M.Ordona	_	D.E.Green	_	J. Sanders
0	10/22/2002	Issued for Purchase	David Royer	_	A.C.Tan	_	J. Sanders
Rev	**Date**	**Description**	**Originator**	**E&NS**	**Checker**	**Reviewer**	**Approver**

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00017**	MR No. **24590-QL-MRA-MKH0-00002** Plant Item No. **24590-HLW-MK-HOP-HEPA-00008B**	Rev No. 5

#			
1	**EQUIPMENT IDENTIFICATION:**		
2	**Full Component Tag Number or BNI Stock Code Number**	**24590-HLW-MK-HOP-HEPA-00008B**	**Safety Classification**
3	**Equipment Datasheet Number**	**24590-HLW-MAD-HOP-00017**	[X] **SC** [ ] **SS**
4			[ ] **APC-PAM**
5–8	**Description**	HLW Vessel Vent / Melter #2 Offgas Vent is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet / Outlet dampers (By Others). There are two parallel assemblies of offgas filters containing two stages of HEPA filters in series to perform high efficiency removal of sub-micron particulates from the heated offgas.	**Seismic Category** [X] SC-I [ ] SC-II [ ] SC-III [ ] SC-IV [ ] SC-III Seismic Interaction only
9	**Location (Facility / Building and Room No.)**	HLW HOP Primary HEPA Filter Housing 24590-HLW-MK-HOP-HEPA-00008B is located inside Room **H-104**, at **EL. 0'-0"**.	
10–12	**Safety Function(s)**	Provide confinement and protection against crush/impact events. To provide filtration of the offgas to prevent releases that may result in consequences to the public, co-worker, and facility worker above RES (Rad. Exposure Std.) in the SRD (Safety Requirement Doc.). Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.3.20.1	
13	Equipment Safety Function Type	[X] Passive Mechanical [ ] Active Mechanical [ ] Electrical	
14	Seismic Safety Function	Seismic Operability Requirements	
15	[X] Yes [ ] No	[X] During Seismic Event [X] After Seismic Event [ ] None	
16			

EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)
(Parameter values stated in this section do not include process conditions or operationally induced conditions)

18 Classification of Environment [X] Mild [ ] Harsh Qualified Life (years) [X] 40 [ ] Other

#	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
21	**Normal Ambients**				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
29	Plant / Process Induced Vibration	[ ] Yes [X] No			
30	Additional Normal Information:	None			
31					
32	**Abnormal Ambients**				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D -W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
40	Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
41	Additional Abnormal Information:	None			
42					

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-HOP-00017**	MR No. **24590-QL-MRA-MKH0-00002**		
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00008B**	Rev No. **5**	

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001. 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					
18	**DBE Chemical Exposure Details**				
19	DBE Chemical Types/Concentration	NONE			
20					
21					
22					
23	**Electrical Interfaces Supporting the Safety Function**				
24	Power Supply Voltage (VAC. VDC)	NA			
25	Power Supply Frequency (Hz)	NA			
26	Power Connection Method	NA			
27	I / O Signals to /from Equipment	NA			
28	I / O Connection Method	NA			
29					
30	**Mechanical Interfaces**				
31	Mounting Configuration (orientation)	* Note 13			
32	Mounting Method (bolts. welds. etc)	* Note 13			
33	Auxiliary Devices	* Note 13			
34					
35	**Equipment Seismic Qualification (ESQ)**				

36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37-38	WTP Seismic Design Specification	Seismic Qualification of Seismic Category I/II Equip. and Tanks	24590-WTP-3PS-SS90-T0001	2	N/A
39-40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00017	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-HOP-HEPA-00008B**	Rev No. 5

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.
14. Note Deleted.
15. Note Deleted See Note 24 A & B.
16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.
17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents, See Note 2). significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr) that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.
18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

19. <u>DOE Radioactive Materials Disclaimer:</u>
Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.
20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.
21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.
22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.
23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions
24. A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."
    B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."
25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.
26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.
27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

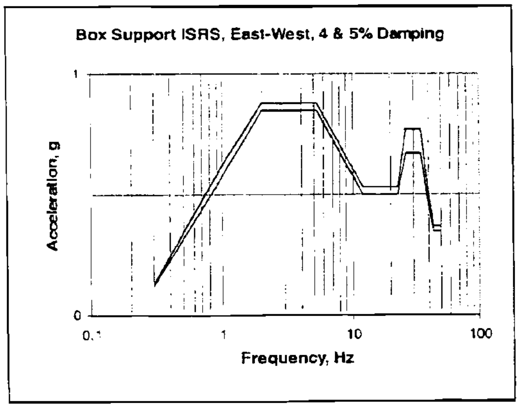
ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-HOP-00017	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-HOP-HEPA-00008B	Rev No. 5

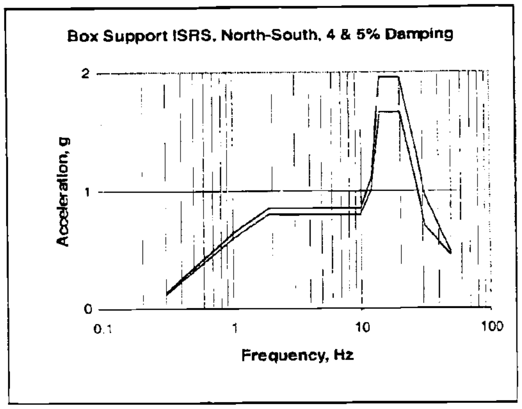
In-Structure Response Spectra (ISRS) and Nozzle Load: Based on 24590-HLW-S0C-S15T-00108, Rev. B

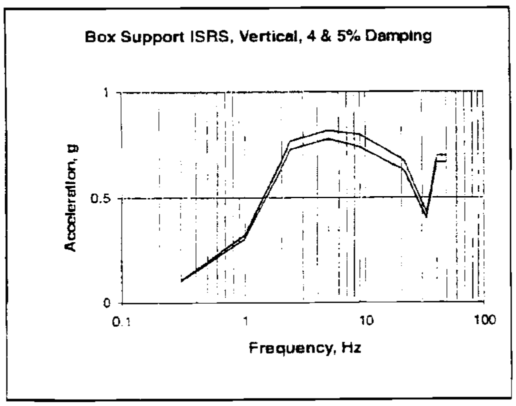
System	Load Case	P / Kip	V2 / Kip	V3 / Kip	T / Kip-in	M2 / Kip-in	M3 / Kip-in
Nozzle Load for HOP HEPA Housing	DL (Dead + Live)	0.12	2.94	0.04	6.7	1.2	5.4
	To (thermal, normal)	0.86	1.87	0.22	13.2	1.8	5.3
	Ta (thermal, off-normal & Post DBE)	2.19	3.92	0.38	28.0	2.7	11.5
	E (Seismic)	0.56	1.13	0.51	8.7	2.4	3.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS



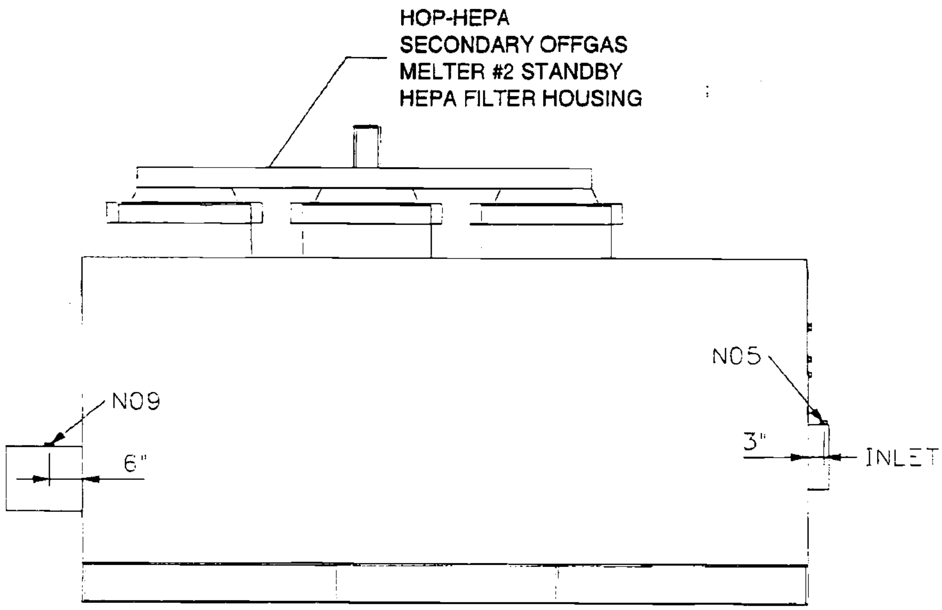




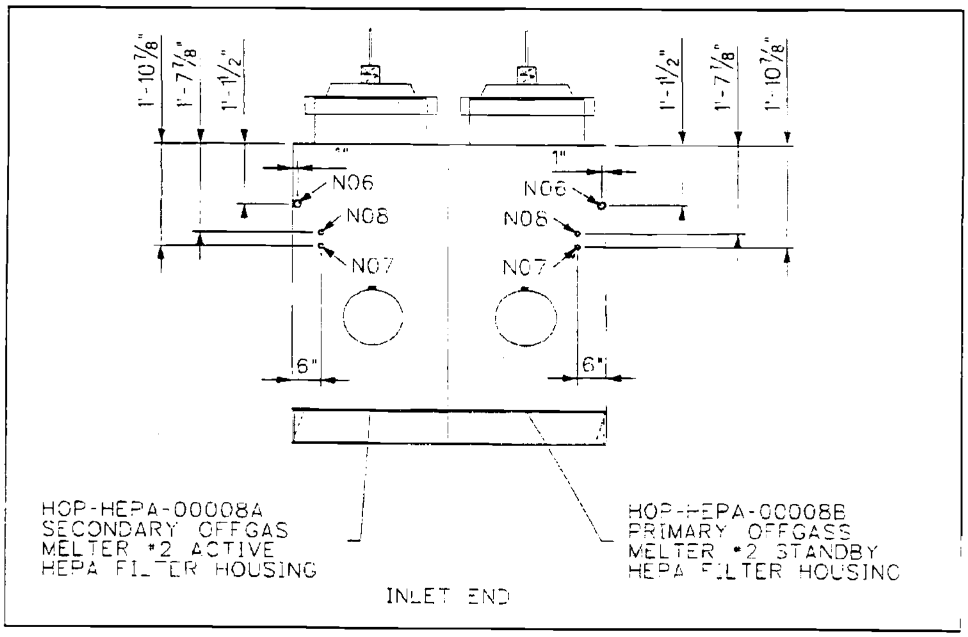
Filter Box Support ISRS Data:

Direction: Damping: Freq. Hz	EW 4% Accel, g	EW 5% Accel, g	Freq. Hz	NS 4% Accel, g	NS 5% Accel, g	Freq. Hz	Vert 4% Accel, g	Vert 5% Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

	APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MKD-HOP-00017	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-HOP-HEPA-00008B	Rev No. 5



ELEVATION VIEW OF HOP-HEPA-00008B



Nozzle Designations:

NO5: Injection port
NO6: Upstream sample
NO7: Upstream static pressure.
NO8: Downstream static pressure
NO9: Downstream sample
NO10: Housing outlet

ISSUED BY
RPP-WTP PDC

R11202140

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00004	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00004A	Rev No. 8

1	Project:	RPP-WTP	Bldg./Rm #	HLW / B-0104	Manufacturer:	Flanders/CSC
2	Project No.	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MAC-PJV-00002	Manufacturer	
4	Safety Class	SS	Calculations		Part No:	*
5	Seismic Category	SC-III	Associated	24590-HLW-M6-PJV-00002	Quantity Required	1
6	System No.	PJV	Drawings		Quality Level	Q
7	System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Pulse Vent System - Primary "Active" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet	

9 DESIGN CONDITIONS

10	Zone Design Temperature- Summer °F	113		Design/Normal Inlet Air Temp. (see Note 4)	114 / 78	°F
11	Site Storage Conditions - Summer °F	113	DB	N/A	WB	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	DB	Radiological dose rate (Note 2 & 6)	3.54E+04	mRad/hr
14	Indoor Design Temperature - Winter °F	59	DB	Rad dose for 40-yr facility life (Note 2 & 6)	1.24E+07	Rad (total)

15 PERFORMANCE RATING

16	Design Flow Rate (CFM)	10,000	Max. Allow. Leakage (CFM/housing)	10 cfm
17	Maximum Operating Pressure (in. WC)	(-) 80	Leak Test Pressure (in. WC, initial)	(-)120 init. test pressure
18	Maximum Design Pressure (in. WC)	(-) 120	Assembly Press. Drop w/ Clean Filters (in. WC)	3.75 (see Note 12)
19	Total Filter Openings Required	6	Weight with HEPA Filters (pounds)	*
20	No. Filters per Bank	5	Weight without HEPA Filters (pounds)	*

21 CONSTRUCTION

22–25: NOTE: This housing unit is paired with 24590-HLW-MK-PJV-HEPA-00004B (Ref. datasheet 24590-HLW-MAD-PJV-00006), orientation as shown:

AIRFLOW »→

inlet	Housing 24590-HLW-MK-PJV-HEPA-00004B	outlet
inlet	Housing 24590-HLW-MK-PJV-HEPA-00004A	outlet

PLAN VIEW

26	Design Housing Manufacturer	Flanders/CSC	Design Housing Model Number:	*		
27	Housing Construction Method	All Welded	Max. Housing Dim. (in.): See Note 8	L = *	H = *	W = *
28	Housing Material :	Type 304L Stainless Steel	Housing Material Gauge	*		
29	Top Panel Material :	Type 304L Stainless Steel	Top Panel Material Gauge	*		
30	Structural Frame Material :	Type 304L Stainless Steel	Structural Frame Features	*		
31	Inlet Plenum Total Volume	*	Outlet Plenum Total Volume	*		
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side		
33	Inlet Nozzle Dimensions (inches):	20 in. Diameter, nominal	Outlet Nozzle Dimensions (inches):	20 in. Diameter, nominal		
34	See Notes 5 & 8	11.6 in. Length	See Notes 5 & 8	8.0 in. Length		
35	Inlet Connection Type.	Welded	Outlet Connection Type	Welded		
36	Inlet Flange Bolt Required	N/A	Outlet Flange Bolts Required	N/A		
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size.	N/A		
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A		
39	Inlet Flange Gasket Material	N/A	Outlet Flange Gasket Material	N/A		
40	Paint and Finish Material	N/A	Paint and Finish Material Minimum Thickness	N/A		

41 HOUSING ACCESSORIES

42	Accessory Provided	Yes	No	Accessory Information	
43	Test w/ Inlet Isolation Damper:		X	Damper Provided By:	N/A
44	See Note 7			Inlet Isolation Damper Type	N/A
45				Inlet Isolation Damper Size:	N/A
46	Inlet Transition Ductwork		X	Inlet Transition Ductwork	N/A
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	
52	Inlet Aerosol Test Port Criteria	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00004

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-PJV-HEPA-00004A
Rev No.	8

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders/CSC	
2	Project No:	24590	Elevation	0'-0"			
3	Site:	DOE Hanford	Supporting	24590-HLW-MAC-PJV-00002	Manufacturer		
4	Safety Class	SS	Calculations		Part No:	*	
5	Seismic Category	SC-III	Associated	24590-HLW-M6-PJV-00002	Quantity Required		1
6	System No.	PJV	Drawings		Quality Level		Q
7	System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003		
8	Description:	HLW Pulse Vent System - Primary "Active" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet		

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/ Outlet Isolation Damper:		X	Damper Provided By:	N/A	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall	N/A	
25				Length (inches):		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension (inches):		
28				Outlet Transition Largest Inside	N/A	
29				Dimension (inches):		
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size:	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2 (see Note 3)	
39	Drain Connection:	See Note 9		Drain Connection Size: (inches)	1-1/2 (see Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:	N/A	

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Intrumentation Taps:	*	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	

48 NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection
49 point located on Appendix 2 sketches. Aerosol injection and sampling lines shall be stainless steel pipe per specification
50 24590-WTP-3PB-P000-TS11Z, or equal.

	REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00004	MR No. **24590-QL-MRA-MKH0-00002**
		Plant Item No. **24590-HLW-MK-PJV-HEPA-00004A** — Rev No. **8**

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders/CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MAC-PJV-00002	Manufacturer Part No:	*
Safety Class	SS				
Seismic Category	SC-III	Associated Drawings	24590-HLW-M6-PJV-00002	Quantity Required	1
System No.	PJV			Quality Level	Q
System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003	
Description:	HLW Pulse Vent System - Primary "Active" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet	

Notes:

1.) Vendor to fill in data in cells with (*) asterisk. NA means not applicable.

2.) **PJV airstream constituents:** Reference Calc. 24590-WTP-M3C-HOP-00001. Melter OffGas and Liquid Effluent Definition. Run Results. See Table Streams No. HV250, page 21 of 24.

The following are the constituents of the offgas:

Chemical:		Radiological:	
By Volume%:	Units (mg/m³):	Units (Bq/m³):	Temperature = 16°C (61°F)
N_2 = 77.7%	NO_X = 6.37E-18	Alpha = 2.56E+01	Heat Capacity 1.00 kJ/kg-C
O_2 = 20.8%	SO_X = 1.41E-19	Beta/Gamma$^{(1)}$ = 2.32E-04	Pressure = 991 mbar
Ar = 0.9%	NH_3 = 3.16E-05	H-3 = 1.01E-02	Relative Humidity 30.0%
CO_2 = 0.0%	Entrained Solids	C-14 = 2.25E-03	Density = 1.192 kg/m³
H_2O = 0.5%	= 1.77E-02	I-129 = 1.02E-04	Avg. Molecular Wt = 28.9 g/mol
			Thermal Cond = 25.13 mW/m-c
			Viscosity = 17.96 μPa-s

(1) Beta/Gamma dose excludes Tritium, Carbon-14, and Iodine.

3.) **Diff. pressure taps:** 1/2-in. socket weld. T-304L SS half coupling. Size of hole penetrating housing pressure boundary at 1/8-in. diam.

4.) **Operating Max/Normal Inlet Air Temperatures** from Table 7.3 in 24590-HLW-M6C-PJV-00003.

5.) **The thickness for the nominal 20-in. diam. inlet/outlet connections** on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.25 " thick (pipe or rolled and welded plate per A240).

6) Radiation Dose Rates for HLW R5 room H-0104 (Filter Cave). See CCN: 152094, Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >/= 99.97% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300; and Equipment Qualification Datasheet (Appendix 1 and Attachment A)

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-P0A-MKH0-00002-06-00006, -07-00087, 07-00088 & -07-00188 for C5V system filter housing configuration and dimensions (similar design to PJV, except for nozzle diameter and orientation).

9.) **Drain connections:** 1-1/2-in. NPT pipe nipple with cap, T-304L SS

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) Contents of this document are **"Dangerous Waste Permit Affecting"**.

12.) **Design pressure drop** is a "Target" value (2.2 in. WC for Housing and associated ducting plus 1.55 for HEPA Filter to a total of 3.75 in. WC), actual value to be reported by F/CSC in prototype test report, subject to buyer approval.

Remarks: ALL DIMENSIONAL DATA SHOWN ON THIS DATA SHEET ARE MEANT TO CONVEY BUYER DESIGN PREFERENCES AND MAY BE MODIFIED BY F/CSC. FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS. Blank data fields are not required to be completed.

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
8	4/27/10	Re-configured Appendix 2, per Plant Design nozzle location and orientation and revised minimum filter housing efficiency to 99.97%.	RKRamos	[signature]	JATuck	[signature]	Gerard Garcia
7	3/1/2010	Added to Note 7, Shaker table test notification. Updated attached EEQ (Attach. A) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. Rev. note 6. Added Appendix 2 for instrument taps nozzle location.	R.K.Ramos	C. Meng	J.Tuck	Pete Shea	W. Lawrence
6	9/24/2009	Rev. rad. dose level, Safety Class, Quality Level, inlet temp., leakage rate, leak test pressure, and pressure drop; rev. Note 2 service conditions (to replace Att. B); rev. Note 8; added Note 11 per DCN 24590-HLW-MAN-PJV-00001; added notes 3, 4, & 12; added Remarks and Safety Screening note; added EQ datasheet and seismic criteria (App. 1 & Att. 1)	J.Tuck	C. Meng	R.K.Ramos	L.H. Solis	Gerard Garcia
0	10/22/2002	Issued for Purchase	David Royer	_	A.C.Tan	_	J. Sanders
Rev	**Date**	**Description**	**Originator**	**E & NS**	**Checker**	**Reviewer**	**Approver**

	APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-PJV-00004	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-PJV-HEPA-00004A	Rev No. 8

1	**EQUIPMENT IDENTIFICATION:**		
2	**Full Component Tag Number or BNI Stock Code Number**	24590-HLW-MK-PJV-HEPA-00004A	**Safety Classification**
3	**Equipment Datasheet Number**	24590-HLW-MAD-PJV-00004	[ ] SC [X] SS
4			[ ] APC-PAM
5–8	**Description**	HLW PJV is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet & Outlet dampers (By Others). Remote change radial flow HEPA filters are used to treat gaseous emissions. The Safety Classification is Safety Significant (SS) to ensure filtration of the emission stream to acceptable level prior to release.	**Seismic Category** [ ] SC-I [ ] SC-II [X] SC-III [ ] SC-IV [ ] SC-III Seismic Interaction only
9	**Location (Facility / Building and Room No.)**	HLW PJV Primary HEPA Filter Housing 24590-HLW-MK-PJV-HEPA-00004A is located inside Room **H-104, at EL. 0'-0".**	
10–12	**Safety Function(s)**	Provide confinement and protection against crush/impact events. Provide Safety Significant filtering of normal operations and as a significant contributor to defense in depth. Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.4.18.	
13	Equipment Safety Function Type	[X] Passive Mechanical [ ] Active Mechanical [ ] Electrical	
14	Seismic Safety Function	Seismic Operability Requirements	
15	[X] Yes [ ] No	[X] During Seismic Event [X] After Seismic Event [ ] None	
16			

17	**EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)** **(Parameter values stated in this section do not include process conditions or operationally induced conditions)**				
18	Classification of Environment	[X] Mild [ ] Harsh		Qualified Life (years)	[X] 40 [ ] Other
19–20	**Parameters Type / Units**	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
21	**Normal Ambients**				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
29	Plant / Process Induced Vibration	[ ] Yes [X] No			
30	Additional Normal Information:	None			
31					
32	**Abnormal Ambients**				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
40	Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
41	Additional Abnormal Information:	None			
42					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-PJV-00004	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00004A**	Rev No **8**

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					
18	**DBE Chemical Exposure Details**				
19–21	DBE Chemical Types/Concentration	NONE			
22					
23	**Electrical Interfaces Supporting the Safety Function**				
24	Power Supply Voltage (VAC, VDC)	NA			
25	Power Supply Frequency (Hz)	NA			
26	Power Connection Method	NA			
27	I / O Signals to /from Equipment	NA			
28	I / O Connection Method	NA			
29					
30	**Mechanical Interfaces**				
31	Mounting Configuration (orientation)	* Note 13			
32	Mounting Method (bolts, welds, etc)	* Note 13			
33	Auxiliary Devices	* Note 13			
34					
35	**Equipment Seismic Qualification (ESQ)**				

36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37–38	WTP Seismic Design Specification	Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	N/A
39–40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-PJV-00004**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00004A**	Rev No. **8**

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.

14. Note Deleted

15. Note Deleted See Note 24 A & B.

16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.

17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents. See Note 2). significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr), that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.

18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

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

20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.

22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

24
  A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."
  B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

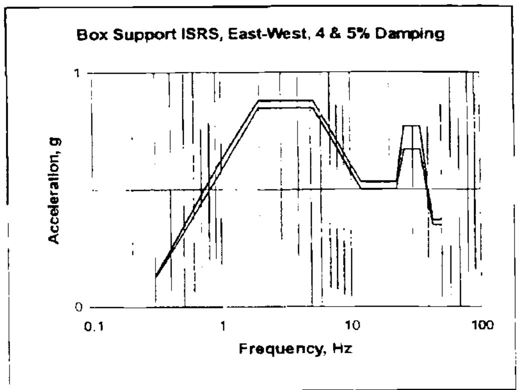
	ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Datasheet: 24590-HLW-MAD-PJV-00004	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-PJV-HEPA-00004A	Rev No. 8

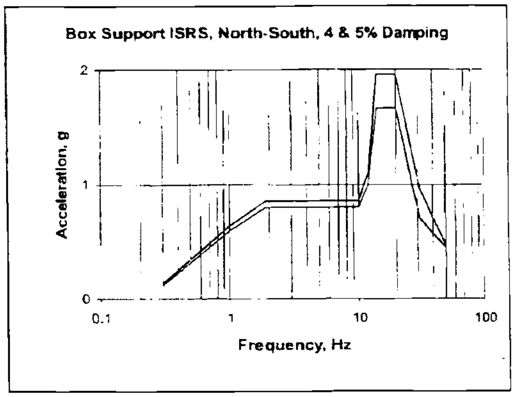
In-Structure Response Spectra (ISRS) and Nozzle Loads: Based on 24590-HLW-S0C-S15T-00108, Rev. 0B.

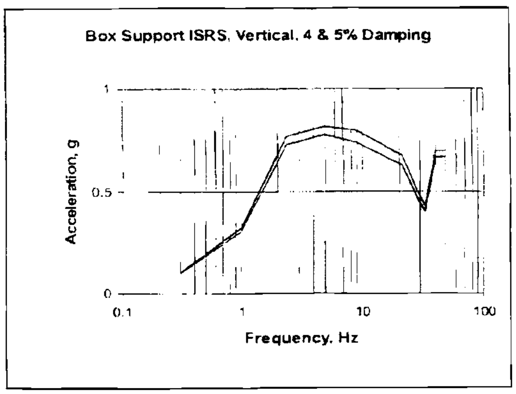
System	Load Case	P/kip	V2/kip	V3/kip	T/kip-in.	M2/kip-in.	M3/kip-in.
Nozzle Load for PJV HEPA Housing	DL (dead + live)	0.09	0.78	0.09	4.0	0.6	2.0
	To (thermal, normal)	5.59	3.05	1.12	52.5	2.6	20.9
	Ta (thermal, off-normal & post-DBE)	6.30	3.35	1.61	75.0	4.1	24.1
	E (seismic)	0.45	0.19	0.26	3.7	3.2	1.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS:



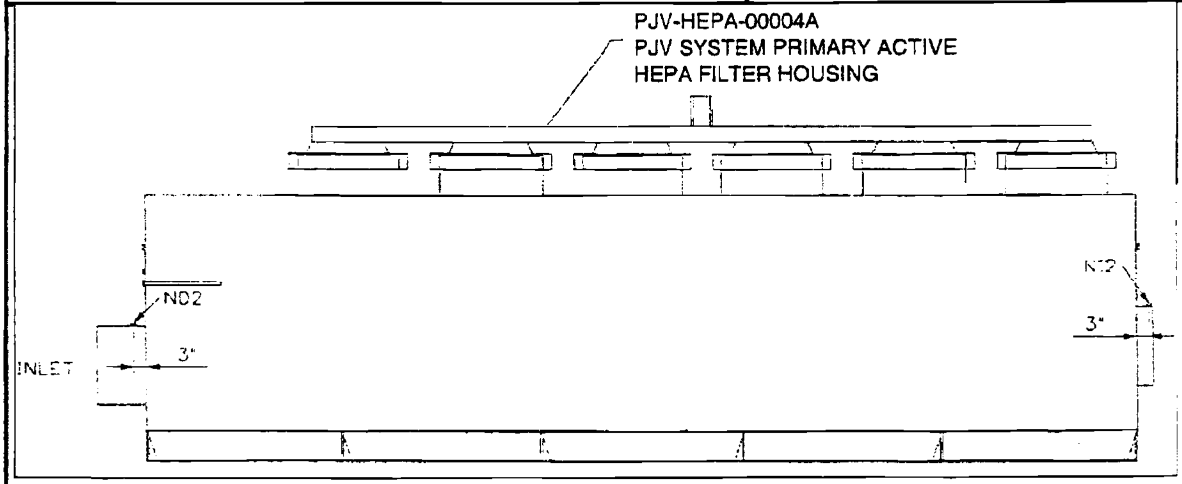




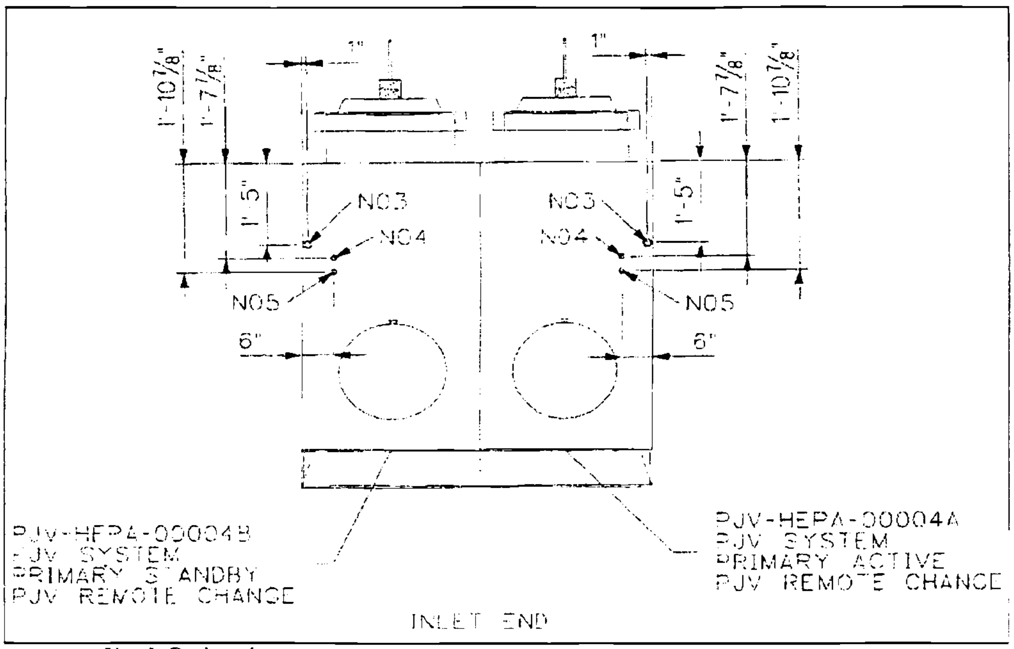
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g	Freq. Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MAD-PJV-00004	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00004A	Rev No. 8



ELEVATION VIEW OF PJV-HEPA-00004A



Nozzle Designations:

N01: Housing inlet
N02: Injection port
N03: Upstream sample.
N04: Upstream static pressure
N05: Downstream static press.
N12: Downstream sample

ISSUED BY
RPP-WTP PDC

R11202141

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00005	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00005A**	Rev No. **8**

1	Project:	RPP-WTP	Bldg./Rm #	HLW / B-0104	Manufacturer:	Flanders/CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting Calculations	24590-HLW-MAC-PJV-00002	Manufacturer Part No:	*
4	Safety Class	SS				
5	Seismic Category	SC-III	Associated Drawings	24590-HLW-M6-PJV-00002	Quantity Required	1
6	System No.	PJV			Quality Level	Q
7	System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Pulse Vent System - Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet	

9	**DESIGN CONDITIONS**					
10	Zone Design Temperature- Summer °F	113		Design/Normal Inlet Air Temp. (see Note 4)	114 / 78	°F
11	Site Storage Conditions - Summer °F	113	DB	N/A	WB	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	DB	Radiological dose rate (Note 2 & 6)	3.54E+04	mRad/hr
14	Indoor Design Temperature - Winter °F	59	DB	Rad dose for 40-yr facility life (Note 2 & 6)	1.24E+07	Rad (total)
15	**PERFORMANCE RATING**					
16	Design Flow Rate (CFM)	10,000		Max. Allow. Leakage (CFM/housing)	10 cfm	
17	Maximum Operating Pressure (in. WC)	(-) 80		Leak Test Pressure (in. WC, initial)	(-)120 init. test pressure	
18	Maximum Design Pressure (in. WC)	(-) 120		Assembly Press. Drop w/ Clean Filters (in. WC)	3.75 (see Note 12)	
19	Total Filter Openings Required	6		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	5		Weight without HEPA Filters (pounds)		*
21	**CONSTRUCTION**					

22	NOTE: This housing unit is paired with 24590-HLW-MK-PJV-HEPA-00005B (Ref. datasheet 24590-HLW-MAD-PJV-00007), orientation as shown:	AIRFLOW »→
23		inlet — Housing 24590-HLW-MK-PJV-HEPA-00005A — outlet
24		inlet — Housing 24590-HLW-MK-PJV-HEPA-00005B — outlet
25		PLAN VIEW

26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*		
27	Housing Construction Method:	All Welded	Max. Housing Dim. (in.): See Note 8	L = *	H = *	W = *
28	Housing Material:	Type 304L Stainless Steel	Housing Material Gauge	*		
29	Top Panel Material	Type 304L Stainless Steel	Top Panel Material Gauge:	*		
30	Structural Frame Material:	Type 304L Stainless Steel	Structural Frame Features.	*		
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*		
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side		
33	Inlet Nozzle Dimensions (inches).	20 in. Diameter, nominal	Outlet Nozzle Dimensions (inches)	20 in. Diameter, nominal		
34	See Notes 5 & 8	11.6 in. Length	See Notes 5 & 8	8.0 in. Length		
35	Inlet Connection Type	Welded	Outlet Connection Type:	Welded		
36	Inlet Flange Bolt Required.	N/A	Outlet Flange Bolts Required	N/A		
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size	N/A		
38	Inlet Flange Bolt Material.	N/A	Outlet Flange Bolt Material	N/A		
39	Inlet Flange Gasket Material	N/A	Outlet Flange Gasket Material.	N/A		
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness:		N/A	

41	**HOUSING ACCESSORIES**				
42	**Accessory Provided**	Yes	No	Accessory Information	
43	Test w/ Inlet Isolation Damper:		X	Damper Provided By:	N/A
44	**See Note 7**			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	N/A
46	Inlet Transition Ductwork.		X	Inlet Transition Ductwork	N/A
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	
52	Inlet Aerosol Test Port Criteria.	X		Challenge Aerosol Connection Type	*
53	**See Note 8**			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity:	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00005	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00005A**	Rev No. **8**

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders/CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting	24590-HLW-MAC-PJV-00002	Manufacturer	
4	Safety Class	SS	Calculations		Part No:	*
5	Seismic Category	SC-III	Associated	24590-HLW-M6-PJV-00002	Quantity Required	1
6	System No.	PJV	Drawings		Quality Level	Q
7	System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Pulse Vent System - Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet	

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/ Outlet Isolation Damper:		X	Damper Provided By:	N/A	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall	N/A	
25				Length (inches):		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension (inches):		
28				Outlet Transition Largest Inside	N/A	
29				Dimension (inches):		
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2 (see Note 3)	
39	Drain Connection:	See Note 9		Drain Connection Size: (inches)	1-1/2 (see Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:	N/A	

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Intrumentation Taps:	*	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	
48	NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection		
49	point located on Appendix 2 sketches. Aerosol injection and sampling lines shall be stainless steel pipe per specification		
50	24590-WTP-3PB-P000-TS11Z, or equal.		

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00005

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No	24590-HLW-MK-PJV-HEPA-00005A
Rev No.	8

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders/CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MAC-PJV-00002	Manufacturer	
Safety Class	SS			Part No:	*
Seismic Category	SC-III	Associated Drawings	24590-HLW-M6-PJV-00002	Quantity Required	1
System No.	PJV			Quality Level	Q
System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003	
Description:	HLW Pulse Vent System - Secondary "Active" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet	

Notes:

1.) Vendor to fill in data in cells with (*) asterisk. NA means not applicable.

2.) **PJV airstream constituents:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter OffGas and Liquid Effluent Definition. Run Results. See Table Streams No. HV250, page 21 of 24

The following are the constituents of the offgas:

Chemical:		**Radiological:**	
By Volume%:	Units (mg/m^3):	Units (Bq/m^3):	Temperature = 16°C (61°F)
N_2 = 77.7%	NO_X = 6.37E-18	Alpha = 2.56E+01	Heat Capacity 1.00 kJ/kg-C
O_2 = 20.8%	SO_X = 1.41E-19	Beta/Gamma[(1)] – 2.32E+04	Pressure = 991 mbar
Ar = 0.9%	NH_3 = 3.16E-05	H-3 = 1.01E-02	Relative Humidity 30.0%
CO_2 = 0.0%	Entrained Solids	C-14 = 2.25E-03	Density = 1.192 kg/m^3
H_2O = 0.5%	= 1.77E-02	I-129 = 1.02E-04	Avg. Molecular Wt = 28.9 g/mol
		(1) Beta/Gamma dose excludes Tritium, Carbon-14, and Iodine.	Thermal Cond. = 25.13 mW/m-c
			Viscosity – 17.96 μPa-s

3.) **Diff. pressure taps:** 1/2-in. socket weld, T-304L SS half coupling. Size of hole penetrating housing pressure boundary at 1/8-in. diam.

4.) **Operating Max/Normal Inlet Air Temperatures** from Table 7.3 in: 24590-HLW-M6C-PJV-00003.

5.) **The thickness for the nominal 20-in. diam. inlet/outlet connections** on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.25 " thick (pipe or rolled and welded plate per A240).

6) Radiation Dose Rates for HLW R5 room H-0104 (Filter Cave), See CCN: 152094, Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate

Min. Housing Filter System Efficiency: >= 99.97% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300; and Equipment Qualification Datasheet (Appendix 1 and Attachment A).

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test

8.) Aerosol test ports include injection and sampling at each stage See vendor submittal 24590-QL-P0A-MKH0-00002-06-00006, -07-00087, 07-00088 & -07-00188 for C5V system filter housing configuration and dimensions (similar design to PJV, except for nozzle diameter and orientation)

9.) **Drain connections:** 1-1/2-in. NPT pipe nipple with cap, T-304L SS.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1

11.) Contents of this document are **"Dangerous Waste Permit Affecting"**.

12.) **Design pressure drop** is a "Target" value (2.2 in. WC for Housing and associated ducting plus 1.55 for HEPA Filter to a total of 3.75 in. WC); actual value to be reported by F/CSC in prototype test report, subject to buyer approval.

Remarks: ALL DIMENSIONAL DATA SHOWN ON THIS DATA SHEET ARE MEANT TO CONVEY BUYER DESIGN PREFERENCES AND MAY BE MODIFIED BY F/CSC. FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.

Blank data fields are not required to be completed

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
8	4/27/10	Re-configured Appendix 2, per Plant Design nozzle location and orientation and revised minimum filter housing efficiency to 99.97%.	RKRamos	[illegible]	JATuck	[illegible]	Gerard Garcia
7	3/1/2010	Added to Note 7. Shaker table test notification. Updated attached EEQ (Attach. A) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. Rev. note 6. Added Appendix 2 for instrument taps nozzle location.	R.K.Ramos	C. Meng	J.Tuck	Pete Shea	W. Lawrence
6	9/24/2009	Rev. rad. dose level, Safety Class, Quality Level, inlet temp., leakage rate, leak test pressure, and pressure drop; rev. Note 2 service conditions (to replace Att. B); rev. Note 8; added Note 11 per DCN 24590-HLW-MAN-PJV-00001, added notes 3, 4, & 12; added Remarks and Safety Screening note; added EQ datasheet and seismic criteria (App. 1 & Att. 1).	J.Tuck	C. Meng	R.K.Ramos	I.H. Solis	Gerard Garcia
0	10/22/2002	Issued for Purchase	David Royer		A.C.Tan	–	J. Sanders
Rev	Date	Description	Originator	E & NS	Checker	Reviewer	Approver

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-PJV-00005	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00005A	Rev No. 8

EQUIPMENT IDENTIFICATION:

Full Component Tag Number or BNI Stock Code Number	**24590-HLW-MK-PJV-HEPA-00005A**	**Safety Classification**
Equipment Datasheet Number	**24590-HLW-MAD-PJV-00005**	[ ] SC [X] SS [ ] APC-PAM
Description	HLW PJV is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet & Outlet dampers (By Others). Remote change radial flow HEPA filters are used to treat gaseous emissions. The Safety Classification is Safety Significant (SS) to ensure filtration of the emission stream to acceptable level prior to release.	**Seismic Category** [ ] SC-I [ ] SC-II [X] SC-III [ ] SC-IV [ ] SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	HLW PJV Primary HEPA Filter Housing 24590-HLW-MK-PJV-HEPA-00005A is located inside Room H-104, at EL. 0'-0".	
Safety Function(s)	Provide confinement and protection against crush/impact events. Provide Safety Significant filtering of normal operations and as a significant contributor to defense in depth. Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.4.18.	
Equipment Safety Function Type	[X] Passive Mechanical [ ] Active Mechanical [ ] Electrical	
Seismic Safety Function [X] Yes [ ] No	Seismic Operability Requirements [X] During Seismic Event [X] After Seismic Event [ ] None	

EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)

(Parameter values stated in this section do not include process conditions or operationally induced conditions)

Classification of Environment [X] Mild [ ] Harsh — Qualified Life (years) [X] 40 [ ] Other

Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
Plant / Process Induced Vibration	[ ] Yes [X] No			
Additional Normal Information:	None			
Abnormal Ambients				
High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
Additional Abnormal Information:	None			

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-PJV-00005	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00005A	Rev No. 8

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					

18	**DBE Chemical Exposure Details**	
19	DBE Chemical Types/Concentration	NONE
20		
21		
22		
23	**Electrical Interfaces Supporting the Safety Function**	
24	Power Supply Voltage (VAC, VDC)	NA
25	Power Supply Frequency (Hz)	NA
26	Power Connection Method	NA
27	I / O Signals to /from Equipment	NA
28	I / O Connection Method	NA
29		
30	**Mechanical Interfaces**	
31	Mounting Configuration (orientation)	* Note 13
32	Mounting Method (bolts, welds, etc)	* Note 13
33	Auxiliary Devices	* Note 13
34		

35	**Equipment Seismic Qualification (ESQ)**				
36	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
37-38	WTP Seismic Design Specification	Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	N/A
39-40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-PJV-00005**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00005A**	Rev No. **8**

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.

14. Note Deleted

15. Note Deleted See Note 24 A & B.

16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.

17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents. See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr), that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.

18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

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

20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.

22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

24 A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

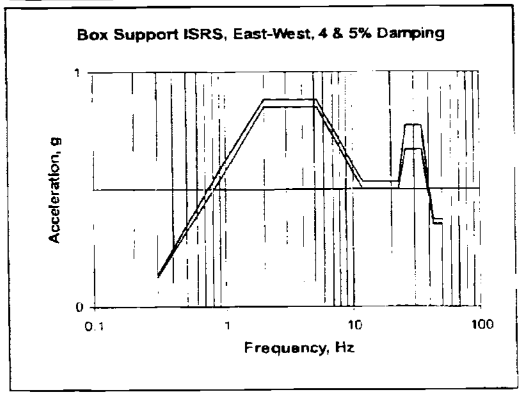
27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

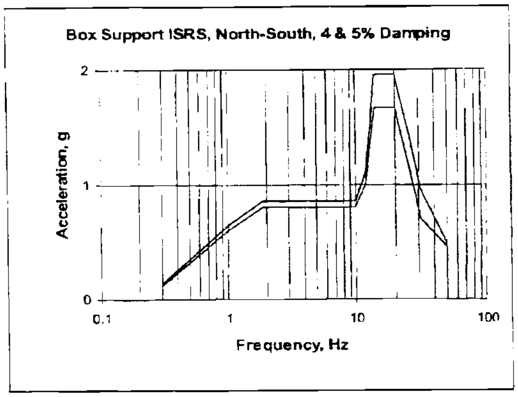
In-Structure Response Spectra (ISRS) and Nozzle Loads: Based on 24590-HLW-S0C-S15T-00108, Rev. 0B.

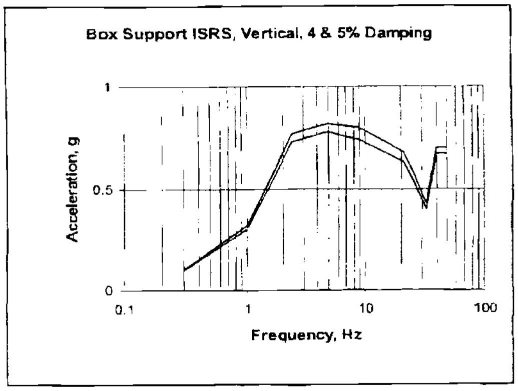
System	Load Case	P/kip	V2/kip	V3/kip	T/kip-in.	M2/kip-in.	M3/kip-in.
Nozzle Load for PJV HEPA Housing	DL (dead + live)	0.09	0.78	0.09	4.0	0.6	2.0
	To (thermal, normal)	5.59	3.05	1.12	52.5	2.6	20.9
	Ta (thermal, off-normal & post-DBE)	6.30	3.35	1.61	75.0	4.1	24.1
	E (seismic)	0.45	0.19	0.26	3.7	3.2	1.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS:



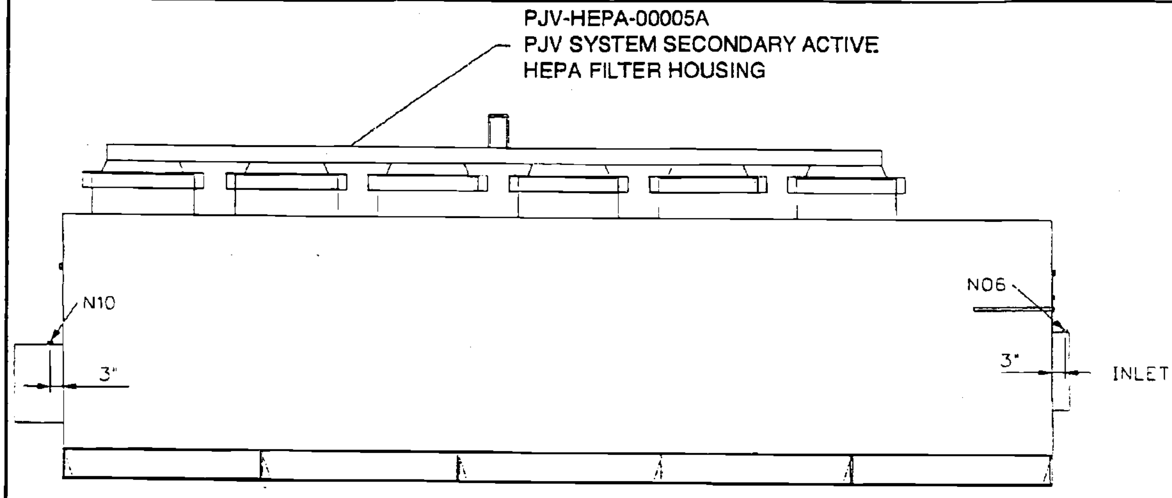




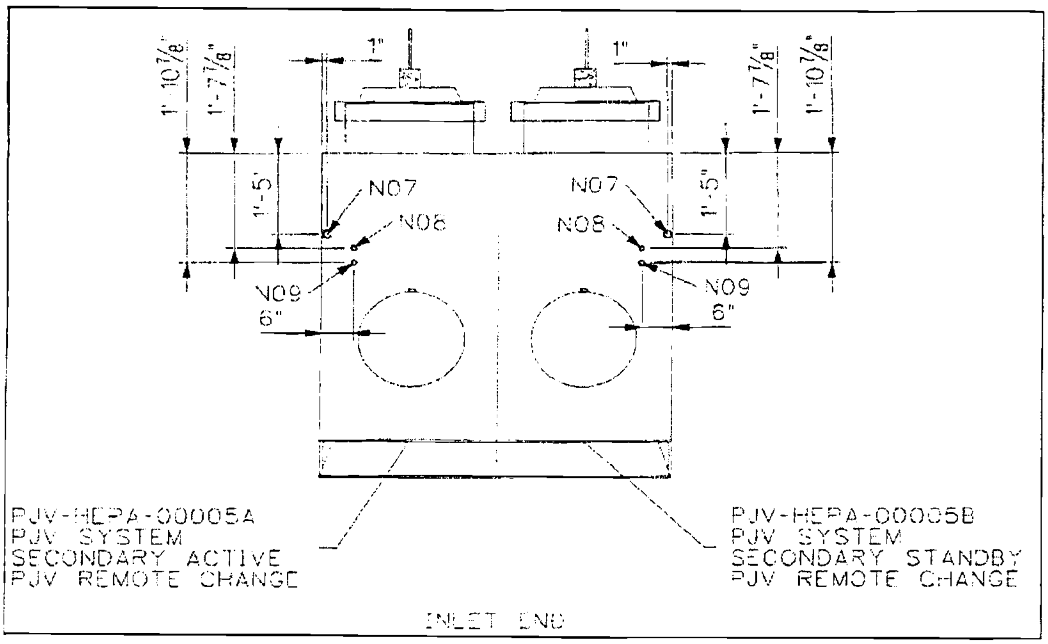
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MAD-PJV-00005	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00005A	Rev No. 8



ELEVATION VIEW OF PJV-HEPA-00005A



Nozzle Designations:

N06: Injection port
N07: Upstream sample.
N08: Upstream static pressure
N09: Downstream static press.
N10: Downstream sample

ISSUED BY
RPP-WTP PDC

R11202142

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00006	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00004B**	Rev No. **8**

1	Project:	RPP-WTP	Bldg./Rm #	**HLW / B-0104**	Manufacturer:	Flanders/CSC	
2	Project No:	24590	Elevation	**0'-0"**			
3	Site:	DOE Hanford	Supporting Calculations	**24590-HLW-MAC-PJV-00002**	Manufacturer Part No:	*	
4	Safety Class	SS					
5	Seismic Category	SC-III	Associated Drawings	**24590-HLW-M6-PJV-00002**	Quantity Required		1
6	System No.	PJV			Quality Level		Q
7	System Description	**24590-HLW-3YD-PJV-00001**		Remote Change Specification	**24590-WTP-3PS-MKH0-T0003**		
8	Description:	**HLW Pulse Vent System - Primary "Standby" Housing**			Environmental Qualification: MILD See Appendix 1 EQ datasheet		

9	**DESIGN CONDITIONS**					
10	Zone Design Temperature- Summer °F	113		Design/Normal Inlet Air Temp. (see Note 4)	114 / 78	°F
11	Site Storage Conditions - Summer °F	113	DB	N/A	WB	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	DB	Radiological dose rate (Note 2 & 6)	3.54E+04	mRad/hr
14	Indoor Design Temperature - Winter °F	59	DB	Rad dose for 40-yr facility life (Note 2 & 6)	1.24E+07	Rad (total)
15	**PERFORMANCE RATING**					
16	Design Flow Rate (CFM)	10,000		Max. Allow. Leakage (CFM/housing)	10 cfm	
17	Maximum Operating Pressure (in. WC)	(-) 80		Leak Test Pressure (in. WC, initial)	(-)120 init. test pressure	
18	Maximum Design Pressure (in. WC)	(-) 120		Assembly Press. Drop w/ Clean Filters (in. WC)	3.75 (see Note 12)	
19	Total Filter Openings Required	6		Weight with HEPA Filters (pounds)		*
20	No. Filters per Bank	5		Weight without HEPA Filters (pounds)		*
21	**CONSTRUCTION**					

22–25: NOTE: This housing unit is paired with 24590-HLW-MK-PJV-HEPA-00004A (Ref. datasheet 24590-HLW-MAD-PJV-00004), orientation as shown:

AIRFLOW »→

inlet | Housing 24590-HLW-MK-PJV-HEPA-00004B | outlet

inlet | Housing 24590-HLW-MK-PJV-HEPA-00004A | outlet

PLAN VIEW

26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*		
27	Housing Construction Method:	All Welded	Max. Housing Dim. (in.): See Note 8	L = *	H = *	W = *
28	Housing Material :	Type 304L Stainless Steel	Housing Material Gauge:	*		
29	Top Panel Material :	Type 304L Stainless Steel	Top Panel Material Gauge:	*		
30	Structural Frame Material :	Type 304L Stainless Steel	Structural Frame Features:	*		
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*		
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side		
33	Inlet Nozzle Dimensions (inches):	20 in. Diameter, nominal	Outlet Nozzle Dimensions (inches):	20 in. Diameter, nominal		
34	See Notes 5 & 8	11.6 in. Length	See Notes 5 & 8	8.0 in. Length		
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded		
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required	N/A		
37	Inlet Flange Bolt Size	N/A	Outlet Flange Bolt Size:	N/A		
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A		
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A		
40	Paint and Finish Material.	N/A	Paint and Finish Material Minimum Thickness.		N/A	

41	**HOUSING ACCESSORIES**				
42	**Accessory Provided**	Yes	No	Accessory Information	
43	Test w/ Inlet Isolation Damper:		X	Damper Provided By:	N/A
44	See Note 7			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	N/A
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	N/A
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	
52	Inlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity:	*

	REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00006	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-PJV-HEPA-00004B	Rev No. 8

1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders/CSC	
2	Project No:	24590	Elevation	0'-0"			
3	Site:	DOE Hanford	Supporting Calculations	24590-HLW-MAC-PJV-00002	Manufacturer Part No:	*	
4	Safety Class	SS					
5	Seismic Category	SC-III	Associated Drawings	24590-HLW-M6-PJV-00002	Quantity Required		1
6	System No.	PJV			Quality Level		Q
7	System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003		
8	Description:	HLW Pulse Vent System - Primary "Standby" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet		

9 HOUSING ACCESSORIES (continued)

10	Accessory Provided	Yes	No	Total Number of Viewing Ports Required:	N/A	
11	Inlet Viewing Ports		X	Inlet Viewing Port Type:	N/A	
12				Inlet Viewing Port Locations:	N/A	
13				Inlet Viewing Port	N/A	Width
14				Dimensions: (inches)	N/A	Length
15	Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
16				Accessory Information	1 per bank	
17	Vacuum-Relief Vent Assembly:	X		Number Required:	*	
18				Vacuum-Relief Vent Assembly Setpoint:	*	
19				Vacuum-Relief Vent Assembly Manufacturer:	*	
20				Vacuum-Relief Vent Model Number:	N/A	
21	Test w/ Outlet Isolation Damper:		X	Damper Provided By:	N/A	
22	See Note 7			Outlet Isolation Damper Type:	N/A	
23				Outlet Isolation Damper Size:	N/A	
24	Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall	N/A	
25				Length: (inches):		
26				Outlet Transition Smallest Inside	N/A	
27				Dimension (inches):		
28				Outlet Transition Largest Inside	N/A	
29				Dimension (inches):		
30	Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
31	See Note 8			Challenge Aerosol Connection Size:	*	
32				Challenge Aerosol Connection Quantity:	N/A	
33	Outlet Viewing Ports:		X	Total Number of Viewing Ports Required:	N/A	
34				Outlet Viewing Port Type:	N/A	
35				Outlet Viewing Port Locations:	N/A	Width
36				Outlet Viewing Port	N/A	Length
37				Dimensions: (inches)	N/A	
38	Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2 (see Note 3)	
39	Drain Connection:	See Note 9		Drain Connection Size: (inches)	1-1/2 (see Note 9)	
40	Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
41				PVC Safe Change Bag Type:	N/A	

42 UTILITY REQUIREMENTS

43	Electrical: (volts/phase/hertz)	N/A	
44	Compressed Air:	N/A	
45	Intrumentation Taps:	*	
46	Pressure/Leak Test Ports	*	
47	Air/Aerosol Mixing Test Ports	*	

48 NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection
49 point located on Appendix 2 sketches. Aerosol injection and sampling lines shall be stainless steel pipe per specification
50 24590-WTP-3PB-P000-TS11Z, or equal.

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00006

MR No.	24590-QL-MRA-MKH0-00002
Plant Item No.	24590-HLW-MK-PJV-HEPA-00004B
Rev No.	8

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders/CSC	
Project No:	24590	Elevation	0'-0"			
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MAC-PJV-00002	Manufacturer Part No:	*	
Safety Class	SS					
Seismic Category	SC-III	Associated Drawings	24590-HLW-M6-PJV-00002	Quantity Required	1	
System No.	PJV			Quality Level	Q	
System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003		
Description:	HLW Pulse Vent System - Primary "Standby" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet		

Notes:

1.) Vendor to fill in data in cells with (*) asterisk. NA means not applicable.

2.) **PJV airstream constituents:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter OffGas and Liquid Effluent Definition. Run Results. See Table Streams No. HV250, page 21 of 24.

The following are the constituents of the offgas:

Chemical:		Radiological:	
By Volume%:	Units (mg/m³):	Units (Bq/m³):	Temperature = 16°C (61°F)
N_2 = 77.7%	NO_X = 6.37E-18	Alpha = 2.56E+01	Heat Capacity 1.00 kJ/kg-C
O_2 = 20.8%	SO_X = 1.41E-19	Beta/Gamma(1) = 2.32E+04	Pressure = 991 mbar
Ar = 0.9%	NH_3 = 3.16E-05	H-3 = 1.01E-02	Relative Humidity 30.0%
CO_2 = 0.0%	Entrained Solids	C-14 = 2.25E-03	Density = 1.192 kg/m³
H_2O = 0.5%	= 1.77E-02	I-129 = 1.02E-04	Avg. Molecular Wt = 28.9 g/mol
		(1) Beta/Gamma dose excludes Tritium, Carbon-14, and Iodine	Thermal Cond. = 25.13 mW/m c
			Viscosity = 17.96 μPa-s

3.) **Diff. pressure taps:** 1/2-in. socket weld, T-304L SS half coupling. Size of hole penetrating housing pressure boundary at 1/8-in. diam.

4.) **Operating Max/Normal Inlet Air Temperatures** from Table 7.3 in: 24590-HLW-M6C-PJV-00003

5.) **The thickness for the nominal 20-in. diam. inlet/outlet connections** on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be 0.25 " thick (pipe or rolled and welded plate per A240).

6) Radiation Dose Rates for HLW R5 room H-0104 (Filter Cave). See CCN: 152094, Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10.

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >= 99.97% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300; and Equipment Qualification Datasheet (Appendix 1 and Attachment A)

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-P0A-MKH0-00002-06-00006, -07-00087, 07-00088 & -07-00188 for C5V system filter housing configuration and dimensions (similar design to PJV, except for nozzle diameter and orientation).

9.) **Drain connections:** 1-1/2-in. NPT pipe nipple with cap, T-304L SS.

10.) **Sealing materials and mechanism** shall comply with ASME AG-1.

11.) Contents of this document are **"Dangerous Waste Permit Affecting"**.

12.) **Design pressure drop** is a "Target" value (2.2 in. WC for Housing and associated ducting plus 1.55 for HEPA Filter to a total of 3.75 in. WC); actual value to be reported by F/CSC in prototype test report, subject to buyer approval.

Remarks: ALL DIMENSIONAL DATA SHOWN ON THIS DATA SHEET ARE MEANT TO CONVEY BUYER DESIGN PREFERENCES AND MAY BE MODIFIED BY F/CSC. FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS. Blank data fields are not required to be completed

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
8	4/27/10	Re-configured Appendix 2, per Plant Design nozzle location and orientation and revised minimum filter housing efficiency to 99.97%	RRamos	[signature]	VATuck	[signature]	Gerard Garcia
7	3/1/2010	Added to Note 7, Shaker table test notification. Updated attached EEQ (Attach. A) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC Rev. note 6. Added Appendix 2 for instrument taps nozzle location.	R.K.Ramos	C. Meng	J.Tuck	Pete Shea	W. Lawrence
6	9/24/2009	Rev. rad. dose level, Safety Class, Quality Level, inlet temp., leakage rate, leak test pressure, and pressure drop; rev. Note 2 service conditions (to replace Att. B); rev. Note 8; added Note 11 per DCN 24590-HLW-MAN-PJV-00001; added notes 3, 4, & 12; added Remarks and Safety Screening note; added EQ datasheet and seismic criteria (App. 1 & Att. 1).	J.Tuck	C. Meng	R.K.Ramos	L.H. Solis	Gerard Garcia
0	10/22/2002	Issued for Purchase	David Royer		A.C.Tan		J. Sanders
Rev	Date	Description	Originator	E & NS	Checker	Reviewer	Approver

APPENDIX 1
REMOTE CHANGE HEPA FILTER HOUSING
EQUIPMENT QUALIFICATION Data Sheet:
24590-HLW-MAD-PJV-00006

MR No. **24590-QL-MRA-MKH0-00002**

Plant Item No. **24590-HLW-MK-PJV-HEPA-00004B** Rev No. **8**

EQUIPMENT IDENTIFICATION:

Full Component Tag Number or BNI Stock Code Number	24590-HLW-MK-PJV-HEPA-00004B	**Safety Classification**
Equipment Datasheet Number	24590-HLW-MAD-PJV-00006	[ ] SC [X] SS [ ] APC-PAM
Description	HLW PJV is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet & Outlet dampers (By Others). Remote change radial flow HEPA filters are used to treat gaseous emissions. The Safety Classification is Safety Significant (SS) to ensure filtration of the emission stream to acceptable level prior to release.	**Seismic Category** [ ] SC-I [ ] SC-II [X] SC-III [ ] SC-IV [ ] SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	HLW PJV Primary HEPA Filter Housing 24590-HLW-MK-PJV-HEPA-00004B is located inside Room H-104, at EL. 0'-0".	
Safety Function(s)	Provide confinement and protection against crush/impact events. Provide Safety Significant filtering of normal operations and as a significant contributor to defense in depth. Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.4.18.	
Equipment Safety Function Type	[X] Passive Mechanical [ ] Active Mechanical [ ] Electrical	
Seismic Safety Function [X] Yes [ ] No	Seismic Operability Requirements [X] During Seismic Event [X] After Seismic Event [ ] None	

EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)

(Parameter values stated in this section do not include process conditions or operationally induced conditions)

Classification of Environment [X] Mild [ ] Harsh — Qualified Life (years) [X] 40 [ ] Other

Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
Plant / Process Induced Vibration	[ ] Yes [X] No			
Additional Normal Information:	None			
Abnormal Ambients				
High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4C)
Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
Exposure to Wet Sprinkler System	[ ] Yes [X] No		NA	
Additional Abnormal Information:	None			

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-PJV-00006	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00004B	Rev No. 8

1	Parameters Type / Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001, 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
10	Submergence	☐ Yes	☒ No	hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes	☒ No	hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					

18	**DBE Chemical Exposure Details**	
19	DBE Chemical Types/Concentration	NONE
20		
21		
22		
23	**Electrical Interfaces Supporting the Safety Function**	
24	Power Supply Voltage (VAC, VDC)	NA
25	Power Supply Frequency (Hz)	NA
26	Power Connection Method	NA
27	I / O Signals to /from Equipment	NA
28	I / O Connection Method	NA
29		
30	**Mechanical Interfaces**	
31	Mounting Configuration (orientation)	* Note 13
32	Mounting Method (bolts, welds, etc)	* Note 13
33	Auxiliary Devices	* Note 13
34		
35	**Equipment Seismic Qualification (ESQ)**	

	Parameters	Title	References/Documents Number	Version/ Revision	Remarks
36	**Parameters**	**Title**	**References/Documents Number**	**Version/ Revision**	**Remarks**
37-38	WTP Seismic Design Specification	Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	N/A
39-40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-PJV-00006	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00004B	Rev No. 8

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.

14. Note Deleted

15. Note Deleted See Note 24 A & B.

16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.

17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents, See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr), that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.

18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

P = Axial	T = Torsion
V2 = Shear along minor axis (vertical)	M2 = Moment about minor axis
V3 = Shear along major axis (horizontal)	M3 = Moment about major axis

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

20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.

22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

24 A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

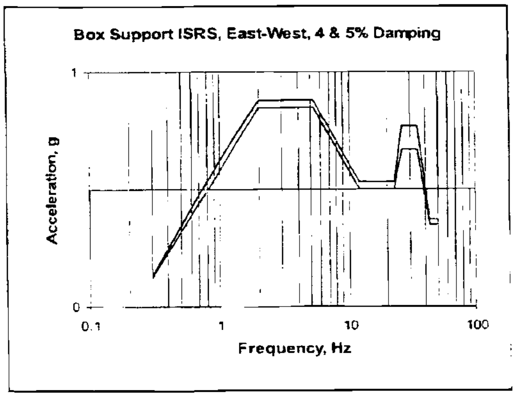
ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Datasheet: 24590-HLW-MAD-PJV-00006	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00004B	Rev No. 8

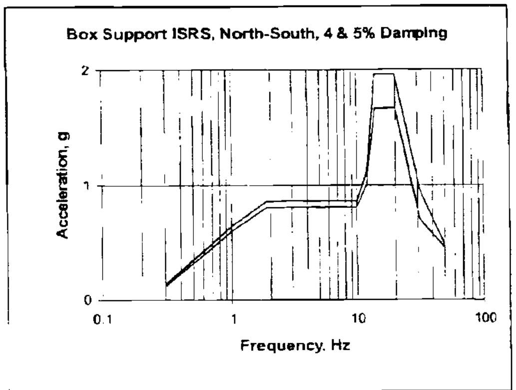
In-Structure Response Spectra (ISRS) and Nozzle Loads: Based on 24590-HLW-S0C-S15T-00108, Rev. 0B.

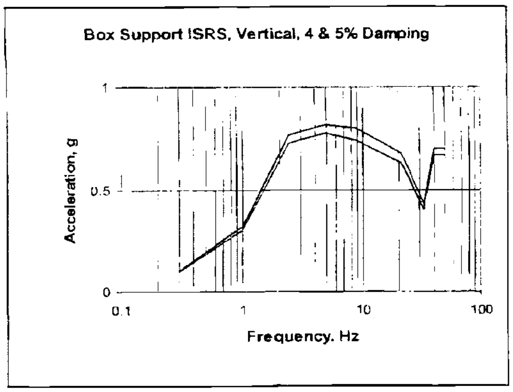
System	Load Case	P/kip	V2/kip	V3/kip	T/kip-in.	M2/kip-in.	M3/kip-in.
Nozzle Load for PJV HEPA Housing	DL (dead + live)	0.09	0.78	0.09	4.0	0.6	2.0
	To (thermal, normal)	5.59	3.05	1.12	52.5	2.6	20.9
	Ta (thermal, off-normal & post-DBE)	6.30	3.35	1.61	75.0	4.1	24.1
	E (seismic)	0.45	0.19	0.26	3.7	3.2	1.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS:



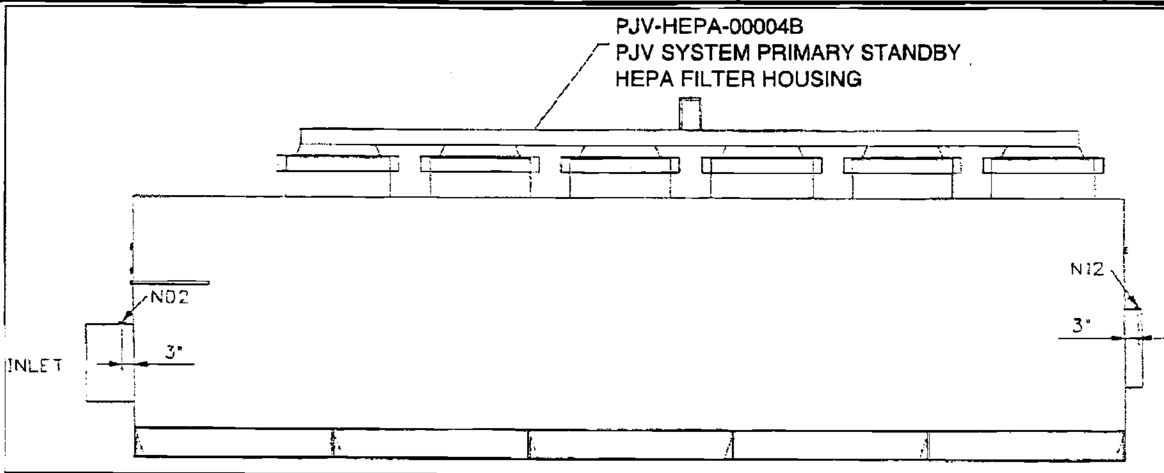




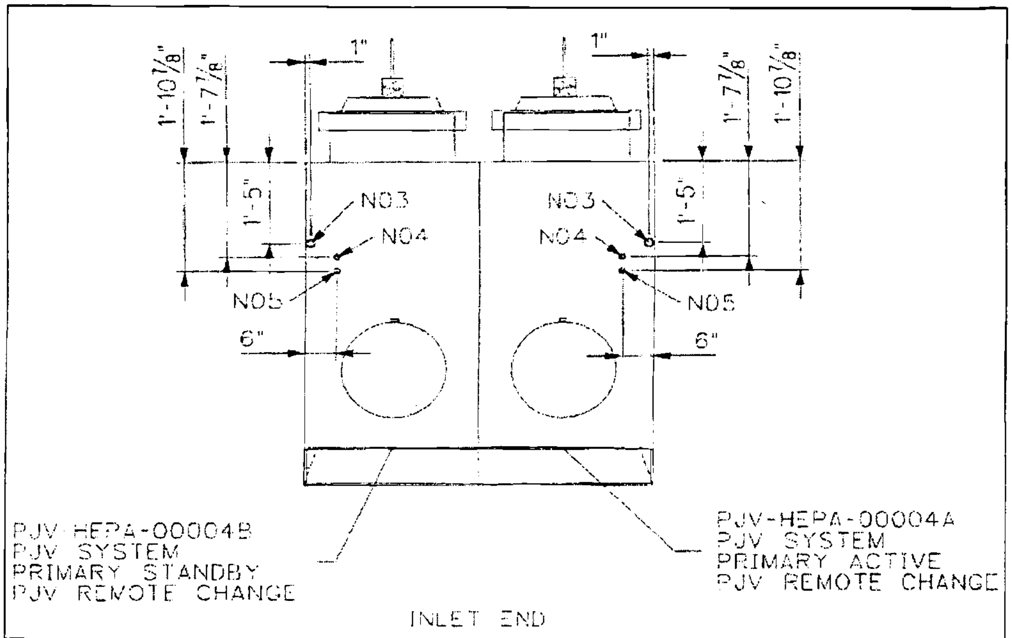
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 REMOTE CHANGE HEPA FILTER HOUSING Nozzle Location Sketch for Datasheet: 24590-HLW-MAD-PJV-00006	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00004B	Rev No. 8



ELEVATION VIEW OF PJV-HEPA-00004B



Nozzle Designations:

N01: Housing inlet
N02: Injection port
N03: Upstream sample.
N04: Upstream static pressure
N05: Downstream static press.
N12: Downstream sample

ISSUED BY
RPP-WTP PDC

R11202143

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00007	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00005B**	Rev No. **8**

#						
1	Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer:	Flanders/CSC
2	Project No:	24590	Elevation	0'-0"		
3	Site:	DOE Hanford	Supporting Calculations	24590-HLW-MAC-PJV-00002	Manufacturer Part No:	*
4	Safety Class	SS				
5	Seismic Category	SC-III	Associated Drawings	24590-HLW-M6-PJV-00002	Quantity Required	1
6	System No	PJV			Quality Level	Q
7	System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003	
8	Description:	HLW Pulse Vent System - Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet	

9 DESIGN CONDITIONS

#						
10	Zone Design Temperature- Summer °F	113		Design/Normal Inlet Air Temp. (see Note 4)	114 / 78	°F
11	Site Storage Conditions - Summer °F	113	DB	N/A	WB	
12	Housing Interior Chemical Exposure	See Note 2				
13	Site Storage Conditions - Winter °F	(-)23	DB	Radiological dose rate (Note 2 & 6)	3.54E+04	mRad/hr
14	Indoor Design Temperature - Winter °F	59	DB	Rad dose for 40-yr facility life (Note 2 & 6)	1.24E+07	Rad (total)

15 PERFORMANCE RATING

#				
16	Design Flow Rate (CFM)	10,000	Max. Allow. Leakage (CFM/housing)	10 cfm
17	Maximum Operating Pressure (in. WC)	(-) 80	Leak Test Pressure (in. WC. initial)	(-)120 init. test pressure
18	Maximum Design Pressure (in. WC)	(-) 120	Assembly Press. Drop w/ Clean Filters (in. WC)	3.75 (see Note 12)
19	Total Filter Openings Required	6	Weight with HEPA Filters (pounds)	*
20	No. Filters per Bank	5	Weight without HEPA Filters (pounds)	*

21 CONSTRUCTION

#				
22	NOTE: This housing unit is paired with 24590-HLW-MK-PJV-HEPA-00005A (Ref. datasheet 24590-HLW-MAD-PJV-00005), orientation as shown:		AIRFLOW »→	
23		inlet	Housing 24590-HLW-MK-PJV-HEPA-00005A	outlet
24		inlet	Housing 24590-HLW-MK-PJV-HEPA-00005B	outlet
25			PLAN VIEW	

#				
26	Design Housing Manufacturer:	Flanders/CSC	Design Housing Model Number:	*
27	Housing Construction Method:	All Welded	Max. Housing Dim. (in.): See Note 8	L = * H = * W = *
28	Housing Material :	Type 304L Stainless Steel	Housing Material Gauge:	*
29	Top Panel Material :	Type 304L Stainless Steel	Top Panel Material Gauge:	*
30	Structural Frame Material :	Type 304L Stainless Steel	Structural Frame Features:	*
31	Inlet Plenum Total Volume:	*	Outlet Plenum Total Volume	*
32	Inlet Position: (Top/Side)	Side	Outlet Position: (Top/Side)	Side
33	Inlet Nozzle Dimensions (inches):	20 in. Diameter, nominal	Outlet Nozzle Dimensions (inches):	20 in. Diameter, nominal
34	See Notes 5 & 8	11.6 in. Length	See Notes 5 & 8	8.0 in. Length
35	Inlet Connection Type:	Welded	Outlet Connection Type:	Welded
36	Inlet Flange Bolt Required:	N/A	Outlet Flange Bolts Required:	N/A
37	Inlet Flange Bolt Size:	N/A	Outlet Flange Bolt Size:	N/A
38	Inlet Flange Bolt Material:	N/A	Outlet Flange Bolt Material:	N/A
39	Inlet Flange Gasket Material:	N/A	Outlet Flange Gasket Material:	N/A
40	Paint and Finish Material:	N/A	Paint and Finish Material Minimum Thickness:	N/A

41 HOUSING ACCESSORIES

#					
42	**Accessory Provided**	Yes	No	Accessory Information	
43	Test w/ Inlet Isolation Damper:		X	Damper Provided By:	N/A
44	See Note 7			Inlet Isolation Damper Type:	N/A
45				Inlet Isolation Damper Size:	N/A
46	Inlet Transition Ductwork:		X	Inlet Transition Ductwork	N/A
47				Overall Length: (inches)	
48				Inlet Transition Smallest	N/A
49				Inside Dimension: (inches)	
50				Inlet Transition Largest	N/A
51				Inside Dimension: (inches)	
52	Inlet Aerosol Test Port Criteria.	X		Challenge Aerosol Connection Type:	*
53	See Note 8			Challenge Aerosol Connection Size:	*
54				Challenge Aerosol Connection Quantity:	*

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00007

MR No.	24590-QL-MRA-MKH0-00002	
Plant Item No.	24590-HLW-MK-PJV-HEPA-00005B	Rev No. 8

Project:	RPP-WTP	Bldg./Rm #	HLW / B-0104	Manufacturer:	Flanders/CSC
Project No:	24590	Elevation	0'-0"		
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MAC-PJV-00002	Manufacturer Part No:	*
Safety Class	SS				
Seismic Category	SC-III	Associated Drawings	24590-HLW-M6-PJV-00002	Quantity Required	1
System No.	PJV			Quality Level	Q
System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003	
Description:	HLW Pulse Vent System - Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet	

HOUSING ACCESSORIES (continued)

Accessory Provided	Yes	No			
Inlet Viewing Ports		X	Total Number of Viewing Ports Required:	N/A	
			Inlet Viewing Port Type:	N/A	
			Inlet Viewing Port Locations:	N/A	
			Inlet Viewing Port Dimensions: (inches)	N/A	Width
				N/A	Length
Internal Fire Suppression:		X	Fire Suppression System Description:	N/A	
			Accessory Information	1 per bank	
Vacuum-Relief Vent Assembly:	X		Number Required:	*	
			Vacuum-Relief Vent Assembly Setpoint:	*	
			Vacuum-Relief Vent Assembly Manufacturer:	*	
			Vacuum-Relief Vent Model Number:	N/A	
Test w/ Outlet Isolation Damper:		X	Damper Provided By:	N/A	
See Note 7			Outlet Isolation Damper Type:	N/A	
			Outlet Isolation Damper Size:	N/A	
Outlet Transition Ductwork:		X	Outlet Transition Ductwork Overall Length (inches):	N/A	
			Outlet Transition Smallest Inside Dimension (inches):	N/A	
			Outlet Transition Largest Inside Dimension (inches):	N/A	
Outlet Aerosol Test Port Criteria:	X		Challenge Aerosol Connection Type:	*	
See Note 8			Challenge Aerosol Connection Size:	*	
			Challenge Aerosol Connection Quantity:	N/A	
Outlet Viewing Ports		X	Total Number of Viewing Ports Required:	N/A	
			Outlet Viewing Port Type:	N/A	
			Outlet Viewing Port Locations:	N/A	Width
			Outlet Viewing Port	N/A	Length
			Dimensions: (inches)	N/A	
Differential Pressure Taps:	X		Differential Pressure Tap Size: (inches)	1/2 (see Note 3)	
Drain Connection:	See Note 9		Drain Connection Size: (inches)	1-1/2 (see Note 9)	
Drain Connection Valve:		X	Drain Connection Valve Size: (inches)	N/A	
			PVC Safe Change Bag Type:	N/A	

UTILITY REQUIREMENTS

Electrical: (volts/phase/hertz)	N/A	
Compressed Air:	N/A	
Intrumentation Taps:	*	
Pressure/Leak Test Ports	*	
Air/Aerosol Mixing Test Ports	*	

NOTE: See Appendix 2 for locations of test ports. SELLER to provide aerosol injection and sampling lines from housing penetration to connection point located on Appendix 2 sketches. Aerosol injection and sampling lines shall be stainless steel pipe per specification 24590-WTP-3PB-P000-TS11Z, or equal.

REMOTE-CHANGE HEPA FILTER HOUSING Data Sheet: 24590-HLW-MAD-PJV-00007

MR No.	
24590-QL-MRA-MKH0-00002	
Plant Item No.	Rev No
24590-HLW-MK-PJV-HEPA-00005B	8

Project:	RPP-WTP	Bldg./Rm #	HLW / H-0104	Manufacturer: Flanders/CSC
Project No:	24590	Elevation	0'-0"	
Site:	DOE Hanford	Supporting Calculations	24590-HLW-MAC-PJV-00002	Manufacturer Part No: *
Safety Class	SS			
Seismic Category	SC-III	Associated Drawings	24590-HLW-M6-PJV-00002	Quantity Required: 1
System No.	PJV			Quality Level: Q
System Description	24590-HLW-3YD-PJV-00001		Remote Change Specification	24590-WTP-3PS-MKH0-T0003
Description:	HLW Pulse Vent System - Secondary "Standby" Housing			Environmental Qualification: MILD See Appendix 1 EQ datasheet

Notes:

1.) Vendor to fill in data in cells with (*) asterisk. NA means not applicable.

2.) **PJV airstream constituents:** Reference Calc. 24590-WTP-M3C-HOP-00001, Melter OffGas and Liquid Effluent Definition, Run Results. See Table Streams No. HV250, page 21 of 24.

The following are the constituents of the offgas:

Chemical:		**Radiological:**	
By Volume%	Units (mg/m³):	Units (Bq/m³):	Temperature = 16°C (61°F)
N_2 = 77.7%	NO_X = 6.37E-18	Alpha = 2.56E+01	Heat Capacity 1.00 kJ/kg-C
O_2 = 20.8%	SO_X = 1.41E-19	Beta/Gamma[1] = 2.32E+04	Pressure = 991 mbar
Ar = 0.9%	NH_3 = 3.16E-05	H-3 = 1.01E-02	Relative Humidity 30.0%
CO_2 = 0.0%	Entrained Solids = 1.77E-02	C-14 = 2.25E-03	Density = 1.192 kg/m³
H_2O = 0.5%		I-129 = 1.02E-04	Avg. Molecular Wt = 28.9 g/mol
			Thermal Cond. = 25.13 mW/m-c
			Viscosity = 17.96 μPa-s

(1) Beta/Gamma dose excludes Tritium, Carbon-14, and Iodine.

3.) **Diff. pressure taps:** 1/2-in. socket weld, T-304L SS half coupling. Size of hole penetrating housing pressure boundary at 1/8-in. diam.

4.) **Operating Max/Normal Inlet Air Temperatures** from Table 7.3 in: 24590-HLW-M6C-PJV-00003.

5.) **The thickness for the nominal 20-in. diam. inlet/outlet connections** on the filter housing and the ductwork supplied between the primary and secondary filter housings shall be **0.25** " thick (pipe or rolled and welded plate per A240).

6) Radiation Dose Rates for HLW R5 room H-0104 (Filter Cave), See CCN: 152094. Ref. Calc. 24590-HLW-Z0C-30-00016, Table 7-10

7.) **HEPA Housing** has been credited to perform following a seismic event. Therefore, the design is required to be Seismic Qualification Tested (i.e., shaker table test) in accordance with 24590-WTP-3PS-MKH0-T0001. During shop test, contractor may use a temporary valve or blank -off plate.

Min. Housing Filter System Efficiency: >/ = 99.97% (inclusive margin) per ASME AG-1 TA-4634, prior to, during and following shake test. Observe and note efficiency reading on photometer during test.

HEPA Filter Seismic Qualification: ASME AG-1 FK-4300; and Equipment Qualification Datasheet (Appendix 1 and Attachment A).

Pressure Boundary and Filter Sealing Surface Allowable Leakage: < 0.0005 scfm/cu. ft of test volume following seismic test.

8.) Aerosol test ports include injection and sampling at each stage. See vendor submittal 24590-QL-P0A-MKH0-00002-06-00006, -07-00087, 07-00088 & -07-00188 for C5V system filter housing configuration and dimensions (similar design to PJV, except for nozzle diameter and orientation).

9.) **Drain connections:** 1-1/2-in. NPT pipe nipple with cap, T-304L SS

10.) **Sealing materials and mechanism** shall comply with ASME AG-1

11.) Contents of this document are **"Dangerous Waste Permit Affecting"**

12.) **Design pressure drop** is a "Target" value (2.2 in. WC for Housing and associated ducting plus 1.55 for HEPA Filter to a total of 3.75 in. WC): actual value to be reported by F/CSC in prototype test report, subject to buyer approval.

Remarks: ALL DIMENSIONAL DATA SHOWN ON THIS DATA SHEET ARE MEANT TO CONVEY BUYER DESIGN PREFERENCES AND MAY BE MODIFIED BY F/CSC. FOR AS-BUILT INFORMATION REFER TO VENDOR SUBMITTALS.

Blank data fields are not required to be completed

SAFETY SCREENING/EVALUATION REQUIRED? IF YES PER 24590-WTP-GPP-SREG-002, E&NS SIGNATURE REQUIRED BELOW			YES = X		NO =		
8	4/27/10	Re-configured Appendix 2, per Plant Design nozzle location and orientation and revised minimum filter housing efficiency to 99.97%	RKramos	[illegible]	VATuck	[illegible]	Gerard Garcia
7	3/1/2010	Added to Note 7, Shaker table test notification. Updated attached EEQ (Attach. A) per latest templates and with revised ISRS data and curves from coupled analysis. HEPA Housing overall dimension per F/CSC. Rev. note 6. Added Appendix 2 for instrument taps nozzle location.	R.K.Ramos	C. Meng	J.Tuck	Pete Shea	W. Lawrence
6	9/24/2009	Rev. rad dose level, Safety Class, Quality Level, inlet temp., leakage rate, leak test pressure, and pressure drop; rev. Note 2 service conditions (to replace Att. B), rev. Note 8, added Note 11 per DCN 24590-HLW-MAN-PJV-00001, added notes 3, 4, & 12; added Remarks and Safety Screening note, added EQ datasheet and seismic criteria (App. 1 & Att. 1)	J.Tuck	C. Meng	R.K.Ramos	L.H. Solis	Gerard Garcia
0	10/22/2002	Issued for Purchase	David Rover		A.C.Tan		J. Sanders
Rev	**Date**	**Description**	**Originator**	**E & NS**	**Checker**	**Reviewer**	**Approver**

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-PJV-00007**	MR No. **24590-QL-MRA-MKH0-00002**	
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00005B**	Rev No. **8**

1	**EQUIPMENT IDENTIFICATION:**		
2	**Full Component Tag Number or BNI Stock Code Number**	24590-HLW-MK-PJV-HEPA-00005B	**Safety Classification**
3	**Equipment Datasheet Number**	24590-HLW-MAD-PJV-00007	☐ SC ☒ SS
4			☐ APC-PAM
5	**Description**	HLW PJV is a Primary and Secondary HEPA Filter Housing configuration with a remote operated Inlet & Outlet dampers (By Others). Remote change radial flow HEPA filters are used to treat gaseous emissions. The Safety Classification is Safety Significant (SS) to ensure filtration of the emission stream to acceptable level prior to release.	**Seismic Category**
6			☐ SC-I ☐ SC-II
7			☒ SC-III ☐ SC-IV
8			☐ SC-III Seismic Interaction only
9	**Location (Facility / Building and Room No.)**	HLW PJV Primary HEPA Filter Housing 24590-HLW-MK-PJV-HEPA-00005B is located inside Room **H-104**, at **EL. 0'-0"**.	
10	**Safety Function(s)**	Provide confinement and protection against crush/impact events. Provide Safety Significant filtering of normal operations and as a significant contributor to defense in depth.	
11		Source: 24590-WTP-PSAR-ESH-01-002-04 Section: 4.4.18.	
12			
13	Equipment Safety Function Type	☒ Passive Mechanical ☐ Active Mechanical ☐ Electrical	
14	Seismic Safety Function	Seismic Operability Requirements	
15	☒ Yes ☐ No	☒ During Seismic Event ☒ After Seismic Event ☐ None	
16			

17	**EQUIPMENT ENVIRONMENTAL QUALIFICATION (EEQ)** **(Parameter values stated in this section do not include process conditions or operationally induced conditions)**				
18	Classification of Environment	☒ Mild ☐ Harsh		Qualified Life (years) ☒ 40 ☐ Other	
19-20	**Parameters Type / Units**	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
21	**Normal Ambients**				
22	High Temperature (°F)	113	Note 20	40 Years	24590-HLW-U0D-W16T-00001
23	Low Temperature (°F)	59	Note 21	N/A	24590-WTP-DB-ENG-01-001, Table 12-1 (Plant rooms)
24	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
25	Low Relative Humidity (%RH)	5	Note 22	N/A	24590-HLW-U0D-W16T-00001
26	High Pressure (in.-w.g.)	0	Note 23	N/A	24590-HLW-U0D-W16T-00001
27	Low Pressure (in.-w.g.)	(-)1.4	Note 23	N/A	24590-HLW-U0D-W16T-00001
28	Radiation Dose Rate (mRad/hr)	35,400	40	Years (Note 24- A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
29	Plant / Process Induced Vibration	☐ Yes ☒ No			
30	Additional Normal Information:	None			
31					
32	**Abnormal Ambients**				
33	High Temperature (°F)	126	8	hours/yr	24590-HLW-U0N-W16T-00001 (For Duration See 24590-HLW-U0D-W16T-00001, 1.4C)
34	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
35	High Relative Humidity (%RH)	100 Condensing	Note 22	N/A	24590-HLW-U0D-W16T-00001
36	Low Relative Humidity (%RH)	6	Note 22	N/A	24590-HLW-U0N-W16T-00001
37	High Pressure (in.-w.g.)	4	Note 23	N/A	24590-HLW-U0D-W16T-00001
38	Low Pressure (in.-w.g.)	(-)6.7	Note 23	N/A	24590-HLW-U0D-W16T-00001
39	Radiation Dose Rate (mRad/hr)	35,400	0	Years (Note 24-A)	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016, See CCN 152094)
40	Exposure to Wet Sprinkler System	☐ Yes ☒ No		NA	
41	Additional Abnormal Information:	None			
42					

APPENDIX 1 **REMOTE CHANGE HEPA FILTER HOUSING** **EQUIPMENT QUALIFICATION Data Sheet:** **24590-HLW-MAD-PJV-00007**	MR No. **24590-QL-MRA-MKH0-00002** Plant Item No.: **24590-HLW-MK-PJV-HEPA-00005B** Rev No.: **8**

1	**Parameters Type / Units**	**Parameter Value**	**Parameter Duration (number)**	**Duration Units**	**WTP Source Document Number**
2	**Design Basis Events (DBE) Ambients**				
3	High Temperature (°F)	135	1000	hours	24590-HLW-U0N-W16T-00001 (For Duration See: 24590-HLW-U0D-W16T-00001. 1.4D)
4	Low Temperature (°F)	40	Note 21	N/A	24590-HLW-U0D-W16T-00001
5	High Relative Humidity (%RH)	100 Condensing	482	hours	24590-HLW-U0D-W16T-00001
6	Low Relative Humidity (%RH)	6	1000	hours	24590-HLW-U0N-W16T-00001
7	High Pressure (in.-w.g.)	4	1000	hours	24590-HLW-U0D-W16T-00001
8	Low Pressure (in.-w.g.)	(-)6.7	1000	hours	24590-HLW-U0D-W16T-00001
9	Radiation Dose Rate (mRad/hr)	35,400	0	hours	24590-HLW-U0D-W16T-00001 (24590-HLW-Z0C-30-00016. See CCN 152094)
10	Submergence	☐ Yes ☒ No		hours	See Note 16
11	Chemical/Spray Exposure	☐ Yes ☒ No		hours	24590-HLW-U0D-W16T-00001
12	Additional DBE Information	Note 25			
13					
14					
15					
16					
17					
18	**DBE Chemical Exposure Details**				
19–21	DBE Chemical Types/Concentration	NONE			
22					
23	**Electrical Interfaces Supporting the Safety Function**				
24	Power Supply Voltage (VAC, VDC)	NA			
25	Power Supply Frequency (Hz)	NA			
26	Power Connection Method	NA			
27	I / O Signals to /from Equipment	NA			
28	I / O Connection Method	NA			
29					
30	**Mechanical Interfaces**				
31	Mounting Configuration (orientation)	* Note 13			
32	Mounting Method (bolts, welds, etc)	* Note 13			
33	Auxiliary Devices	* Note 13			
34					
35	**Equipment Seismic Qualification (ESQ)**				

36	**Parameters**	**Title**	**References/Documents Number**	**Version/ Revision**	**Remarks**
37–38	WTP Seismic Design Specification	Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	N/A
39–40	Specified Seismic Load Parameters	HLW Filter Cave Coupled Structural Analysis	24590-HLW-S0C-S15T-00108	0B	See Note 18 and Attachment A
41					
42					
43					
44					
45					
46					
47					
48					

APPENDIX 1 REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Data Sheet: 24590-HLW-MAD-PJV-00007	MR No. 24590-QL-MRA-MKH0-00002	
	Plant Item No. 24590-HLW-MK-PJV-HEPA-00005B	Rev No. 8

Equipment Qualification Notes and Additional Information

Notes: Continuation from page 3, Data Sheet:

13. * Data to be provided by SELLER through the submittal process as required on the G-321-E form.
14. Note Deleted
15. Note Deleted See Note 24 A & B.
16. Equipment submergence shall reference to the room postulated water depths and the actual equipment elevation from the floor. Remote HEPA Filter Housing are supported by structural steel and elevated above the room flood heights of 1.58 ft.
17. Remote HEPA Filter Housing needs to be qualified for the external (Room H-0104 (R5/C5)) and internal (Off-gas constituents. See Note 2), significant environment differences such as in room temperatures, pressures and radiation dose level (Rad dose could be above 34,500 mRad/hr), that may affect the short term or long term ability of the equipment to perform its safety functions. The interrelationship between external/internal of the Remote HEPA Filter Housing environments has not been analyzed so the difference identified in the EQD represent potential for extreme.
18. Nozzle loads and in-structure response spectra (ISRS) are provided by CSA (see Att.A). ISRS are suitable for seismic qualification of the filter boxes by analysis. They are also provided for testing of the filters, but do not include a 1.4 factor for testing, or any other conservatism. The curves are provided for 4% and 5% damping. ISRS data points are at the bottom support points of the boxes. In the nozzle load data, live loads related to civil structural steel and are not directly involved with ducting or filter housing. The "thermal, normal" case is intended for combination with seismic (if required). The "thermal, off-normal" applies to post-DBE conditions. Nozzle ISRS data point locations are on the nozzle centerline at the filter housing box face. Nozzle loads in Att. A do not include factors for conservatism. Magnitudes are enveloping for all nozzles. Load components in Att. A are defined as follows:

    P = Axial — T = Torsion
    V2 = Shear along minor axis (vertical) — M2 = Moment about minor axis
    V3 = Shear along major axis (horizontal) — M3 = Moment about major axis

19. <u>DOE Radioactive Materials Disclaimer:</u>
    Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.
20. For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.
21. The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per note 20 above. Therefore, no duration is assigned for the low temperatures.
22. The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and low normal, and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.
23. If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.
24. A. If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."
    B. If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."
25. The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.
26. The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.
27. Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

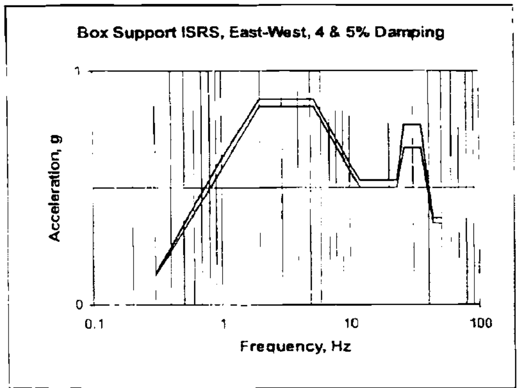
	ATTACHMENT A REMOTE CHANGE HEPA FILTER HOUSING EQUIPMENT QUALIFICATION Datasheet: 24590-HLW-MAD-PJV-00007	MR No. 24590-QL-MRA-MKH0-00002	
		Plant Item No. 24590-HLW-MK-PJV-HEPA-00005B	Rev No. 8

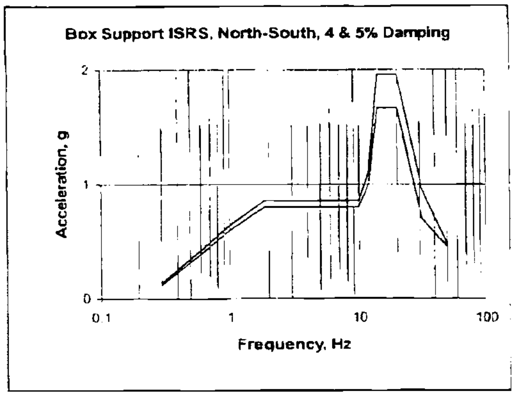
In-Structure Response Spectra (ISRS) and Nozzle Loads: Based on 24590-HLW-S0C-S15T-00108, Rev. 0B.

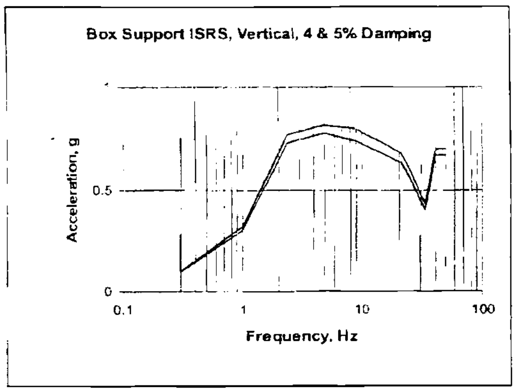
System	Load Case	P/kip	V2/kip	V3/kip	T/kip-in.	M2/kip-in.	M3/kip-in.
Nozzle Load for PJV HEPA Housing	DL (dead + live)	0.09	0.78	0.09	4.0	0.6	2.0
	To (thermal, normal)	5.59	3.05	1.12	52.5 .	2.6	20.9
	Ta (thermal, off-normal & post-DBE)	6.30	3.35	1.61	75.0	4.1	24.[illegible]
	E (seismic)	0.45	0.19	0.26	3.7	3.2	1.0

See Note 18 for definition of load components (P, V2, V3, T, M2, & M3), load cases, and conservatism factors.

Filter Box Support ISRS:



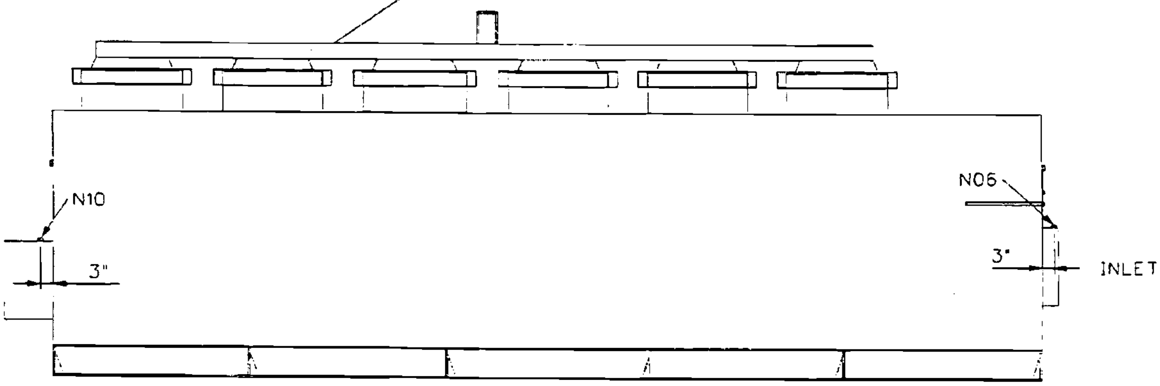




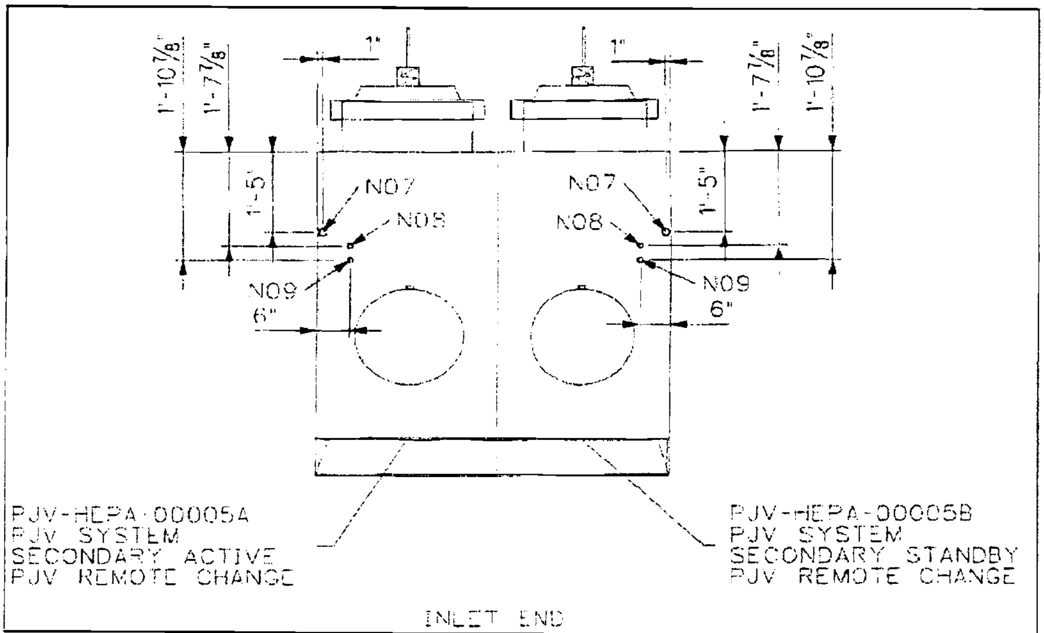
Filter Box Support ISRS Data:

Direction:	EW	EW		NS	NS		Vert	Vert
Damping:	4%	5%		4%	5%		4%	5%
Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g	Freq, Hz	Accel, g	Accel, g
0.30	0.13	0.12	0.30	0.13	0.12	0.30	0.105	0.10
0.94	0.60	0.55	1.00	0.64	0.60	1.00	0.32	0.30
2.00	0.88	0.85	1.90	0.85	0.80	2.40	0.77	0.73
5.30	0.88	0.85	6	0.85	0.80	5	0.82	0.78
12	0.53	0.50	10	0.85	0.80	9	0.80	0.74
23	0.53	0.50	12	1.10	1.00	21	0.68	0.63
26	0.77	0.67	14	1.96	1.66	33	0.43	0.40
35	0.77	0.67	20	1.96	1.66	40	0.70	0.67
43	0.37	0.35	31	0.96	0.70	50	0.70	0.67
50	0.37	0.35	50	0.48	0.45			

APPENDIX 2 **REMOTE CHANGE HEPA FILTER HOUSING** **Nozzle Location Sketch for Datasheet:** **24590-HLW-MAD-PJV-00007**	MR No. **24590-QL-MRA-MKH0-00002**		
	Plant Item No. **24590-HLW-MK-PJV-HEPA-00005B**	Rev No. **8**	



ELEVATION VIEW OF PJV-HEPA-00005B



Nozzle Designations:

N06: Injection port
N07: Upstream sample.
N08: Upstream static pressure
N09: Downstream static press.
N10: Downstream sample

R11087304

ISSUED BY
RPP-WTP PDC

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Nuclear Grade High Efficiency Particulate Air (HEPA) Filters (ASME AG-1 Section FK Filters)

Content applicable to ALARA? ☒ Yes ☐ No

ADR No.
24590-WTP-ADR-HV-04-0002

Rev
0

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

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

REV	DATE	BY	CHECK	REVIEW	E&NS	QA	DPEM
3	6/24/08	A. Jocson	G. Dunn	for G.G. G. Garcia	B. Erlandson	N/A	J. Julyk
2	08-Mar-06	P. Sullivan	J. Dick	W. Lawrence	M. Rosenthal	W. Dey for S. Akerman	G. Garcia
1	19-Aug-04	P. Sullivan	J. Dick	G. Garcia	N/A	W. Dey for G. Warner	G. Garcia for G. Duncan
0	05-Aug-02	G. Garcia	L. Solis	J. Sanders	N/A	G. Warner	F. Davis

SPECIFICATION No.	**Rev**
24590-WTP-3PS-MKH0-T0002	3

Revision History

Revision	Reason for Revision
0	Issued for Purchase
1	Issued to support design development. NOT TO BE USED FOR FABRICATION OF QL-1 OR QL-2 FILTERS. Complete Revision. Conforms Spec to Current Project Requirements. Incorporate Spec Change Notice (SCN): 24590-WTP-3PN-MKH0-00004. SCN 24590-WTP-3PN-MKH0-00008 not incorporated. Incorporate Supplier Deviation Disposition Requests (SDDRs): 24590-WTP-SDDR-PROC-04-00134, 24590-WTP-SDDR-PROC-03-0155, 24590-WTP-SDDR-PROC-03-0193.
2	Issued to support design qualification testing and production. Completely revised. This revision includes, but is not limited to, changes to incorporate: 1) Specification Change Notice 24590-WTP-3PN-MKH0-00018 incorporated as follows: • 1st change: 24590-WTP-SDDR-PROC-05-00116 superceded by 24590-WTP-SDDR-HV-06-00008. This later SDDR is incorporated by reference. • 2nd change: Second sentence "If a date or revision...." not incorporated. Justification: Proposed text would violate procedure 24590-WTP-3DP-G04B-00049 Engineering Specifications, Rev. 10, Article 3.6.2. • 3rd change: Not incorporated. SCN text is no longer consistent with text as presented in RPP-WTP Safety Requirements Document Volume II 24590-WTP-SRD-ESH-01-001-02 Appendix C 35.0 (see subarticle FK-4100). • 4th change: Not incorporated. SCN text is no longer consistent with text as presented in RPP-WTP Safety Requirements Document Volume II 24590-WTP-SRD-ESH-01-001-02 Appendix C 35.0 (see Table FK-4001). For the Safe Change HEPA filter, the specification requirement article 3.2.4 is stated for a more stringent pressure drop maximum (i.e., 1.3 in.wg.) than the allowed maximum (1.6 in. wg.) as stated in the SRD. • 5th change: Incorporated. • 6th change: Editorial- The correct article cross reference has been made. 2) New title to clarify intent of specification on RPP-WTP. 3) ASME AG-1 Section FK requirements, replacing Section FC requirements throughout document. Revised edition of ASME N509 from 1989 to 2002. These changes were made in accordance with CCN 128654, Approval of Authorization Basis Amendment Request 24590-WTP-SE-ENS-04-0212 Rev. 1. (Note: There are no SRD implementing code or standard deviations in the following changes.) 4) Requirements to test all HEPA filters in accordance with approved Trend TN-24590-03-01317, "QA Testing of HEPA Filters at DOE Filter Test Facility". Specification Sections 1.2, 1.5, 3.1, 3.2, 6.3, 7.2, 7.3, 7.6 and 8.2. 5) Specification requirements for Type 3 HEPA filters (used primarily for safe change HEPA housing vacuum relief during maintenance filter replacement). 6) Remote change HEPA filter design cross-reference and criteria related to remote handling process (Specification Section 3.1). 7) Expanded discussion regarding filter seismic qualification test plan and test report requirements (Specification Section 3.2). 8) Added HEPA Filter Data Sheet (Appendix A).

Revision	Reason for Revision
	9) Expanded Shipping and Handling Instructions (Specification Section 7.6). 10) Clarified code and project required supplier quality assurance (Specification Section 8.2) and submittal requirements (Specification Section 10).
3	Administrative update to source document to incorporate outstanding changes and supersede permit document no longer required by Project. Incorporated 24590-WTP-3PN-MKH0-00022. Supersedes 24590-WTP-3PS-MKH0-TP002, Rev 3.

Contents

Tables

Appendices

1 Scope

1.1 Project Description and Location

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

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

1.2 Equipment, Material, and Services Required

The Supplier shall design, qualify, fabricate and test HEPA Filters in accordance with the requirements of ASME AG-1, Section FK and this specification. Two types of HEPA filter described by ASME AG-1 Section FK may be procured for the RPP-WTP using this specification:

- Type 1 Radial Flow HEPA Filters with Gelatinous Seals (FK-4111 (b) and (d)) rated for 2,000 acfm
- Type 3 Axial Flow Circular Filters with Inlet and/or Outlet Connections (FK-4114)

AG-1 required qualification testing shall be performed and certified by an independent test facility. Production of the Radial Flow HEPA Filters shall not commence until the qualification tests are successfully completed and the results are accepted by the Buyer.

This specification also incorporates select supplemental requirements from Department of Energy (DOE) standard, DOE-STD-3020-2005, *Specification for HEPA Filters Used by DOE Contractors*. This specification includes requirements to conduct independent quality assurance testing at a DOE Filter Test Facility (FTF). With the exception of replacement of FTF failed filters (i.e., 6.3), the Supplier is not responsible for FTF-applicable specification requirements (i.e., section 6.3 and FTF label application per 7.2 and 7.3).

1.3 Work by Others

1.3.1 Material unloading and storage at job site

1.3.2 Installation labor

1.4 Definition

1.4.1 Challenge Aerosol. Poly-disperse droplets used as challenge aerosol for testing installed HEPA filters for leaks. The poly-disperse aerosol used for leak testing of systems differs in size from the 0.3 micrometer mono-disperse DOP aerosol used for efficiency testing of individual HEPA filters by manufacturers.

1.4.2 Certificate of Conformance (C of C). A written statement, signed by a qualified party, certifying that items or services comply with specific requirements.

1.4.3 Grab Ring. Ring provided at the inlet of a Remote Change HEPA Filter to facilitate insertion and removal operations by remote systems.

1.4.4 HEPA Filter. High Efficiency Particulate Air Filter. A throwaway, extended-media dry type filter with a rigid casing. The filter shall exhibit a particle removal efficiency of 99.97% when tested with essentially mono-dispersed 0.3 micrometer diameter test aerosol particles.

1.4.5 Production Test. A test made on an individual production item to verify its performance in accordance with specified requirements.

1.4.6 Qualification Tests. Test performed on HEPA filters, prior to production, by an independent test facility in accordance with the requirements of ASME AG-1, Section FK-5100.

1.4.7 Remote Change. Remote change implies that the Remote Change HEPA filter requires an integral grab ring that works in conjunction with a mechanical filter handling tool as required for remote installation and removal.

1.4.8 Safe Change. Safe change implies that the Safe Change HEPA filter can be manually installed and removed by an operator without remote equipment and without breaking confinement.

1.4.9 Type 1. Radial flow HEPA filters as defined by ASME AG-1 Section FK-4100 and FK-4111. Also referred to as "Safe Change" and "Remote Change" HEPA filters throughout this specification.

1.4.10 Type 3. Axial flow circular filters as defined by ASME AG-1 Section FK-4100 and FK-4114.

1.4.11 Water Column (WC). The units for air pressure typically expressed in inches of water column height (e.g., 2.5-inches WC).

1.5 Abbreviations

1.5.1 ACFM. Actual Cubic Feet per Minute

1.5.2 ANSI. American National Standards Institute

1.5.3 ASHRAE. American Society of Heating, Refrigerating and Air-Conditioning Engineers

1.5.4 ASME. American Society of Mechanical Engineers

1.5.5 ASTM. American Society for Testing and Materials

1.5.6 CAS. Chemical Abstract Service

1.5.7 C of C. Certificate of Conformance

1.5.8 DOE. Department of Energy

1.5.9 FTF. Department of Energy Filter Test Facility

1.5.10 HEPA. High Efficiency Particulate Air

1.5.11 PPOE. Parent Piece of Equipment

1.5.12 RPP-WTP. River Protection Project - Waste Treatment Plant

1.5.13 SDDR. Supplier Deviation Disposition Request

1.5.14 UL. Underwriters Laboratories, Inc.

1.5.15 WC. Water Column

1.6 Safety and Quality Classifications

Type 1 HEPA filters provided under this Specification are expected to meet RPP-WTP Project requirements for Important-to-Safety (ITS) Safety Class (SC), Quality Level Q, and Seismic Category I service.

Type 3 HEPA filters provided under this Specification are Non-Important-to-Safety (Non-ITS), Commercial Material (CM) components and are not credited for seismic purposes (SC-V) unless otherwise stated in the procurement documentation.

2 Applicable Documents

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the document referenced herein and the contents of this specification, the Buyer shall be notified of the conflict.

The latest document edition and addenda shall apply unless otherwise noted.

For the codes and standards listed below, the specific revision or effective date identified, as well as the specific revision or effective date of codes and standards that they incorporate by reference (daughter codes and standards) shall be followed. The effective dates and revisions listed in section 2 shall apply to subsequent references to the codes and standards within this specification.

2.1 ANSI/ASME – American National Standards Institute/American Society of Mechanical Engineers

2.1.1 ASME AG-1-1997 with ASME AG-1a-2000 Addenda, Code on Nuclear Air and Gas Treatment (Hereinafter referred to as ASME AG-1 or AG-1).

2.1.2 ASME N509-2002, Nuclear Power Plant Air Cleaning Units and Components.

2.1.3 ASME N510-1989, Reaffirmed 1995, Testing of Nuclear Air Treatment Systems.

2.1.4 ASME NQA-1-89, Quality Assurance Program Requirements for Nuclear Facilities.

2.1.5 UL-586-1990, Underwriters Laboratories Inc., Test Performance of High Efficiency Particulate, Air Filter Units.

2.1.6 ASME NQA-1-2004 Quality Assurance Requirements for Nuclear Facility Applicatons. (Limited Application - Packaging and Storage Requirements Only)

2.1.7 ASME AG-1 Section FK, Special HEPA Filters. (Although Section FK was approved by the ASME Board on Nuclear Codes and Standards on July 21, 2005 and is now considered part of the AG-1 Code, it has not yet been formally issued in a code addenda. It is available for reference at: http://cstools.asme.org/csconnect/pdf/CommitteeFiles/16990.pdf.).

2.2 US Department of Energy Standards

2.2.1 DOE-STD-3020-2005, Specification for HEPA Filters Used by DOE Contractors

2.2.2 DOE-STD-3025-99, Quality Assurance Inspection and Testing of HEPA Filters

2.3 Other Reference Documents and Drawings

2.3.1 24590-WTP-3PS-MKH0-T0001, Engineering Specification for HVAC Safe Change HEPA Filter Housings.

2.3.2 24590-WTP-3PS-MKH0-T0003, Engineering Specification for HVAC Remote Change HEPA Filter Housings.

2.3.3 24590-WTP-3PS-G000-T0001, Supplier Quality Assurance Program Requirements.

2.3.4 24590-WTP-3PS-G000-T0003, Engineering Specification for Packaging, Handling and Storage Requirements.

2.4 Informational Reference Documents

The following codes and standards are not specifically invoked on the RPP-WTP Project, but were used to the extent referenced herein and/or by ASME AG-1 as a source of information in development of technical and performance requirements.

2.4.1 DOE-HDBK-1169-2003, DOE Nuclear Air Cleaning Handbook

2.5 Design Changes Incorporated By Reference

2.5.1 24590-WTP-SDDR-HV-06-00008 (Supercedes 24590-WTP-SDDR-PROC-05-00116)

3 Design Requirements

Note: References to ASME AG-1 Section FK requirements are made throughout this specification. The Section FK references and requirement excerpts provided herein are not intended to imply non-applicability of any Section FK requirement that is not specifically included. Unless explicitly stated otherwise, all ASME AG-1, Section FK requirements apply.

3.1 General

3.1.1 This specification relates to Type 1 and Type 3 circular HEPA filters as specified in ASME AG-1 Section FK. More specifically, the Type 1 HEPA filters are further described as Safe Change and Remote Change Radial Flow HEPA Filters with a maximum rating of 2,000 ACFM (950 liters per second) per filter and suitable for manual and remote change housing installations, respectively. The Type 3 HEPA filters are axial flow circular filters with a maximum rating of 120 ACFM (56 liters per second) and are typically intended for use as vacuum relief (e.g., bleed) filters for manual housing maintenance. Design of Radial Flow HEPA Filters shall conform to applicable sections of the documents listed in Section 2 of this specification.

3.1.2 Safe Change Radial Flow HEPA Filters shall include a gelatinous seal and be suitable for horizontal installation in multi-filter cabinet style housings specified in 24590-WTP-3PS-MKH0-T0001, Engineering Specification for HVAC Safe Change HEPA Filter Housings.

3.1.3 Type 1 HEPA filter performance requirement design criteria as identified in ASME AG-1 Table FK-4000-4 are specified on the HEPA Filter Data Sheets (Appendix A). Type 3 HEPA filters used for safe change housing maintenance (e.g., vacuum relief) are not subjected to deleterious environments.

3.1.4 Remote Change Radial Flow HEPA Filters shall include a gelatinous seal and be suitable for vertical installation in remotely operated multi-filter cabinet style housings specified in 24590-WTP-3PS-MKH0-T0003, Engineering Specification for HVAC Remote Change HEPA Filter Housings.

3.1.5 For design development purposes only, limiting criteria for Remote Change Radial Flow HEPA Filters are shown in Table 1. These criteria may be superseded by Supplier design drawings submitted for Buyer review and permission to proceed. The Supplier design drawings will be used to document the final design.

3.1.6 Design of the Type 1 (Safe Change and Remote Change Radial Flow) and Type 3 (Circular Axial Flow) HEPA Filters shall conform to applicable portions of ASME AG-1, Section FK and applicable portions of the documents listed in Section 2 of this specification. Where conflicts between the Supplier's design and ASME AG-1, Section FK, exist, the Supplier shall identify the respective code articles that do not apply and notify the Buyer (i.e., SDDR) prior to initiation of filter design qualification testing. For filter designs (e.g., Type 3) that have been previously qualification tested, the Supplier shall notify the Buyer of code conflicts during design submittal review (e.g., prior to fabrication). Deviations to ASME AG-1 Section FK requirements identified within this Specification do not require Buyer notification.

3.1.7 As required by ASME AG-1, Section FK-3130, filter media shall comply with ASME AG-1, Section FC, Mandatory Appendix FC-I.

3.1.8 Type 1 filter packs shall comply with ASME AG-1, FK-4111. Type 3 filter packs shall comply with ASME AG-1, FK-4114. Other ASME AG-1 Section FK articles pertaining to filter pack design also apply (e.g., FK-4116, -4120, -4130).

3.1.9 Installation and removal of the safe change filter shall be based on bag-in bag-out procedure. Installation and removal of the remote change filter shall be based upon use of a sequencing grapple that is remotely positioned onto the filter using a crane and hook. Reference 2.3.2 provides further information on this remote handling process.

3.1.10 The Safe Change Radial Flow HEPA Filters shall utilize a gel filled channel located on the inner diameter of the filter inlet. The channel shall be manufactured from ASME AG-1 compatible materials and either fully integrated into the filter inlet flange (preferred) or affixed in position using a construction method that shall ensure that the gel channel remains in place and does not contribute to filter bypass during operation or fail structurally during filter installation and removal.

3.1.11 The Remote Change Radial Flow HEPA Filters shall utilize a gel filled channel located on the outer diameter of the filter inlet. The channel shall be manufactured from ASME AG-1 compatible materials and either fully integrated into the filter inlet flange (preferred) or affixed in position using a construction method that shall ensure that the gel channel remains in place and does not contribute to filter bypass during operation or fail structurally during filter installation and removal. The Supplier shall demonstrate that the remote change filter design is capable of withstanding the loads applied during remote manipulation of the filter, without permanent deformation or deterioration of "like-new" filter performance.

3.1.12 Filter seals shall perform the following functions:

3.1.12.1 Provide a leak tight seal between the filter and the mating surface in the housing.

3.1.12.2 Accommodate maximum fabrication tolerances of the housings mating knife-edge without compromising seal integrity.

3.1.12.3 The gel seal material shall remain in the gel seal channel during installation and removal cycles that would be normally expected to occur during operation of the system, as well as during design basis seismic events.

3.1.13 Handles on Safe Change Radial Flow HEPA Filters used for installation and removal shall:

3.1.13.1 Facilitate manual handling without damage to the filter.

3.1.13.2 Be attached to withstand installation and removal loads.

3.1.14 Grab Rings on Remote Change Radial Flow HEPA Filters used for installation and removal shall:

3.1.14.1 Facilitate remote mechanical handling without damage to the filter.

3.1.14.2 Be attached to withstand installation and removal loads.

3.1.14.3 Be compatible with remotely operated mechanical systems (provided by others) to facilitate insertion and removal operations by remote systems.

3.1.15 Connection fittings selected for fabrication of Type 3 HEPA filters, intended for use as vacuum relief (e.g., bleed) filters, shall be compatible with the couplers specified for use on the Safe Change HEPA housings (Reference 2.3.1).

3.1.16 All filters shall be inspected and tested at a DOE FTF prior to Buyer acceptance.

3.2 Performance

The performance of Safe Change and Remote Change Radial Flow HEPA Filters shall conform to applicable portions of ASME AG-1, Section FK, and applicable portions of the documents listed in Section 2 of this specification, including, but not limited to the following requirements:

3.2.1 Filter Media Efficiency: ASME AG-1, FK-1130: 99.97% when tested with an aerosol of essentially 0.3 micron diameter test aerosol particles.

3.2.2 Seismic: ASME AG-1, FK-4300. Type 1 HEPA filters shall be seismically qualified as part of the filter housing by the proof testing method in accordance with ASME AG-1, Subarticle FK-4300 and AA-4350. The acceptance criteria shall be per FK-4300.

3.2.2.1 The specification for the parent piece of equipment (e.g., filter housing) shall be used to document Buyer seismic test and load criteria to be used for this qualification testing.

3.2.2.2 The Supplier may submit a prior report qualifying use of a filter in a given installation provided that the Supplier can prove the following:

- The equipment proposed to be used on the WTP Project is identical to that used in the prior qualification report. If they are not identical, the Seller shall demonstrate how the differences would not affect the seismic qualification.

- The WTP Project equipment functional requirements during and after the DBE are similar or less stringent than those in the prior qualification report.

- Potentially significant aging mechanisms related to equipment performance as identified for the prior qualification report bound the aging characteristics expected for the given RPP-WTP system installation.

- The equipment support used in the testing is identical to that proposed for use on the WTP Project, and, prior qualification report TRS envelopes the WTP RRS.

3.2.2.3 A seismic qualification test plan shall be provided to the Buyer for review and approval prior to testing. This test plan shall be a submittal requirement of the PPOE specification and is not a submittal requirement of this specification.

3.2.3 Qualification Testing: ASME AG-1, FK-5100: Testing prior to acceptance and production, and certified by an independent test facility.

3.2.4 Resistance to Airflow: The following alternate criteria are approved for use for Type 1 HEPA filter designs regarding ASME AG-1 Articles FK-4100 and FK-5110. These resistance criteria apply when tested in accordance with paragraph FK-5120.

ASME AG-1 SECTION	SECTION FK CODE REQUIREMENT TEXT	ACCEPTED RPP-WTP REPLACEMENT REQUIREMENT TEXT
FK-4100	"The total media area provided within the filter pack shall be such that the maximum media velocity is 5 ft/min (1.5 m/min) at the rated flow."	The total media area provided within the RPP-WTP radial filter pack shall be such that the maximum media velocity is 6.5 ft/min at the rated flow.
Table FK-4000-1	Type 1 Radial Flow HEPA Filter Nominal Rating: Maximum Resistance of 1.3 in.WC at 2000 acfm maximum rated air flow.	For Type 1 Remote Change HEPA Filter Only: Nominal Rating: Maximum Resistance of 1.55 in.WC at 2000 acfm maximum rated air flow. (Note: Table FK-4000-1 requirements continue to apply as-is to the Type 1 safe change HEPA filter.)

3.2.5 Test Aerosol Penetration: ASME AG-1, FK-5120, 0.03% at rated (i.e., maximum) flow rate and 20% of rated flow rate, where rated flow rate is 2,000 acfm.

3.2.6 Resistance to Rough Handling: ASME AG-1, FK-5130.

3.2.7 Resistance to Pressure: ASME AG-1, FK-5140.

3.2.8 Resistance to Heated Air: ASME AG-1, FK-5150.

3.2.9 Spot Flame Resistance: ASME AG-1. FK-5160.

3.2.10 Supplier performed production inspection and testing shall be in accordance with ASME AG-1, Subarticles FK-5500 and FK-5600.

Note: All production-testing results are subject to validation through FTF quality assurance testing.

3.3 Design Conditions

3.3.1 Anticipated filter service conditions are included on the associated HEPA Filter Data Sheet (Appendix A).

3.3.2 HEPA filters are not to be used for installations where there is a possibility of condensation forming on them.

3.4 Temperature

Per ASME AG-1, Sub-subarticle FK-1121, filters built to Section FK shall be acceptable for continuous use at a maximum operating temperature of 250°F (121°C). However, extended service under such conditions can cause accelerated aging of organic materials and may subsequently contribute to filter failure. Therefore, when specifying filters subject to operating conditions that may exceed 200°F (93°C) for extended durations, the system engineer shall consult with the responsible engineer for HEPA filter procurement to ensure optimum materials and/or system controls are selected.

3.5 Aging

Note: The maximum life for a HEPA filter specified below is based upon guidance in the DOE Nuclear Air Cleaning Handbook (Reference 2.4.1 section 3.3.8.1).

The maximum total life (storage and in-service) for a HEPA filter is considered to be 10 years from the date of manufacture for applications in dry systems and 5 years in applications where the filter has the potential to become wet (e.g., more than once for short periods). If a filter gets wet, it should be replaced expeditiously.

4 Materials

4.1 Construction

4.1.1 Materials of construction for the Safe Change and Remote Change Radial Flow HEPA Filters shall conform to ASME AG-1, Section FK, Article 3000, and applicable portions of the documents listed in Section 2 of this specification.

4.1.1.1 Type 1: ASME AG-1, FK-1121 Type C media pack with urethane adhesive. Reference the Material Requisition 24590-QL-MRA-MKH0-00003 for quantity required. This filter type shall be developed and qualification tested for each type of housing (remote and safe change).

4.1.1.2 Type 3: ASME AG-1, FK-1121 Type C media pack with urethane adhesive. Reference the Material Requisition 24590-QL-MRA-MKH0-00001 for quantity required.

4.1.1.3 Case Material Thickness and Material Type: ASME AG-1, FK-3110: ASTM A240 Type 304 or 304L (annealed) is preferred, however, alternate materials subject to Article FK-3220 requirements and Buyer review may be proposed for use.

4.1.1.4 Grilles: ASME AG-1, FK-3170: ASTM F 1267 Type II Class 3 Expanded Stainless Steel fabricated from Type 304L (annealed) stainless steel sheets as specified in ASTM A666.

4.1.1.5 Gasket Material: ASME AG-1, FK-3122.

4.1.1.6 Media: ASME AG-1, FK-3130 with hydrofluoric acid resistant media formulation (e.g., DN703)

4.1.1.7 Adhesive: ASME AG-1, FK-3150.

4.1.2 Limiting criteria for Remote Change Radial Flow HEPA Filters are shown in Table 1. These criteria may be superceded by Supplier design drawing submittals that have been submitted for Buyer review and permission to proceed. The Supplier design drawings will be used to document the final design.

4.2 Prohibited Materials

4.2.1 For materials in contact with stainless steel, the following shall apply: Low melting point metals (i.e., lead, zinc, tin, antimony, cadmium, mercury) shall not exceed 1% by weight, with mercury not exceeding 50 ppm. Halides shall not exceed 200 ppm. This prohibition applies to use of tools, fixtures, paints, coatings and sealing compounds, and any other equipment or materials used by the Supplier during handling, assembly and storage of stainless steel parts or components.

4.2.2 Asbestos shall not be included in any component of the Safe Change and Remote Change Radial Flow HEPA Filter.

5 Fabrication

5.1 General

5.1.1 Fabrication of the Type 1 Safe Change and Remote Change Radial Flow HEPA Filters shall be as specified in ASME AG-1, Article FK-6000 with the following exceptions.

ASME AG-1 SECTION	SECTION FK CODE REQUIREMENT TEXT	ACCEPTED RPP-WTP REPLACEMENT REQUIREMENT TEXT
FK-6211(a)	"Type 1 filter flange and end cap tolerances shall meet the following criteria: parallel within 1/16 in. (1.6 mm), square to the filter centerline axis to within 1/16 in (1.6 mm) over the total filter length, flat within 1/16 (1.6 mm)."	Type 1 filter flange and end cap tolerances shall meet the following criteria: parallel within 1/8 in., flat within 1/16 in." Circular runout of inlet flange with respect to outlet end cap shall not exceed 3/32 in.
FK-6212(a)	"Type 1 filter length shall be ± 1/16" (1.6 mm), filter sealing ring diameter ± 1/16" (1.6 mm), sealing face diameter +1/32 in./-0 in. (+0.8 mm/-0 mm), concentricity shall be 1/16 in. (1.6 mm), all other dimensions ± 1/16 (±1.6 mm)."	Type 1 filter length shall be (+0/-1/8 in.), circular runout of filter flange with respect to the filter end cap shall be within 3/32 in., all other dimensions +/- 1/16 in. with exception that design filter media to grille (i.e., faceguard) gap shall be +/- 1/8 in. (i.e., to maintain a minimum media to grille gap of 1/8in.

5.1.2 Fabrication of the Type 3 axial flow circular HEPA filters shall be as specified in ASME AG-1, Article FK-6000 unless otherwise accepted by the Buyer (e.g., Supplier Deviation Disposition Request).

6 Tests and Inspections

6.1 General

6.1.1 The test and inspection of Type 1 and Type 3 HEPA Filters shall conform to ASME AG-1, Article FK-5000.

6.1.2 The Suppliers test and inspection personnel shall be formally trained to perform assigned duties in accordance with the Suppliers training qualifications program. This program shall be documented and shall be in accordance with recognized standards.

6.1.3 Type 1 Safe Change and Remote Change Radial Flow HEPA Filters shall require qualification testing prior to acceptance and production. Filter testing shall be performed and certified by an independent test facility as specified by ASME AG-1, Article FK-5100. Type 3 HEPA filters may be qualified based on the prior qualification of a similar qualified Type 2 circular axial flow filter.

6.1.4 Each Type 1 and Type 3 HEPA Filter shall bear the UL-586 label indicating successful testing of these filter types in conformance with UL procedures as required by ASME AG-1.

6.1.5 Each Type 1 and Type 3 HEPA Filter manufactured for delivery shall be inspected and production tested in accordance with ASME AG-1, Sections FK-5500 and FK-5600.The results of the production test shall be marked on the label of each filter. Additional attributes to be inspected for Type 1 HEPA Filters are circular runout and parallelism.

6.1.6 The Supplier shall provide objective evidence acceptable to the Buyer that the requirements of ASME AG-1 Mandatory Appendix FC-I, Articles I-3000 and I-5000 have been satisfied. Reference AG-1 Mandatory Appendix FC-I-4120.

6.2 Site Tests

Buyer's startup personnel will perform in-place tests after initial installation. Supplier shall provide startup assistance at Buyer's request.

6.3 DOE Filter Test Facility Quality Assurance Testing

6.3.1 Uniform Commercial Code (UCC) requirements governing acceptance and disposition of nonconforming goods apply. If during FTF receipt inspection, a filter is identified as damaged and unacceptable for use, the FTF shall contact the buyer and seller (supplier) and inform them of the damage immediately.

6.3.2 FTF inspection and testing shall be performed in accordance with DOE-STD-3025-99, Quality Assurance Inspection and Testing of HEPA Filters. As a condition of acceptance, all production filters must successfully pass FTF inspection and testing requirements per sections 6 and 7 of DOE-STD-3025-99. Testing at the DOE FTF of filters fabricated to support design development or qualification is not required unless otherwise requested by the buyer.

6.3.3 FTF shall prepare a report to document the test results and apply permanent test labels on the filter case and the filter shipping carton.

6.3.4 Accepted and rejected filters shall be marked in accordance with section 8 of DOE-STD-3025-99.

6.3.5 If filter(s) fail inspection or testing, the FTF shall notify both the buyer and supplier. The supplier shall be responsible for either replacing failed filter(s), or crediting the buyer, unless other accommodations are agreed upon between the buyer and the supplier.

6.3.6 After completion of required inspections and tests, but immediately preceding repackaging of the filter, FTF personnel shall re-inspect the fluid seal (if so equipped) to verify the gelatinous seal was not inadvertently damaged during FTF handling.

6.3.7 FTF shall repack accepted filters in a manner comparable to the original packaging received.

6.3.8 FTF activities involving packaging, shipping and storage of HEPA filters shall conform to ASME AG-1 Article FK-7000 requirements (i.e., Level B per NQA-1-2004).

7 Preparation for Shipment

7.1 General

7.1.1 HEPA Filters shall be packaged, shipped, handled and stored in accordance with ASME AG-1, Article FK-7000, and in accordance with requirements of Reference 2.3.4.

7.2 Filter Marking and Identification

7.2.1 Each HEPA Filtershall be identified in accordance with requirements of ASME AG-1, Section FK-9100. The marking and labeling requirements of Reference 2.3.4 are also applicable.

7.2.2 Filter nameplates shall be affixed to the filter end cap in the most readily visible location.

7.2.3 In addition to the information required by ASME AG-1 FK-9100, filter labeling shall include the following information:

- Date of Penetration Test
- Purchase Order (PO) Number and PO Line Item Number
- Procurement Specification Number and Revision
- FTF Test Label (applied by FTF personnel)

7.2.4 Review purchase order to ensure additional filter identification and labeling requirements are not applicable.

7.3 Package Marking and Identification

7.3.1 Marking and labeling for each filter carton shall conform to the requirements of ASME AG-1 Subarticle FK-9200.

7.3.2 In addition to the information required by ASME AG-1 FK-9200, filter package marking shall include the following information:

- Project Number, Purchase Order (PO) Number and PO Line Item Number
- Filter Serial Number
- Procurement Specification Number and Revision
- FTF Test Label (applied by FTF personnel)
- Marking or label indicating the need for special storage environment (i.e. "Special Storage Requirements: NQA-1-2004 Level B Storage or equivalent is required.").

7.4 Packaging

7.4.1 Packaging shall be in accordance with ASME AG-1, Section FK-7000. The packaging requirements of Reference 2.3.4 are also applicable.

7.5 Documentation

7.5.1 Reference Section 10 of this Specification. Shipping documentation shall accurately reflect specific traceability to the items being shipped.

7.6 Shipping and Handling Instructions

7.6.1 Shipping and Handling of items shall be in accordance with ASME AG-1, Section FK-7000.

7.6.2 Filters shall not be shipped by rail unless prior approval is obtained from the Buyer (Reference 2.4.1 Appendix A.). For large shipments, it is recommended that the entire shipment be shipped in a sealed dedicated trailer. At all times, the filters must be handled with care and oriented properly. Handling requirements (unique to filters) shall be clearly visible on the shipping carton.

7.6.3 Unless otherwise approved by the buyer, filters shall be shipped palletized or crated to minimize unit handling, particularly at public carrier interchange points. Standard pallet sizes shall be used by the supplier.

7.6.4 No other materials shall be placed on top of the filters during shipment. A packing list shall be glued securely to the outside of one carton. The packing list shall clearly state if the shipment is a partial shipment. When requested and authorized by the buyer, airfreight shipments shall also be palletized in accordance with this specification.

7.6.5 Arrangements shall be made by the Supplier to ensure filters are shipped directly to the DOE-FTF. Note: Filters fabricated to support design development or qualification are not required to be shipped to the DOE-FTF.

7.6.6 The carrier shall be instructed that the buyer's personnel will be responsible for unloading filters at the buyer's receiving facility.

7.6.7 The following information, taken from the content of Appendix A of Reference 2.4.1, is provided for those arranging shipment of HEPA filters. It should be considered as guidance information only.

Handling at interchange stations should be controlled to prevent temporary storage in conditions that would subject the filters to dampness, excessive heat or cold or rapidly changing temperatures. Proper attention to orientation of the cartons should be maintained consistent with the filter package instruction. Another control is to require that the filters be packed properly in a sealed truck-trailer body or in a sealed containerized-freight unit, not to be opened until arrival at the specified delivery point. Unloading should be performed by personnel who have been thoroughly instructed in the proper care and handling of HEPA filters. Mixed-load shipments should be avoided.

7.6.8 The following information, taken from the content of Appendix A of Reference 2.4.1, is provided for those receiving and unloading HEPA filters. It should be considered as guidance information only.

As the shipment is being unloaded, each carton should be inspected for external damage and improper positioning in the cargo space (i.e., the carton placed with arrow direction horizontally). Damaged cartons, including those with corners dented and those improperly oriented in the truck, should be set aside for particularly careful inspection of their contents. Damage will be more prevalent when filter units are loaded with mixed cargoes or are shipped in a partially loaded carrier. The filter unit must be removed carefully from its carton. The acceptable method for removal is to open the top flaps of the container after removing the sealing tape. With flaps folded back, the carton should be inverted or upended gently to place the exposed end of the filter unit on a flat surface, preferably the floor. The surface must be clear of protrusions. Withdraw the carton from the filter unit. Attempts to remove the filter unit from the carton by grasping below the exposed filter case can result in irreparable damage if fingers puncture the delicate filter materials.

If conflicting handling instructions are provided by the filter manufacturer, the manufacturer's instructions shall prevail.

7.7 Storage

7.7.1 HEPA Filters shall be stored in a controlled environment consistent with Level B as identified in ASME AG-1 Article FK-7000 and described in References 2.1.6 and 2.4.1 Appendix A.4.

8 Quality Assurance

8.1 Supplier Quality Assurance Program

8.1.1 The supplier shall have in place a Quality Assurance program meeting the requirements of ASME NQA-1-1989 marked as applicable in the Supplier Quality Assurance Program Requirements Data Sheet attached to the Material Requisition. The Supplier shall submit his Quality Assurance Manual with the Supplier's bid documentation.

8.1.2 The successful bidder must pass a pre-award survey by the Buyer. Supplier shall demonstrate that their quality program is in compliance with the procurement quality requirements listed in the Supplier Quality Assurance Program Requirements Data Sheet. The Supplier's Quality Assurance Program, reviewed and accepted by the Buyer, shall apply to every sub-tier supplier to the Supplier. The Supplier shall allow Bechtel, its agent, and DOE access to their or any sub-tier supplier's, facility, and records pertaining to the purchase order for the purpose of Quality Assurance Audits and Surveillance at mutually agreed times.

8.1.3 All items shall be manufactured in accordance with the Supplier's Quality Assurance program that meets the requirements of ASME NQA-1-1989, and has been previously evaluated and accepted by the Buyer's Quality Assurance Organization.

8.1.4 Supplier shall submit their Quality Assurance program and work plan to Buyer for approval and permission to proceed prior to commencement of work. The work plan shall include documents and procedures to implement the work and include a matrix of essential Quality Assurance elements cross referenced with the documents/procedures.

8.2 Quality Assurance Requirements Specific to Item

8.2.1 Rejected Filters. The Buyer shall notify the Supplier of rejected filters, including the nature of the rejection. Unless otherwise negotiated between the Supplier and Buyer, the Supplier shall provide replacement filters until the stipulated quantity of filters is found acceptable. The Supplier shall provide, at the discretion of the Buyer, replacement filters and/or credit for any rejected filters.

8.2.2 The Buyer may elect to have qualification testing or verification of materials performed on any filters furnished to them. Failure of any filter submitted for qualification testing to meet specification requirements shall be cause for a reevaluation of the Supplier's quality assurance program.

8.2.3 Qualification Test Evidence. Upon request, the Supplier shall show documented evidence that qualification tests have been conducted in accordance with ASME AG-1 Subarticle FK-5100, FK-5300 and Mandatory Appendix FC-I.

8.2.4 Identification of Items with Part Number/Model Number. All filters and filter packages shall be identified with the serial number and model number. Identification shall be in conformance with sections 7.2 and 7.3 of this specification.

Note: The following items are necessary to satisfy Buyer G-321-V Form submittal requirements.

8.2.5 Quality Verification Documents shall be submitted in the form and quantities shown on Form G-321-V, Quality Verification Document Requirements of the procurement package.

8.2.6 Certificate of Conformance (C of C). Each shipment shall be accompanied by one copy of the Supplier's C of C, which meets or exceeds the requirements of ASME AG-1, Subarticle FK-8200. The C of C shall include copies of all filter case material certifications.

The Supplier/Manufacturer shall provide documentation that is legible/reproducible. Supplier's/Manufacturer's authorized representative responsible for quality shall sign the C of C. The C of C shall indicate the appropriate Purchase Order/Contract Order number under which the material, equipment, item or service is being supplied.

8.2.7 Identification of Items with Product Data Sheet. The supplier shall submit a legible copy of the product data sheet (e.g., drawing, catalog page, brochure) that provides adequate information to enable the Buyer to verify the form and function of the article procured. One copy of the documentation, unless otherwise specified, shall accompany the applicable item(s) shipped.

8.2.8 Production Inspection and Test Report. The Supplier shall submit legible, reproducible copies of the production test results and section 6.1 of this specification. The report(s) shall include the following:

- Identification of the applicable inspection and/or test procedure utilized.
- Resulting data for all characteristics evaluated, as required by the governing inspection/test procedure.
- Traceability to the item inspected/tested, (i.e., serial number, part number, etc.).
- Signature of the Supplier's authorized representative or agency that performed the inspections/tests.
- One copy of the documentation, unless otherwise specified, shall accompany the applicable item(s) shipped.

8.2.9 Filter Test Facility (FTF) Inspection and Test Report. A report or data sheet prepared by FTF personnel for each order. Minimum content requirements for this report are contained in Reference 2.2.2. Also, reference section 6.3.3 of this specification.

8.3 Substitutions

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

8.3.2 Supplier-proposed deviations from procurement documents shall be initiated by use of the Supplier Deviation Disposition Request (SDDR) form attached to the Material Requisition.

8.3.3 As required in ASME AG-1 Article FK-5100, new or revised filter designs shall require qualification testing prior to acceptance and production. Furthermore, FK-3220 states that other materials found acceptable by the qualification tests of FK-5000, and the design requirements of FK-4000 and Section AA will be acceptable for fabrication of HEPA filters. It is the responsibility of the Supplier to inform the Buyer when Buyer selected designs and/or materials deviate from these two requirements of ASME AG-1.

9 Configuration Management

Each HEPA Filter shall be tagged in accordance with Section 7.2 of this specification.

10 Documentation and Submittals

10.1 General

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

10.2 Submittals

Submittals for HEPA Filters shall include:

10.2.1 Product catalog data sheets with product description, service application, and limitations for all components.

10.2.2 Materials of construction for all components.

10.2.3 Pressure drop performance curves indicating PRESSURE DROP (Inches WC) versus FLOWRATE (ACFM).

10.2.4 HEPA filter maximum allowable pressure drop.

10.2.5 Recommended HEPA filter maximum shelf life and basis for this information.

10.2.6 Gasket material radiation tolerance.

10.2.7 Weight.

10.2.8 Filter dimensions.

10.2.9 Material Safety Data Sheets.

10.2.10 Provide manufacturers Certificate of Conformance covering the ASME, ASTM, or other material specification, grade, class, (as applicable) for each material used in the filter designs.

10.2.11 Design Qualification Test Report prepared to support qualification of filter designs in accordance with AG-1 Article FK-5100. Provide a Certificate of Conformance with this test report that summarizes Section FK conformance status of the filter designs. Reference AG-1 Article FK-8200.

10.2.12 The Supplier shall provide objective evidence acceptable to the Buyer that the requirements of ASME AG-1 Articles I-3000 and I-5000 have been satisfied. Reference AG-1 Mandatory Appendix FC-I-4120.

10.2.13 Copies of the AG-1 FK-5600 Production Test results.

10.2.14 Filter Inspection Record and Packaging Certificate to satisfy AG-1 Articles FK-6300 and FK-5500.

10.3 Drawings

10.3.1 All drawings shall be submitted as CAD drawings in MicroStation, or MicroStation convertible format.

10.3.2 Drawings showing the following information shall be submitted to Buyer for review prior to fabrication:

10.3.3 The outline dimensions of the HEPA Filter, including outline and detail drawings for each component.

10.3.4 Details of construction and fabrication drawings including fabrication tolerances.

10.3.5 The weight of individual components.

10.3.6 The ASTM or equivalent designation for materials.

10.4 Procedures

Procedures to be submitted shall include:

10.4.1 Test procedures to support FK-5100 Qualification and FK-5600 Production Testing.

10.4.2 Supplier's filter inspection, packaging, and shipping preparation procedure(s) as required to meet the intent of AG-1 Articles FK-5500, FK-6300 and FK-7000.

10.4.3 Supplier recommendations (e.g., procedure) for receiving inspection and storage.

10.5 Calculations

Calculations to be submitted shall include:

10.5.1 Submit applicable engineering data/calculations/performance charts that demonstrate compliance with this Specification.

10.6 Manuals

Manuals and instructions to be submitted shall include:

10.6.1 Quality Assurance Manual.

10.7 Certificates of Conformance

10.7.1 The Supplier shall provide Certificates of Conformance complying with ASME AG-1 FK-8200. The following clarifications apply:

10.7.1.1 In regard to where conflicts between the Supplier's design and ASME AG-1 Sections FK exist, the Supplier shall identify the respective code articles that do not apply. This may be accomplished by direct reference on the Certificate of Conformance to Buyer accepted submittal drawings and/or Supplier Deviation Disposition Request(s).

10.7.1.2 Copies of all filter case material certifications shall be provided. These certifications shall state all applicable material standards with year or edition to permit compliance assessment with Article FK-2000.

10.7.2 Furnish UL-586 certificate to meet evidence requirement of Article FK-5160.

10.8 Schedules

Lists and schedules shall include schedule of engineering, material purchase, and fabrication. Lists and schedules shall be submitted to the Buyer's Expediter.

10.9 Materials Certificates/Statistics

Reference Section 10.7 of this Specification.

10.10 Data

10.10.1 The Supplier shall provide HEPA Filter performance data sheets and/or design drawings that include the following data.

10.10.1.1 Name of manufacturer, make, model number

10.10.1.2 Media area

10.10.1.3 Pleat depth, pleat length

10.10.1.4 Capacity, initial resistance, temperature rating

10.10.1.5 Dimensions with fabrication tolerances

10.10.1.6 Seal diameter

10.10.1.7 Weight

10.10.1.8 Materials of construction

10.10.1.9 Sealant type

10.10.1.10 Gasket materials

Table 1 Remote Change Radial Flow HEPA Filter Limiting Criteria

Criteria	Basis Statement
The outer diameter (OD) of the filter, inclusive of all design features (e.g. seal channel) and fabrication tolerances shall not exceed 21 inches.	Export of waste filter from facility C5 cave requires use of remote equipment, export basket, and 55 gallon waste container. This process limits the dimensions of the waste item (i.e. filter).
The length of the filter, inclusive of all design features and fabrication tolerances shall not exceed 26-1/2 inches.	The current design of the export basket limits the filter size which may be inserted into the basket. The basket is inserted into a 55 gallon waste container.

Appendix A:

HEPA Filter Data Sheet

HEPA FILTER DATA SHEET FOR STANDARD NUCLEAR GRADE HEPA FILTERS (ASME AG-1 SECTION FK COMPLIANT FILTERS)	MR No. 24590-QL-MRA-MKH0-00003 DATA SHEET No. / Rev. 24590-###-MKD-###-##### / Rev.#	Page 1 of 2

Quality Level Q (no exceptions)		
Service / Application: *Note: Facility, System, Room and PPOE Number required only for filters designated as Dedicated Facility Spare Parts*	Generic (RPP-WTP) Spare Part?	☐ Yes ☐ No
	Dedicated Facility Spare Part?	☐ Yes ☐ No
RPP-WTP Facility & System:__________ Facility Rm # (where PPOE is located):______ PPOE Number:_____________	Potential for Wetting?	☐ Yes ☐ No
	Potential for Corrosive Atmosphere?	☐ Yes ☐ No
Filter Type (1 or 3 Only):_____ Safe or Remote Change (NA for Type 3): _________	Potential exposure to HNO_3 acid?	☐ Yes ☐ No
Filter Quantity:_____	Potential exposure to HF acid?	☐ Yes ☐ No
Parent Piece of Equipment (PPOE)	Potential for High Temperature (>200°F)	☐ Yes ☐ No

Recommended Manufacturer:_____

Recommended Manufacturer's part number:_____
Manufacturer's part number (as furnished): *

ASME AG-1 Table FK-4000-4 Performance Requirements (Note: Completion of this section not required for Type 3 Safe Change Housing Vacuum Relief Filters)	
Temperature (Max. Continuous Rating is 250°F)	Normal Operating °F (°C):_____
	Minimum Operating °F (°C):_____ Maximum Operating °F (°C):_____
	Duration for Minimum:_________ and :_________Maxiumum Temperatures
Note(s):	
Airflow Rate (Type 1 Max. Rating is 2,000 acfm / filter)	Normal Operating: scfm : acfm
	Minimum: scfm : acfm
	Maximum: scfm : acfm
	Temperature and Pressure for Standard Conditions: °F atm
Note(s):	
Relative Humidity	Minimum: ____% Maximum: ____%
Note(s):	
Chemical Exposure (Concentration data for corrosive environments)	Normal operating condition:
	Upset condition & duration:
Note(s): Filter media is glass (boron silicate microfiber formed into paper with an acrylic latex polymer binder) and contains silicone for water repellency. Acid resistance obtained with addition of Nomex®.	
Radiation	Radiological dose level (mrem/hr):
	Total integrated dose for 10 yr filter life (rads):
	Radiation Limits: 2.0 x 10^7 rads integrated dose
Note(s): Limit based upon radiation affect on Blu-Jel® sealing properties.	
Biological Exposure	

Ref. 24590-WTP-3PS-MKH0-T0002 Rev. 2

HEPA FILTER DATA SHEET FOR STANDARD NUCLEAR GRADE HEPA FILTERS (ASME AG-1 SECTION FK COMPLIANT FILTERS)	MR No. 24590-QL-MRA-MKH0-00003 DATA SHEET No. / Rev. 24590-###-MKD-###-##### / Rev.#	Page 2 of 2

Note(s):

- All Filters shall be tested at the DOE Filter Test Facility (FTF)
- Filters must be tested per UL 586. Objective evidence shall include a UL-586 label.
- FILTERS SHALL BE IN ACCORDANCE WITH SPECIFICATION 24590-WTP-3PS-MKH0-T0002 AND BUYER ACCEPTED SUPPLIER SUBMITTAL DRAWINGS.

Additional Instructions: ____

0		Issued for Purchase				P Sullivan
Rev	**Date**	**Purpose**	**Originator**	**Checker**	**Approver**	**R.E. Approval**

Ref. 24590-WTP-3PS-MKH0-T0002 Rev. 2

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-008

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant
Update mechanical data sheets for HOP Plate Heat Exchangers, Silver Mordenite Preheaters (HOP-HX-00002 and HOP-HX-00004) in Appendix 10.6 of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator: Reviewed by ORP Program Office:

Donna Busche 10/5/10 10/20/10

D. M. Busche Date D. L. Noyes Date

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-008

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update mechanical data sheets for HOP Plate Heat Exchangers, Silver Mordenite Preheaters (HOP-HX-00002 and HOP-HX-00004) in Appendix 10.6 of the DWP.

The following mechanical data sheet is being submitted to replace the mechanical data sheets currently in Appendix 10.6:

Appendix 10.6			
Replace:	24590-HLW-MED-HOP-P0012, Rev. 1	With:	24590-HLW-MED-HOP-00031, Rev. 0
Replace:	24590-HLW-MED-HOP-P0017, Rev. 1	With:	24590-HLW-MED-HOP-00031, Rev. 0

This modification requests Ecology approval and incorporation into the permit the mechanical data sheet for welded plate and frame heat exchangers for the silver mordenite preheaters HOP-HX-00002 and HOP-HX-00004. Mechanical data sheet 24590-HLW-MED-HOP-00031 consolidates and replaces information previously specified in mechanical data sheets 24590-HLW-MED-HOP-P0012 and 24590-HLW-MED-HOP-P0017. Revisions are the result of ongoing design (changes from vendor preliminary data to vendor detailed design) and incorporates general criteria from a design verification review. The following identifies the significant changes that have been revised on the attached mechanical data sheet:

- Re-titled the document for greater specificity (from "PLATE HEAT EXCHANGER" to "WELDED PLATE AND FRAME HEAT EXCHANGER")
- Updates reference drawings, corrosion evaluation, and calculations
- Design and operating parameters have been revised as necessary per vendor design
- The reference data section has been revised as a general data section and includes revisions to the equipment quality designator, design code, and design parameters, in addition to specific manufacturer's information and other design data not previously shown
- The process design data section has been deleted since sufficient and relevant detail is now shown in the thermal/hydraulic data and other sections
- The normal conditions portion of the thermal/hydraulic data section has been deleted
- Additional data for equipment cycle and fatigue assessment has been provided
- An equipment qualification data sheet has been added

The following is a list of outstanding change documents that have not been incorporated into this modification:

- none

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-008

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number:

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: [X] Yes [ ] Denied (state reason below)	Reviewed by Ecology:
Reason for denial:	[signature] for — 12.17.10
	J. J. Wallace — Date

R11169763

MECHANICAL DATA SHEET

WELDED PLATE AND FRAME HEAT EXCHANGER

PLANT ITEM No.
24590-HLW-ME-HOP-HX-00002
24590-HLW-ME-HOP-HX-00004

Project	***RPP-WTP***	Description	***Silver Mordenite Preheater @ 0' Elv. – Room H-A123***
Project No.	***24590***	Corrosion Evaluation	***24590-HLW-N1D-HOP-00007***
Site	***Hanford***	P&ID	***24590-HLW-M6-HOP-00003, 24590-HLW-M6-HOP-20003***
Process Flow Diagram	***24590-HLW-M5-V17T-00004***	Calculations	***24590-HLW-MEC-HOP-00003, 24590-HLW-M4C-HOP-00011, 24590-HLW-MVC-30-00001***

General Data

Quality Level	***Q***	Manufacturer / Type / Model No.	***Tranter / Supermax / SM-54-M-08-HM-422***
Seismic Category	***SC-III***	Flow Type	***Single Pass, Countercurrent***
Design Level	***L-2 (per 24590-WTP-3PS-MV00-T0001)***	Heat Exchanger Duty Btu/hr	***337,889***
Design Code	***ASME Sect. VIII Div. 1***	Heat Exchanger Area ft^2	***4,961.89***
Oversurface (Minimum) %	***15***	ΔT LMTD °F	***46.08***
Thermal Efficiency (Minimum) %	***70***	Design Life yrs	***40***
Overall Flange in-leakage per nozzle scfm	***< 1***	Fouling Resistance hr-ft^2- °F / BTU	***0.000757***
Plate Corrosion Allowance inch	***0.00***	Shell Corrosion Allowance inch	***0.04***

Thermal/Hydraulic Data
(Maximum Conditions)

	Hot Side		Cold Side	
Fluid Name	***HLW Catalyst Skid Discharge Offgas***		***Activated Carbon Adsorbers Offgas***	
Fluid Quantities: Total lb/hr	***8221***	***8267***	***7047***	***7094***
Condensable Vapor lb/hr	***855***	***855***	***718***	***718***
Liquid lb/hr	***0***	***0***	***0***	***0***
Noncondensable lb/hr	***7366***	***7412***	***6329***	***6376***
Temperature (In/Out) °F	***426***	***272 (Note 10)***	***210***	***392.85 (Note 10)***
Density lb/ft^3	***0.036***	***0.043***	***0.053***	***0.041***
Viscosity cP	***0.0260***	***0.0225***	***0.0210***	***0.0252***
Molecular Weight, Vapor/Noncondensable g/mol	***18/27.3***	***18/27.3***	***18/27.3***	***18/27.3***
Specific Heat Btu/lb-°F	***0.270***	***0.265***	***0.264***	***0.268***
Thermal Conductivity Btu/hr-ft-°F	***0.022***	***0.019***	***0.018***	***0.021***
Inlet pressure psia	***12.4***		***13.8***	
Velocity (Max Allowable) ft/s	***20***		***20***	
Pressure Drop (Max Allowable) in-WG	***4***		***4***	

Mechanical Design Data

	Hot Side		Cold Side	
Design Pressure (Max/Min) psig	***5***	***FV***	***5***	***FV***
Design Temperature (Max/Min) °F	***500***	***14***	***500***	***14***
Insulation	***Equipment will be covered with 6" thick calcium silicate insulation having a density of 15 lbs/ft^3. This information is provided for design analysis. However, insulation is not considered part of the SELLERS scope of work.***			

Material Data

Plate Pack	***SA-240 316 Note 13***	Nozzles	***SA-182 F316 Note 13***
End Plates	***SA-240 316 Note 13***	Removable Shroud	***N/A***
Top/Bottom Covers	***SA-240 316 Note 13***	Saddle	***SA-240 316 Note 13***
Shell	***SA-240 316 Note 13***	Skid	***SA-240 316 Note 13***

Construction Data *(To be determined by the supplier when not specified by the buyer)*

		Hot Side Piping (Nozzle Number)		Cold Side Piping (Nozzle Number)	
Inlet (Size/Connection Type)		**16" 150 lb RFWN Flange (N01)**		**14" 150 lb RFWN Flange (N03)**	
Outlet (Size/Connection Type)		**14" 150 lb RFWN Flange (N04)**		**14" 150 lb RFWN Flange (N02)**	
Total Number of Plates / Thickness		422 / 0.8mm			
Size (LxWxH)		Note 2			
Weight lb	9500	Operating Weight lb	9500	Test Weight lb	TBD

Notes

1. **Not Used**
2. **Bounding dimensions not to exceed: 174" L x 56" W x 72" H.**
3. **Not Used**
4. **Not Used**
5. **Plates shall be all welded assembly, no gasketed joints allowed.**
6. **Not Used**
7. **Not Used**
8. **There shall be no leakage between hot side and cold side.**
9. **Not Used**
10. **Outlet temperatures are based on the Oversurface Area**
11. **Not Used**
12. **Contents of this document are Dangerous Waste Permit affecting.**
13. **Maximum 0.030% Carbon; dual certified.**
14. **Not Used**

MECHANICAL DATA SHEET

WELDED PLATE AND FRAME HEAT EXCHANGER

PLANT ITEM No.
24590-HLW-ME-HOP-HX-00002
24590-HLW-ME-HOP-HX-00004

Equipment Cyclic Data Sheet

Plant Item Number	24590-HLW-ME-HOP-HX-00002 24590-HLW-ME-HOP-HX-00004
Component Description	Silver Mordenite Preheater for the Melter Offgas Treatment Process System (HOP).

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction	**Type 316 Austenitic Stainless Steel (Maximum 0.030% Carbon; dual certified)**
Design Life	***40 years***
Component Function and Life Cycle Description	Melter Offgas Treatment Process System (HOP)

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	***-5***	***5***	***10***	
Operating Pressure	psig	***-3***	***3***	***80***	
Operating Temperature	℉	***59***	***401***	***80***	
Contents Specific Gravity		***N/A***	***N/A***	***N/A***	***gas process***
Contents Level	inch	***N/A***	***N/A***	***N/A***	
Localized Features					
Nozzles		***N/A***			
Supports		***N/A***			

Nozzle Loads

Vendor to provide allowable nozzle loads.

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification			
Full Component Tag Number or BNI Stock Code Number	24590-HLW-ME-HOP-HX-00002 24590-HLW-ME-HOP-HX-00004		Safety Classification ☐ SC ☒ SS ☐ APC-PAM
Equipment Datasheet Number	N/A		
Description	Silver Mordenite Preheater for the Melter Offgas Treatment Process System (HOP). Plate & Frame Type Heat Exchanger. Welded Gasket Construction. Manufactured by Tranter. Model No. SM-54-M-08-HM-422.		Seismic Category ☐ SC-I ☐ SC-II ☒ SC-III ☐ SC-IV ☐ SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	HLW, Elevation 0'-0", Room H-A123, Column Lines P-5/4		
Safety Function(s)	Ensure confinement of radioactive materials during normal operations and accident conditions. Reference: 24590-WTP-PSAR-ESH-01-002-04, Rev. 04K, Table 4A-2, Page 4A-14		
Equipment Safety Function Type	☒ Passive Mechanical	☐ Active Mechanical	☐ Electrical
Seismic Safety Function ☒ Yes ☐ No	Seismic Operability Requirements ☐ During Seismic Event	☐ After Seismic Event	☒ None

Equipment Environmental Qualification (EEQ)
(Parameter values stated in this section do not include process conditions or operation induced conditions)

Classification of Environment ☒ Mild ☐ Harsh

Qualified Life (years) ☒ 40 ☐ Other

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	83	Note a	Years	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	59	Note b	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	Note c	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	10	Note c	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g.)	0	Note d	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g.)	0.4 vacuum	Note d	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mRad/hr)	10	Note e	Years (Note e)	24590-HLW-U0D-W16T-00001
Plant/Process Induced Vibration	☐ Yes ☒ No			
Additional Normal Ambient Information:	N/A			

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Abnormal Ambients				
High Temperature (°F)	137	Note a	hours / year	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	40	Note b	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	Note c	N/A	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	5	Note c	N/A	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g)	4	Note d	N/A	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g)	6.7 vacuum	Note d	N/A	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mR/hr)	10	Note e	Years (Note e)	24590-HLW-U0D-W16T-00001
Exposure to Wet Sprinkler System	☒ Yes ☐ No	g	hours	24590-HLW-U0D-W16T-00001
Additional Abnormal Ambient Information	N/A			
Design Basis Events (DBE) Ambients				
High Temperature (°F)	139	1000	hours	24590-HLW-U0D-W16T-00001
Low Temperature (°F)	40	Note b	N/A	24590-HLW-U0D-W16T-00001
High Relative Humidity (%RH)	100	1000	hours	24590-HLW-U0D-W16T-00001
Low Relative Humidity (%RH)	5	1000	hours	24590-HLW-U0D-W16T-00001
High Pressure (in.-w.g)	4	1000	hours	24590-HLW-U0D-W16T-00001
Low Pressure (in.-w.g)	6.7 vacuum	1000	hours	24590-HLW-U0D-W16T-00001
Radiation Dose Rate (mR/hr)	10.0	0	hours	24590-HLW-U0D-W16T-00001
Submergence	☒ Yes ☐ No Note j	N/A	hours	24590-HLW-U0D-W16T-00001
Chemical/Spray Exposure	☒ Yes ☐ No	12.5	hours	24590-HLW-U0D-W16T-00001
Additional DBE Information	N/A			

DBE Chemical Exposure Details	
DBE Chemical Types / Concentrations	Ammonia Nitric Acid Fume

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Electrical Interfaces Supporting the Safety Function	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Mechanical Interfaces	
Mounting Configuration (orientation)	Horizontal Equipment
Mounting Method (bolts, welds, etc.)	Post Installed Concrete Anchors. Sized by SELLER. Provided by BUYER.
Auxiliary Devices	N/A

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification	Engineering Specification for Seismic Qualification Criteria for Pressure Vessel	24590-WTP-3PS-MV00-T0002	2	N/A
Specified Seismic Load Parameters	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment	24590-WTP-3PS-FB01-T0001	4	N/A

Equipment Qualification Notes and Additional Information

a) For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

b) The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per item a) above. Therefore, no duration is assigned for the low temperatures.

c) The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and the low normal and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

d) If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

e) (1) If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

(2) If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

f) The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

g) Spray due to fire sprinkler actuation shall be taken to occur once over the entire qualified life duration for a period of 2 hours, even if the qualified life is a period less than 40 years. If spray qualification is provided for DBE conditions (whether for water or chemical spray), then separate qualification for the fire sprinkler spray need not be provided.

h) The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

i) Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

j) Support elevation is 6.5 inches above the floor height. Flood height is 1.58 feet above the floor.

DOE Radioactive Materials Disclaimer:

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

Approval

Rev	Description	System Engineer	Vessel Engineer	Checked	MET	E&NS	Approved	Date
0	Issued for Procurement. This document supersedes document number 24590-HLW-MED-HOP-00032, Rev. B.	M. O'Neill	J. Brumfield	M. Seed	D. Adler	C. Meng	J. Julyk	3/11/10

358
03/10/2010
HLW
REFERENCES for Data Sheet: 24590-~~PTF~~-MED-HOP-00031, REV. 0 (For BNI Use only)

Data	Document #	Rev	Document Title
Quality Level	24590-HLW-M6-HOP-00003 24590-HLW-M6-HOP-20003	2 2	*P&ID - HLW Melter Offgas System Melter 1 Secondary Offgass Treatment Sheet 1 of 3* *P&ID - HLW Melter Offgas System Melter 2 Secondary Offgas Treatment Sheet 1 of 3*
Seismic Category	24590-HLW-M6-HOP-00003 24590-HLW-M6-HOP-20003	2 2	*P&ID - HLW Melter Offgas System Melter 1 Secondary Offgass Treatment Sheet 1 of 3* *P&ID - HLW Melter Offgas System Melter 2 Secondary Offgas Treatment Sheet 1 of 3*
Heat Exchanger Duty	Vendor Supplied	N/A	*N/A*
LMTD	Vendor Supplied	N/A	*N/A*
Total, hot side (lb/hr)	24590-HLW-M4E-HOP-00001	N/A	*Incorporate Operating Efficiency for Fan Exhausters*, pg. 13/58
Condensable Vapor, hot side (lb/hr)	24590-HLW-M4E-HOP-00001	N/A	*Incorporate Operating Efficiency for Fan Exhausters*, pg. 13/58
Liquid, hot side (lb/hr)	24590-HLW-M4E-HOP-00001	N/A	*Incorporate Operating Efficiency for Fan Exhausters*, pg. 13/58
Noncondensable, hot side (lb/hr)	24590-HLW-M4E-HOP-00001	N/A	*Incorporate Operating Efficiency for Fan Exhausters*, pg. 13/58
Temperature, hot side (F)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Density, hot side (lb/cuft)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Viscosity, hot side (cP)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Molecular Weight, vapor, hot side	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Molecular Weight, noncondensable, hot side	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Specific Heat, hot side (Btu/lb-F)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Thermal Conductivity, hot side (Btu/hr-ft-F)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Inlet Pressure, hot side (psia)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Velocity, hot side (ft/s)	24590-WTP-3PS-MEP0-T0001	0	Engineering Specification for Plate and Frame Heat Exchangers, Section 3.1.7
Pressure Drop allowed, hot side (in-wg)	24590-HLW-MEC-HOP-00003	1	*HLW Silver Mordenite Preheater Process Conditions and Design Requirements, pg. 2 & 8*
Oversurface %	24590-HLW-MEC-HOP-00003	1	*HLW Silver Mordenite Preheater Process Conditions and Design Requirements, pg. 2 & 8*
Thermal Efficiency %	24590-HLW-MEC-HOP-00003	1	*HLW Silver Mordenite Preheater Process Conditions and Design Requirements, pg. 2 & 8*
Total, cold side (lb/hr)	24590-HLW-M4E-HOP-00001	N/A	*Incorporate Operating Efficiency for Fan Exhausters*, pg. 13/58
Condensable Vapor, cold side (lb/hr)	24590-HLW-M4E-HOP-00001	N/A	*Incorporate Operating Efficiency for Fan Exhausters*, pg. 13/58
Liquid, cold side (lb/hr)	24590-HLW-M4E-HOP-00001	N/A	*Incorporate Operating Efficiency for Fan Exhausters*, pg. 13/58
Noncondensable, cold side (lb/hr)	24590-HLW-M4E-HOP-00001	N/A	*Incorporate Operating Efficiency for Fan Exhausters*, pg. 13/58

REFERENCES for Data Sheet: 24590-HLW-MED-HOP-00031, REV. 0

Temperature, cold side (F)	24590-HLW-M4C-HOP-00011 Temp Cold Out Vendor Supplied	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Density, cold side (lb/cuft)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Viscosity, cold side (cP)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Molecular Weight, vapor, cold side	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Molecular Weight, noncondensable, cold side	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Specific Heat, cold side (Btu/lb-F)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Thermal Conductivity, cold side (Btu/hr-ft-F)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Inlet Pressure, cold side (psia)	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Velocity, cold side (ft/s)	24590-WTP-3PS-MEP0-T0001	0	Engineering Specification for Plate and Frame Heat Exchangers, Section 3.1.7
Pressure Drop allowed, cold side (in-wg)	24590-HLW-MEC-HOP-00003	1	*HLW Silver Mordenite Preheater Process Conditions and Design Requirements, pg. 2 & 8*
Design Pressure, hot side (psig)	24590-HLW-MVC-30-00001	B	*HLW Vessel Cyclic Datasheet Inputs, pg. 13 (Note: Vendor provided P=FV in their quote)*
Design Temperature, hot side (F)	24590-WTP-DB-ENG-01-001 24590-HLW-M4C-HOP-00011	10 1	*Basis of Design, Section 12 - Ventilation Basis of Design, pg. 12-19, Table 12-1* HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Corrosion Allowance (Plate) Corrosion Allowance (Shell)	24590-HLW-N1D-HOP-00007 E-Mail from MET	0 N/A	*HOP-HX-00002 & HOP-HX-00004 (HLW) - Silver Mordenite Preheater, pg. 1* *Original CE done for conventional Plate and Frame HX. Bid is for Welded pack inside shell. Therefore MET has indicated a corrosion allowance for the shell via E-mail.*
Erosion Allowance, hot side (in)	24590-HLW-N1D-HOP-00007	0	*HOP-HX-00002 & HOP-HX-00004 (HLW) - Silver Mordenite Preheater, pg. 1*
Insulation	24590-WTP-3PS-NN00-T0001	2	*Engineering Specification for Thermal Insulation for Mechanical Systems*
Design Pressure, cold side (psig)	24590-HLW-MVC-30-00001	B	*HLW Vessel Cyclic Datasheet Inputs, pg. 13 (Note: Vendor provided P=FV in their quote)*
Design Temperature, cold side (F)	24590-WTP-DB-ENG-01-001 24590-HLW-M4C-HOP-00011 Vendor provided lower value	10 0	*Basis of Design, Section 12 - Ventilation Basis of Design, pg. 12-19, Table 12-1* HLW Melter Offgass System Design Basis Flowsheets, pg. A-2 & A-3
Erosion Allowance, cold side (in)	24590-HLW-N1D-HOP-00007	0	*HOP-HX-00002 & HOP-HX-00004 (HLW) - Silver Mordenite Preheater, pg. 1*
Design Flowrate, hot side (scfm)	24590-HLW-MEC-HOP-00003	1	*HLW Silver Mordenite Preheater Process Conditions and Design Requirements, pg. 2 & 8*
Fouling Resistance (hr-sqft-F/Btu)	24590-HLW-MEC-HOP-00003	1	*HLW Silver Mordenite Preheater Process Conditions and Design Requirements, pg. 2 & 8*
Overall Flange inleakage (scfm)	24590-HLW-MEC-HOP-00003	1	*HLW Silver Mordenite Preheater Process Conditions and Design Requirements, pg. 2 & 8*
Design Flowrate, cold side (scfm)	24590-HLW-MEC-HOP-00003	1	*HLW Silver Mordenite Preheater Process Conditions and Design Requirements, pg. 2 & 8*
Cyclic Data	24590-HLW-MVC-30-00001	B	*HLW Vessel Cyclic Datasheet Inputs, Sheets A-5 & A-6*

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-009

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Submitted by Co-Operator:		Reviewed by ORP Program Office:	
Donna Busche	10/5/10	D. L. Noyes	10/28/10
D. M. Busche	Date	D. L. Noyes	Date

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-009

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to replace Permit Specification 24590-WTP-3PS-MBTV-TP001 *Engineering Specification for Thermal Catalytic Oxidizer/Reducers* with 24590-HLW-3PS-MBTV-T0002 *Engineering Specification for the HLW Thermal Catalytic Oxidizer/Reducer* in Appendix 7.7 of the DWP.

Since the permitted specification also contains the LAW Thermal Catalytic Oxidizer/Reducers, the permitted version should remain in the permit after approval of Permit Change Notice 24590-HLW-PCN-ENV-10-009 until Modification Notification Form 24590-LAW-PCN-ENV-10-002 is submitted and approved by Ecology.

The following engineering specification is being submitted to replace the permit specification currently in Appendix 7.7.

Appendix 7.7			
Replace:	24590-WTP-3PS-MBTV-TP001, Rev. 0	With:	24590-HLW-3PS-MBTV-T0002, Rev. 0

This modification requests Ecology approval and incorporation into the permit the new specification that superceded the permitted version. The permitted specification was cancelled and split into two new specifications with one for the HLW facility and the other for LAW. The LAW specification will be submitted under modification 24590-LAW-PCN-ENV-10-002.

The following identifies the significant changes from the permitted version:

- The new specification applies to the HLW thermal catalytic oxidizer/reducer only. The LAW unit is placed under its own specification 24590-LAW 3PS-MBTV-T0001 and will be submitted under modification 24590-LAW-PCN-ENV-10-002
- Section 6, Tests and Inspections is a complete re-write
- Section 10, Submittals, is clarified by removing requirements which are redundant to the daughter specifications
- The quality level was changed from Q to CM
- Updated Acronyms, Definitions, and Industry Standards
- Added Attachments one through seven

The following is a list of outstanding change documents that have not been incorporated into this modification:

- 24590-CM-MRA-MBT0-00002-T0002
- 24590-CM-MRA-MBT0-00002-T0004
- 24590-CM-MRA-MBT0-00002-T0007
- 24590-CM-MRA-MBT0-00002-T0009
- 24590-WTP-SDDR-MS-10-00004

Quarter Ending 12/31/10 24590-HLW-PCN-ENV-10-009

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number:

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur:	Reviewed by Ecology:
[X] Yes [ ] Denied (state reason below)	[signature] for 12-17-10
Reason for denial:	J. J. Wallace — Date

R10986772

ISSUED BY
RPP-WTP PDC

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

HLW Thermal Catalytic Oxidizers/Reducers

Content applicable to ALARA? ☒ Yes ☐ No

ADR No. 24590-HLW-ADR-HV-02-002 **Rev** 1

Quality Level
CM
DOE Contract No. DE-AC27-01RV14136

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

REV	DATE	BY	CHECK	REVIEW	E&NS	QA	DPEM
0	5/4/09	Darryl Nelson	Dennis Rickettson	Grant Goolsby	Dick Carlstrom	N/A	Janet Roth

SPECIFICATION No. 24590-HLW-3PS-MBTV-T0002 **Rev** 0

Revision History

Revision	Reason for Revision
0	~~This new specification replaces 24590-WTP-3PS-MBTV-T0001, Rev. 4 which was a Q spec and addressed both HLW and LAW TCO's.~~ This new specification changed from Q to enhanced CM and deals with the TCO and Ammonia /Air Injection units for HLW only. Section 6, Tests and Inspections, is a complete re-write. Section 10, Submittals, is clarified by removing requirements which are redundant to the daughter specifications and adding detail to some requirements. Issued for purchase

4/29/09

Notice

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

Contents

Figures

Deleted

Attachments

1 Scope

1.1 Project Description and Location

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is a complex of waste treatment facilities where the Department of Energy's (DOE) Hanford site tank waste will be pretreated and immobilized into stable glass form via vitrification. The WTP Contractor will design, build, and start up the WTP pretreatment and vitrification facilities for the US Department of Energy's (DOE) Office of River Protection (ORP). The waste treatment facilities will pre-treat and immobilize the Low-Activity Waste (LAW) and High-Level Waste (HLW) currently stored in underground storage tanks at the Hanford Site.

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

1.2 Equipment, Material, and Services Required

This specification provides the requirements for the design, analysis, materials selection, appurtenances selection, project management, quality control, quality assurance, inspection, fabrication, testing and labeling of 2 ea. HLW Thermal Catalytic Oxidizers/Reducers and the associated Ammonia/Air Dilution Skids.

The scope of work for the SELLER includes all work specifically defined in this specification and its addenda and attachments. Work shall include, but is not limited to, the following:

1.2.1 NOT USED

1.2.2 High Level Waste: 2 ea. Thermal Catalytic Oxidizer/Reducer Skids, 24590-HLW-MX-HOP-SKID-00005 and 24590-HLW-MX-HOP-SKID-00007. 2 ea. Ammonia/Air Dilution Skids, 24590-HLW-MX-HOP-SKID-00006 and 24590-HLW-MX-HOP-SKID-00008. 2 ea. Heater Control Panels, HOP-PNL-00004 and HOP-PNL-00008 (if vendor panel is provided). Components are Seismic Category III as denoted on the MDS in Section 2 of the MR.

1.2.3 NOT USED

1.2.4 Provide an analysis from a Thermal Catalytic Oxidizer/Reducer expert of the design to determine expected catalyst changeout frequency.

1.2.5 NOT USED

1.2.6 NOT USED

1.2.7 NOT USED

1.2.8 NOT USED

1.2.9 NOT USED

1.2.10 NOT USED

1.2.11 Provide certified material test reports, welding procedures, insulation installation procedures, surface preparation and coating procedures, testing procedures, testing results, quality assurance procedures, quality assurance inspection results, and all other procedures and documentation required per this specification and its addenda and attachments.

1.2.12 Provide transportation, storage, and installation instructions for the Thermal Catalytic Oxidizers/Reducers and the Ammonia/Air Dilution Skids per manufacturer's recommendation and this specification.

1.2.13 Provide packaging and prepare the Thermal Catalytic Oxidizer/Reducers Skids, the Ammonia/Air Dilution Skids, control panels, shim pack, gaskets, special tools (if required), and catalyst bed for shipment to the WTP site. Packaging shall be sufficient to allow outdoor storage for a period of up to 12 months at the WTP site, without BUYER action except routine inspection. Environmental conditions for storage are found in Section 3.6 of this specification. SELLER shall provide specific guidelines for storage beyond 12 months.

1.2.14 Provide special tools required for installation and maintenance.

1.2.15 Provide Material Safety Data Sheets (MSDSs) for the catalyst cartridges and any other potentially hazardous chemicals or materials which will be delivered to the BUYER.

1.2.16 Provide a thermal analysis of the Thermal Catalytic Oxidizer/Reducer, and support frame in accordance with the requirements of this specification and Mechanical Data Sheets (MDSs) in Section 2 of the Material Requisition (MR). Select insulation material (i.e. calcium silicate, refractory brick, mineral wool, etc.) to meet thermal requirements of this specification.

1.2.17 Provide detailed installation procedure for insulation, complete with design drawings and insulation map.

1.2.18 Provide a seismic analysis of the Thermal Catalytic Oxidizer/Reducer and ammonia supply/dilution skids in accordance with the requirements of this specification.

1.2.19 Provide shop painting of carbon steel surfaces.

1.2.20 Provide an equipment reliability assessment for all major components and subcomponents including expected catalyst life of the Thermal Catalytic Oxidizers/Reducers. The definition of components and sub-components is at SELLER's discretion.

1.2.21 Provide junction boxes to accommodate wiring to remote-mounted SELLER control panel. SELLER shall provide wiring schedule, diagrams, and documentation to facilitate installation of wiring from equipment to remote control panel.

1.2.22 Provide ASME Sec VIII and B31.3 analysis of the Thermal Catalytic Oxidizer/Reducer and the associated Ammonia/Air Dilution supply piping in accordance with the requirements of this specification.

1.3 Work by Others

Specific activities and materials excluded from the scope of this specification include:

1.3.1 Shipping to WTP jobsite

1.3.2 Material unloading and storage at jobsite

1.3.3 Installation labor

1.3.4 Foundation embeds

1.3.5 NOT USED

1.3.6 NOT USED

1.3.7 Ammonia vapor supply to skid connection

1.3.8 Electric power supply

1.3.9 Off skid external wiring

1.3.10 External connection to BUYER's instrumentation and controls

1.3.11 Insulation installation required per SELLER's thermal analysis and design

1.3.12 ABB Control System Components, software and programming for normal (PCJ) and safety control (PPJ) systems

1.3.13 Containment Tent, portable HEPA filter exhauster

1.3.14 Grounding cable

1.4 Acronyms

AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CGD	Commercial Grade Dedication
CM	Commercial
COA	Certificate of Analysis

DBE	Design Basis Event
DRE	Destruction and Removal Efficiency
FAT	Factory Acceptance Test
FF	Foundation® Fieldbus
FMEA	Failure Mode and Effects Analysis
HEPA	High Efficiency Particulate Air
HLW	High Level Waste
ISA	Instrument Service Air
LAW	Low Activity Waste
MACT	Maximum Achievable Control Technology
MDS	Mechanical Data Sheet
MR	Material Requisition
MSDS	Material Safety Data Sheet
MTBF	Mean-Time Between Failure
NACE	National Association of Corrosion Engineers
NDE	Non-Destructive Examination
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NOx	Nitrogen Oxides
P&ID	Piping and Instrumentation Diagram
PCJ	Process Control System
PIP	Process Industry Practices
PMI	Positive Material Identification
PPE	Personnel Protection Equipment
PPJ	Programmable Protection System
PQR	Procedure Qualification Record
PSA	Process Service Air

QAP	Quality Assurance Program
Q	Quality
QL	Quality Level
RPP	River Protection Project
SC	Safety Class
SCO	Selective Catalytic Oxidation
SCR	Selective Catalytic Reduction
SDDR	Supplier Deviation Disposition Request
SS	Safety Significant
SSCs	Systems, Structures, and Components
SVOCs	Semi-Volatile Organic Compounds
TCO	Thermal Catalytic Oxidizer
UL	Underwriters Laboratories, Inc.
VOCs	Volatile Organic Compounds
VSL	Vitreous State Laboratory
WAC	Washington Administrative Code
WPS	Welding Procedure Specification
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.5 Definitions

The equipment covered by this specification will be used in the WTP, where the following definitions are applicable:

Quality Level (QL): The quality level identifies the quality requirements to be applied to the equipment. The identified quality levels are Q (Quality), and CM (Commercial). Quality requirements are specifically defined on the associated MDSs and supplier Quality Assurance Program (QAP) requirements data sheets.

Seismic Category (SC): Specific requirements for each seismic category are defined in reference documents listed in Sections 2.3.12 and 2.3.26 of this specification.

Thermal Catalytic Oxidizer/Reducer Expert: One who has extensive knowledge regarding the characteristics and application of Thermal Catalytic Oxidizers/Reducers. Must have a minimum of five (5) years experience.

1.6 Safety/Quality Classifications

1.6.1 Refer to the MDS in Section 2 of the MR for Safety Class, Quality Level and Seismic Category classifications related to the HLW Thermal Catalytic Oxidizers/Reducers and the Ammonia/Air Dilution skids.

1.6.2 NOT USED

2 Applicable Documents

2.1 General

2.1.1 Work shall be done in accordance with the referenced codes, standards, and documents listed below, which are an integral part of this specification.

2.1.2 When specific chapters, sections, parts, or paragraphs are listed following a code, industry standard, or reference document, only those chapters, sections, parts, or paragraphs of the document are applicable and shall be applied. For the codes and standards listed in Section 2, the specific revision or effective date identified shall be followed. If a date or revision is not identified, the latest issue, including addenda, at the time of quotation, shall apply.

2.2 Industry Standards

2.2.1 AISC M016 - 9th Edition, *Manual of Steel Construction, Allowable Stress Design*, as tailored in Appendix C of 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Vol. II* (see Attachment 3)

2.2.2 NOT USED

2.2.3 NOT USED

2.2.4 NOT USED

2.2.5 NOT USED

2.2.6 ASME B31.3 – 1996, *Process Piping Code*, as tailored in Appendix C of 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Vol. II* (see Attachment 2)

2.2.7 ASME B & PVC, Section VIII-2004, Division 1: *Rules for Construction of Pressure Vessels*

2.2.8 NOT USED

2.2.9 ASME Y14.100-2004, *Engineering Drawing Practices*

2.2.10 ASTM – E84-08, *Surface Burning Characteristics of Building Materials*

2.2.11 ASTM - A240-07, *Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels*

2.2.12 AWS D1.6-1999, *Structural Welding Code, Stainless Steel*

2.2.13 NOT USED

2.2.14 NEMA 250-2003, *Enclosures for Electrical Equipment (1,000 Volts Maximum)*

2.2.15 NOT USED

2.2.16 NFPA 70 – 1999, *National Electrical Code*

2.2.17 NFPA 497-2007, *Recommended Practice for Classification of Hazardous Locations for Electrical Installations in Chemical Process Areas*

2.2.18 NOT USED

2.2.19 UL 467-2007, *Standard for Safety Grounding and Bonding Equipment*

2.2.20 UL 508-2007, *Standard for Safety Electric Industrial Control Equipment*

2.2.21 UL 508A-2007, *Standard for Industrial Control Panels*

2.2.22 ANSI K61.1 - 1999, *Safety Requirements for the Storage and Handling of Anhydrous Ammonia*, as tailored in Appendix C of 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Vol. II* (see Attachment 1)

2.2.23 IEEE 384-1992, *Standard Criteria for Independence of Class 1E Equipment and Circuits*, as tailored in referenced specification 24590-WTP-3PS-EKP0-T0001

2.2.24 NOT USED

2.2.25 NOT USED

2.2.26 NOT USED

2.2.27 NOT USED

2.2.28 NOT USED

2.2.29 NOT USED

2.2.30 NOT USED

2.2.31 AWS D1.1-2000, *Structural Welding Code – Steel*

2.2.32 29 CFR 1910, *Occupational Safety and Health Standards for General Industry*

2.3 Reference Documents/Drawings

2.3.1 24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Protective Coating for Steel Items and Equipment*

2.3.2 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*

2.3.3 24590-WTP-3PS-G000-T0002, *General Specification for Positive Material Identification (PMI)*

2.3.4 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling and Storage Requirements*

2.3.5 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems*

2.3.6 24590-WTP-3PS-EKP0-T0001, *Engineering Specification for Electrical Requirements for Packaged Equipment*

2.3.7 NOT USED

2.3.8 24590-WTP-3PS-NN00-T0001, *Engineering Specification for Thermal Insulation for Mechanical Systems*

2.3.9 24590-WTP-3PS-PS02-T0001, *Engineering Specification for Shop Fabrication of Piping*

2.3.10 24590-WTP-3PS-SS00-T0001, *Engineering Specification for Welding of Carbon Structural Steel*

2.3.11 24590-WTP-3PS-SS00-T0002, *General Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*

2.3.12 24590-WTP-3PS-FB01-T0001, *Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks*

2.3.13 24590-WTP-3PS-NWP0-T0001, *Engineering Specification for General Welding and NDE Requirements for Supplier Fabricated Piping*

2.3.14 NOT USED

2.3.15 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*

2.3.16 24590-WTP-3PS-MVB2-T0001, *Engineering Specification for Welding of Pressure Vessel, Heat Exchangers and Boilers*

2.3.17 NOT USED

2.3.18 NOT USED

2.3.19 NOT USED

2.3.20 NOT USED

2.3.21 NOT USED

2.3.22 NOT USED

2.3.23 VSL-08R1390-1 *Small Scale Melter Testing for Allyl Alcohol Method Verification*

2.3.24 NOT USED

2.3.25 NOT USED

2.3.26 24590-WTP-3PS-MV00-T0002, *Engineering Specification for Seismic Qualification Criteria for Pressure Vessels*

2.3.27 24590-WTP-LIST-CON-08-0001, *Restricted Materials List WTP Safety Assurance*

2.3.28 24590-WTP-3PS-JQ06-T0005, *Environmental Qualification of Control and Electrical Systems and Components*

2.3.29 24590-WTP-3PS-G000-T0015, *Environmental Qualification of Mechanical Equipment*

3 Design Requirements

3.1 General

3.1.1 The Thermal Catalytic Oxidizers/Reducers and the associated Ammonia/Air Dilution units shall be designed per this specification, the applicable documents listed in Section 2 of this specification, and the MDSs in Section 2 of the MR.

3.1.2 The WTP facility is designed for a minimum service life of 40 years. Structural and pressure boundary components related to the Thermal Catalytic Oxidizer/Reducer and the associated Ammonia/Air Dilution units shall be engineered with a design life of 40 years. Catalyst used in the Thermal Catalytic Oxidizers/Reducers shall have a minimum design life of one year. Other mechanical components shall have a minimum service life of five years with periodic maintenance. Components that cannot be guaranteed for a minimum service life of five years shall be identified in accordance with the following requirements:

- Failure rate or Mean-Time Between Failure (MTBF), whichever is available, and the basis for the rate including specific references to any sources.
- Estimated modes of failure (example, dielectric breakdown, element overheat, etc.). This may be delineated in a Failure Mode and Effects Analysis (FMEA). The method used to perform the FMEA (Example, MIL-STD-1629) and the year shall be specified. All assumptions used to perform the FMEA shall be clearly stated.
- Recommended maintenance and frequency, as applicable.
- Estimated time to perform the recommended maintenance, as applicable.

The data above shall be based on the physical and environmental conditions delineated in this specification and MDSs. Where possible, the SELLER shall compare the figures for the equipment in this specification to similar equipment sold and serviced by the SELLER. The source for all estimates and any underlying assumptions shall be stated. If software is used to perform the FMEA, the SELLER shall specify the software used and the version (example software, Relex, Isogen, Reliasoft, etc.).

3.1.3 Operation of the Thermal Catalytic Oxidizers/Reducers and the associated Ammonia/Air Dilution units shall be continuous for one year. Refer to MDSs in Section 2 of the MR for thermal cyclic conditions.

3.1.4 The thermal and seismic analyses to be provided per this specification must verify that the final detailed design of the Thermal Catalytic Oxidizers/Reducers and the associated Ammonia/Air Dilution units meet the requirements set forth in this specification and its addenda and attachments.

3.1.5 The maximum pressure drops across the Thermal Catalytic Oxidizers/Reducers shall be in accordance with the requirements of the MDSs.

3.1.6 The following requirements shall be met:

- Pressure boundary shall be designed in accordance with the requirements of ASME B&PVC, Section VIII, Div. 1 and BUYER specification 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*. Code stamp is not required

- Non-Destructive Examination (NDE) requirements for the pressure boundary shall be in accordance with BUYER specification 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*, Commercial Grade (CM) Vessels

- Seismic analysis shall be per BUYER specification 24590-WTP-3PS-MV00-T0002, *Engineering Specification for Seismic qualification Criteria for Pressure Vessels*

- The structure supporting the pressure boundary shall be designed per BUYER specification 24590-WTP-3PS-MV00-T0002, Section 7.2.2, *Engineering Specification for Seismic Qualification Criteria for Pressure Vessels*

3.1.7 Penetrations in the pressure boundary (i.e. access doors, sample ports, etc.) shall be designed and reinforced in accordance with the requirements of ASME B&PVC, Section VIII, Div. 1, and BUYER specification 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*. In addition, access doors shall be designed for ease of operation by one person.

3.1.8 If determined necessary by thermal analysis. SELLER shall design the Thermal Catalytic Oxidizers/Reducers to be externally insulated so the external surface temperature does not exceed 140°F. Insulation shall meet applicable requirements of BUYER specification 24590-WTP-3PS-NN00-T0001 *Engineering Specification for Thermal Insulation for Mechanical Systems*.

3.1.9 Internal bracing shall be minimized. Where internal bracing is required, bracing members of circular cross section are preferred.

3.1.10 NOT USED

3.1.11 NOT USED

3.1.12 The SELLER shall select insulation and design the Thermal Catalytic Oxidizers/Reducers and support frame to prevent the BUYER's concrete foundation from reaching a maximum temperature of 150°F.

3.1.13 SELLER shall design and supply necessary outlet piping for sample nozzles located downstream of the recuperative heat exchanger required for ammonia control. SELLER shall include pipe supports and Tied Expansion joints for both the offgas process inlet and outlet connections. Tied Expansion joints shall be 2 ply or greater.

3.1.14 The following are the Safety Significant functions of the HLW Thermal Catalytic Oxidizer/Reducer and the Ammonia/Air Dilution units. (Note: Only root components are listed below. See P&ID 24590-HLW-M6-HOP-00008 / -20008 for the remaining components):

a) Confinement of Melter Offgas: TCO housing, piping, and appurtenances shall be designed to maintain offgas confinement during normal operation, and during and after a seismic event. Structural failure of internals shall not breach confinement boundary.

b) Confinement of Ammonia: The ammonia supply piping, valves, and appurtenances shall maintain confinement of ammonia during normal operation, and during and after a seismic event.

c) Heater High Temperature Interlock: TE0514(Z), JY0520(Z), TE2514(Z), JY2520(Z). Heater to be shut down at a given high temperature setpoint to prevent an over temperature condition.

d) Low Dilution Air Flow Interlock: YV0504(Z), YV2504(Z), YV0509(Z), YV2509(Z), FT0517(Z), FT2517(Z), FT0518(Z), FT2518(Z). Ammonia supply to be shut off at a given low dilution air flow setpoint.

e) NOT USED

f) Low SCR Temp Interlock: TE0336(Z), TE2336(Z). Ammonia supply to be shut off at a given low SCR temperature setpoint.

g) NOT USED

h) NOT USED

i) NOT USED

3.1.15 NOT USED

3.2 Offgas Treatment System Description

Offgas is generated from the vitrification of radioactive waste in Joule heated ceramic melters.

3.2.1 NOT USED

3.2.2 HLW Thermal Catalytic Oxidizer/Selective Catalytic Reduction Units:

The feed to the HLW Thermal Catalytic Oxidizer/Reducer is primarily melter offgas that has been treated by a Submerged Bed Scrubber (SBS), Wet Electrostatic Precipitator (WESP), High Efficiency Mist Eliminator (HEME), HEPA Filters, Activated Carbon Bed Adsorber, and Silver Mordenite column.

3.3 Basic Function

Each Thermal Catalytic Oxidizer/Reducer unit shall consist of four primary components, a recuperative heat exchanger, electric heater, VOC selective catalytic oxidation (SCO) bed, and NO_X selective catalytic reduction (SCR) bed. The rating of each component shall be determined by the SELLER to meet the performance requirements specified in Section 3.4 of this specification. SELLER shall also include ammonia dilution and mixing appurtenances necessary to meet performance requirements of this specification.

3.3.1 Recuperative Heat Exchanger

The recuperative heat exchanger is primarily employed to recover heat from the SCR hot exhaust gas for the Thermal Catalytic Oxidation/Reducer unit. The heat exchanger shall cool down the hot SCR exhaust gas and heat the incoming offgas.

3.3.2 Electric Heater

The electric heater is downstream of the recuperative heat exchanger and is employed to heat the offgas feed to the final desired oxidation and reduction temperatures. After startup, the electric heater shall function as a trim control to raise the offgas temperature to the required oxidizing temperature. Required oxidizing and reduction temperatures shall be per performance criteria specified in Section 3.4 of this specification.

3.3.3 Oxidation Catalyst

The SCO, containing oxidation catalyst, is downstream of the Electric Heater and will oxidize volatile and semi-volatile organic compounds creating water and carbon dioxide. The residence time and number of catalyst beds shall be as specified in Section 3.4 of this specification.

3.3.4 NO_X Selective Catalytic Reduction Unit

The SCR, containing reduction catalyst, is downstream of the Oxidation Catalyst and shall use ammonia injection to reduce the NO_X to Nitrogen, Oxygen, and water through catalytic reaction with ammonia.

3.3.5 Ammonia Dilution System

The BUYER will supply ammonia gas to the HLW SCRs. SELLER shall specify dilution air flow rates and pressures if required for the Ammonia/Air Dilution system. SELLER shall supply necessary equipment required to meet performance requirements.

3.4 Performance

3.4.1 Refer to the Thermal Catalytic Oxidizers/Reducers MDSs for design data and gas stream properties.

3.4.2 The organic Destruction and Removal Efficiency (DRE) performance shall be based on inlet loadings specified in the MDSs.

3.4.3 The Thermal Catalytic Oxidizers/Reducers shall meet the DRE for Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) as required in the MDSs as well as residence time and minimum oxidizing temperatures specified.

3.4.4 The NOx SCR unit shall meet the reduction efficiency at less than the specified ammonia slip concentration required in the MDSs.

3.4.5 Detection limits used to verify the Thermal Catalytic Oxidizers/Reducers guaranteed performance shall be based on BUYER information (MDS General Note 9).

3.4.6 SELLER shall provide curves plotting efficiency versus inlet operating temperature for the Thermal Catalytic Oxidizer and Selective Catalytic Reducer catalysts.

3.4.7 SELLER shall provide ammonia slip curves for SCR performance.

3.4.8 NOT USED

3.4.9 NOT USED

3.4.10 The ammonia slip exiting the HLW systems shall be specified by the SELLER to meet the NOx reduction efficiencies specified in Section 3.4.4 of this specification.

3.4.11 BUYER's residence time, specified in the MDSs, is the minimum for VOC and SVOC destruction and therefore shall be used by SELLER if it exceeds the SELLER's calculated required residence time.

3.4.12 As specified in the MDSs, concentrations of certain chemical compounds are subject to large step increases and spikes. The SELLER's calculation shall account for these increases and spikes.

3.4.13 SELLER shall identify if additional NOx analyzers are required outside the boundaries of the SELLER's equipment to meet the specified NO_X reduction efficiency and ammonia slip MDS requirements. SELLER shall obtain BUYER's approval for additional NO_X analyzers.

3.5 Design Conditions

3.5.1 Refer to the Thermal Catalytic Oxidizers/Reducers and the associated Ammonia/Air Dilution MDSs in Section 2 of the MR.

3.5.2 NOT USED

3.5.3 As required, approximately ½ inches of shim plates will be stacked at embed locations for leveling support frames. SELLER shall provide a shim pack for each point the Thermal Catalytic Oxidizer/Reducer Skid's and Ammonia/Air Dilution Skid's support frames are supported and/or attached to BUYER's foundation embed plates. Each shim pack shall include one (1) 0.25 inch shim and two (2) 0.125 inch, 0.0625 inch, 0.040 inch, 0.010 inch, and 0.005 inch shims. Material shall be stainless steel 304, 304L, 316, 316L or any combination. Once leveled, the following will be completed to anchor column support frames to BUYER's foundation:

- Shim plates will be field welded together
- Support frames will be field welded to shim plates
- Shim plates will be field welded to embed plates

3.5.4 NOT USED

3.6 Environmental Conditions

3.6.1 The Thermal Catalytic Oxidizer/Reducer Skids and Ammonia/Air Dilution Skids will be located indoors. Refer to MDSs for specific room environmental design conditions.

3.6.2 Thermal Catalytic Oxidizers/Reducers and components, except catalysts, and the Ammonia/Air Dilution Skids may be stored outdoors prior to installation at ambient extreme temperatures ranging from minus 23°F dry-bulb to 113°F dry-bulb and a relative humidity of 0 to 100%.

3.6.3 Refer to Sections 3.7, 3.9 and 3.10 of this engineering specification for enclosure, instrumentation and electrical requirements and related environmental qualification requirements.

3.6.4 Safety Significant instrumentation that is required to meet environmental qualification shall be qualified in accordance with engineering specification 24590-WTP-3PS-JQ06-T0005, *Engineering Specification for Environmental Qualification of Control and Electrical Systems and Components.*

3.7 Mechanical Requirements

3.7.1 General

3.7.1.1 Due to access restrictions for installation, the Thermal Catalytic Oxidizer/Reducer units shall be fabricated in such a manner that will allow delivery in three to five sections that comply with the bounding dimensions specified in MDSs. Each section of the Thermal Catalytic Oxidizer/Reducer shall be skid mounted.

3.7.1.2 The catalyst bed shall be designed for manual removal and replacement. The catalyst bed shall be designed to meet service life requirements outlined in Section 3.1.2 of this specification. The weight of a catalyst module shall not exceed 50 pounds for lifting manually. BUYER prefers side access for replacing the catalysts. If weights exceed 50 pounds, lifting beams or rigs shall be designed and supplied by the SELLER.

3.7.1.3 SELLER shall provide transitions for connection to BUYER's piping and gas analyzer instrumentation. All flanges required for connection to BUYER's piping and gas analyzers shall have raised face flanges. See Attachment 4 (HLW Skid Interface Connections). See also Attachments 5 and 6 (Connection for Non-Routine Sample Extraction and Connection for Sample Extraction - Permanent Typical, respectively) for non-routine and permanent analyzer connection details.

3.7.1.4 SELLER shall provide TCO drain lines. Drain lines shall be welded to the housing at low points. Penetrations by drains shall be arranged and individually sealed so that catalysis beds cannot be bypassed. Drain lines shall be piped to skid edge and flanged.

3.7.1.5 NOT USED

3.7.1.6 SELLER shall design and supply recuperative heat exchanger outlet piping as specified in the MDSs. Pipe fabrication and supports shall be designed in accordance with ASME B31.3 and BUYER specification 24590-WTP-3PS-PS02-T0001 *Shop Fabrication of Piping*, and be included in the SELLER's scope of supply. SELLER shall include pipe supports and tied expansion joints for both offgas process inlet and outlet connections.

3.7.1.7 Mechanical components required to meet the Safety Significant functions of containment of melter offgas shall be designed and fabricated to meet environmental qualifications in accordance with engineering specification 24590-WTP-3PS-G000-T0015, *Engineering Specifi-cation for Environmental Qualification of Mechanical Equipment.*

3.7.1.8 A containment tent or series of containments tents will be erected by the BUYER to control the work area for catalyst removal and replacement after permanent installation of the TCO units. The BUYER will supply and set up a portable HEPA filtered exhauster for containment tent ventilation with discharge port monitoring. The TCO unit will be ventilated using permanently installed process fans. Prior to opening the catalyst access doors on the TCO unit, the TCO unit air will be sampled using an up stream, 1/4 inch pre-installed sample tap. The air sample will be used to determine the level of airborne radioactive material inside the TCO unit. After the air samples are taken and deemed acceptable, opening the catalyst access doors will take place inside the containment tent once stable air flow conditions are established.

The SELLER shall supply the following for each TCO unit:

- One 1/4 inch air sample tap per TCO unit. Include one 1/4 inch ball valve. The sample tap shall extend 12 inches inside the TCO unit. The accessible end of the 1/4 inch ball valve shall include a cap. There shall be at least 3 inches of clearance, for tightening bolts, between the insulating jacketing and the underside of the flange.

Catalyst removal / installation:

- The catalyst bed (s) shall be designed for manual removal and replacement without entering the TCO unit for contact maintenance. It is acceptable for hands and arms to break the plane of the catalyst access door to reach inside the TCO to operate jack bolts with hand tools or use tools with extended handles to remove /replace catalyst modules. It is acceptable to split the movable catalyst frame to minimize the weight of the frame being moved for catalyst module removal / replacement. Pulling the Catalyst module forward to unsnap the tongue and groove connection is not desirable. A jack bolt system that applies pressure to the movable frame to hold the catalyst modules in place is desired.

3.7.1.9 To facilitate process troubleshooting and to obtain additional data during testing and operations, the SELLER shall supply the following for each TCO unit:

- One thermowell between each of the VOC catalyst beds to be provided to take temperature readings during non-routine evolutions. Thermowells shall be located to minimize flow disturbance and not interfere with the manipulation of the catalyst access doors. The location shall consider optimum accessibility. However, it is acceptable to locate the thermowell on the top of the TCO. Include ball valve, blind flange, gaskets and bolts for each well assembly. See Attachment 5 (Connection for Non-Routine Sample Extraction) for temporary connection details.

- One sample port between each of the VOC catalyst beds to be used to measure offgas concentrations during non-routine evolutions. Sample ports shall be located to minimize flow disturbance and not interfere with the manipulation of the catalyst access doors. The location shall consider optimum accessibility. However, it is acceptable to locate the sample ports on the top of the TCO. Include ball valve, blind flange, gaskets and bolts for each sample port. See Attachment 5 (Connection for Non-Routine Sample Extraction) for temporary connection details.

3.7.2 Recuperative Heat Exchanger

3.7.2.1 Unless otherwise specified, the heat exchanger pressure boundary shall be designed in accordance with ASME B&PVC, Section VIII, Div. 1.

3.7.2.2 The recuperative heat exchangers in the Thermal Catalytic Oxidizer/Reducer units are expected to have a design life of 40 years. If the design life is less than 40 years, the SELLER shall provide provisions for cleaning, maintenance, repair or unit replacement. The SELLER shall submit options for cleaning, maintenance, repair or provisions for total unit replacement of the recuperative heat exchanger. Options to be considered, but not limited to, include:

- Body flanges that allow for total unit replacement,
- Clean out doors for maintenance access,
- Automatic wash systems/particulate collection hoppers, and
- Bolted connection to skid support frame.

3.7.2.3 Heat exchangers shall be designed for full differential pressure, with one side at the design pressure and the other side at atmospheric pressure.

3.7.2.4 NOT USED

3.7.2.5 NOT USED

3.7.2.6 NOT USED

3.7.3 Ammonia/Air Dilution Equipment

3.7.3.1 Design and fabrication of ammonia piping and valves shall be in accordance with ANSI K61.1, ASME B31.3, and BUYER specification 24590-WTP-3PS-PS02-T0001, *Shop Fabrication of Piping.*

3.7.3.2 NOT USED

3.7.3.3 Piping and components required for the HLW Ammonia/Air Dilution shall be located on a separate skid away from the Thermal Catalytic Oxidizer/Reducer skid. Refer to MDS for space envelope and equipment layout requirements. SELLER shall include necessary equipment to meet performance requirements of this specification.

3.7.3.4 NOT USED

3.7.3.5 NOT USED

3.7.3.6 NOT USED

3.7.3.7 NOT USED

3.7.3.8 NOT USED

3.7.3.9 NOT USED

3.7.3.10 NOT USED

3.7.3.11 NOT USED

3.7.3.12 NOT USED

3.7.3.13 NOT USED

3.7.3.14 NOT USED

3.7.3.15 NOT USED

3.7.3.16 NOT USED

3.7.3.17 NOT USED

3.7.3.18 NOT USED

3.8 Loading

3.8.1 The Thermal Catalytic Oxidizers/Reducers (24590-HLW-MX-HOP-SKID-00005/7) and the associated Ammonia/Air Dilution assemblies shall be self-supporting, capable of carrying the static loads of components and the stress imposed during shipment, installation, and operation.

3.8.2 The Thermal Catalytic Oxidizer/Reducer and the associated Ammonia/Air Dilution skids shall be designed in accordance with the load and load combination requirements of specification 24590-WTP-3PS-FB01-T0001, *Structural Design Loads for Seismic Category III & IV Equipment and Tanks* and 24590-WTP-3PS-MV00-T0002, *Engineering Specification for Seismic Qualification Criteria for Pressure Vessels.*

3.8.3 The SELLER shall provide a seismic analysis in accordance with Section 3.8.2 of this specification. The SELLER shall provide the documented results of the seismic analysis in report form to the BUYER.

3.8.4 The Thermal Catalytic Oxidizer/Reducer units shall be designed in accordance with the nozzle load requirements as specified in the MDSs in Section 2 of the MR.

3.9 Electrical Requirements

3.9.1 Electrical components and appurtenances furnished with the Thermal Catalytic Oxidizer/Reducer and the associated Ammonia/Air Dilution units shall conform to the requirements of specification 24590WTP-3PS-EKP0-T0001. *Electrical Requirements for Packaged Equipment.* Electrical components shall also meet applicable sections of NFPA 70, and requirements outlined in NFPA 497.

3.9.2 Electric heaters shall be of the element type and mounted on removable flanged plates for ease of maintenance. BUYER will supply a 480V 3-wire wye grounded power circuit. If SELLER's supplied heaters are rated for a lower voltage, SELLER shall supply the necessary components to step the electricity down to the necessary voltage.

3.9.3 Electrical enclosures shall be NEMA 4X rated.

3.9.4 The Thermal Catalytic Oxidizer/Reducer control panel components shall be UL 508 listed and certified. Control panels as a whole shall be UL 508A labeled.

3.9.5 Safety Significant electrical systems/components are required to meet environmental qualification and shall be qualified in accordance with engineering specification 24590-WTP-3PS-JQ06-T0005, *Engineering Specification for Environmental Qualification of Control and Electrical Systems and Components.*

3.9.6 NOT USED

3.9.7 SELLER shall provide a grounding lug or boss, in accordance with UL 467, on the equipment housing or frame to facilitate attachment of grounding cable by the BUYER.

3.9.8 SELLER shall provide total electric load for each Thermal Catalytic Oxidizer/Reducer.

3.10 Instrumentation and Control Requirements

3.10.1 Instrumentation and controls furnished with the Thermal Catalytic Oxidizer/Reducer and the associated Ammonia/Air Dilution units shall meet the requirements of engineering specification 24590-WTP-3PS-JQ07-T0001,Rev. 2, *Instrumentation for Package Systems*. BUYER shall provide the appropriate ABB control system components (i.e. I/O modules, power supplies) to the SELLER for fabrication into the SELLER's heater control panel as described in Section 3.4.2.1.1 of 24590-WTP-3PS-JQ07-T0001, Rev. 2. SELLER shall provide non-ABB manufactured equipment (fiber optic converters, fiber optic patch cables and plates, terminals, circuit breaker, wiring, etc.) and panel fabrication.

3.10.2 SELLER shall design the heater control panel to utilize the ABB control system equipment and provide a panel arrangement drawing with Bill of Material identifying all parts to be provided by the BUYER. SELLER shall provide an I/O list on the panel arrangement drawing for all instruments. Reference BUYER's P&IDs in Section 2 of the MR for additional information regarding instrument locations and types.

3.10.3 SELLER shall provide control narrative, logic drawings, termination drawings, and related items as specified in 24590-WTP-3PS-JQ07-T0001, *Instrumentation for Package Systems* for normal (PCJ) and safety control system (PPJ) operation. BUYER shall provide programming for normal operation (PCJ) via software included with BUYER supplied ABB components, and for safety operation via BUYER's safety control system (PPJ), according to SELLER's specification of the monitoring and control requirements. BUYER shall provide controller, software, and attend and support the factory test of the equipment at the SELLER's facility.

3.10.4 NOT USED

3.10.5 In-line instruments shall be wired or tubed to the skid edge. Tubing shall terminate with a bulkhead connection. Wiring shall terminate in a junction box.

3.10.6 NOT USED

3.10.7 NOT USED

3.10.8 NOT USED

3.10.9 NOT USED

3.10.10 NOT USED

3.10.11 NOT USED

3.10.12 NOT USED

3.10.13 NOT USED

3.10.14 Safety Significant instrumentation is required to meet environmental qualification and shall be qualified in accordance with engineering specification 24590-WTP-3PS-JQ06-T0005, *Engineering Specification for Environmental Qualification of Control and Electrical Systems and Components.*

3.11 Lifting Requirements

3.11.1 Lifting lugs shall be installed on the Thermal Catalytic Oxidizers/Reducers and Ammonia/Air Dilution skid packages for balanced lifting and handling. SELLER shall identify the weight and center of gravity of each package. All lifting points shall be designed in accordance with the requirements of BUYER specification 24590-WTP-3PS-G000-T0003, *General Specification for Packaging, Handling, and Storage Requirements.*

3.11.2 Lifting eyes or lugs shall be certified to be suitable for the safe, balanced lifting and handling of the equipment without distortion or damage to the components.

3.11.3 All lifting attachments shall have either a safety factor of three (3), based on material ultimate strength, or five (5), based on the material yield strength, whichever is more conservative. The lifting points and center of gravity shall have a label clearly identifying its safe working load.

3.11.4 Lifting lugs must accept standard commercial lifting equipment. Chain blocks or braiding shall not be permitted.

3.11.5 The lifting lugs for the packages must be accessible from the top, without removal of components or covers.

3.11.6 NOT USED

3.11.7 SELLER to provide calculations for the lift lug design.

3.12 Thermal Analysis Requirements

3.12.1 Method of thermal analysis shall be proposed by the SELLER.

3.12.2 Refer to MDS for thermal analysis technical information and heat loss requirements (i.e. thermal conductivity values, room temperatures, etc.).

3.12.3 The thermal analysis shall include the effects of stresses resulting from potential variations in temperatures due to startup, normal operation, shutdowns, and thermal cycling of the Thermal Catalytic Oxidizer/Reducer. Analysis shall show that the Thermal Catalytic

Oxidizers/Reducers are adequate for the design life specified in Section 3.1.2 of this specification. Analysis shall also establish design temperature of the TCOs.

3.12.4 The thermal analysis shall include thermal expansion of the Thermal Catalytic Oxidizers/Reducers and resulting nozzle loadings in X, Y, and Z planes with deflections at normal operating conditions and design conditions.

3.12.5 NOT USED

3.12.6 The thermal analysis shall determine the thickness and extent of insulation required on the sides, ends, top and bottom of the Thermal Catalytic Oxidizers/Reducers to ensure that the insulation jacket temperature and all exterior uninsulated portions with potential for personnel exposure, do not exceed 140 °F at maximum design temperature.

3.12.7 The thermal analysis shall determine the thickness and extent of insulation required on the bottom of the Thermal Catalytic Oxidizers/Reducers so that the temperature of the concrete does not exceed 150 °F.

3.12.8 The SELLER shall provide the documented results of the thermal analysis in report form to the BUYER. The thermal analysis report shall provide a complete thermal analysis of the Thermal Catalytic Oxidizers/Reducers and shall include 3-D graphical results of models and all calculations performed, as applicable to the analysis approach chosen.

3.12.9 All assumptions shall be plainly identified and data presented (including their uncertainty) with precise logic.

3.12.10 The final thermal analysis report shall convey information to several disciplines, many of whom may be less familiar with the general subject than the authors. Care shall be taken to use simple statements and expressions and to make statements as concise as possible. If highly technical terms are necessary, they shall be adequately explained and defined.

3.13 Thermal Catalytic Oxidizer/Reducer Design Analysis Requirements

3.13.1 The SELLER shall conduct and submit Thermal Catalytic Oxidizer/Reducer design analyses for the HLW units. The design analysis of the Thermal Catalytic Oxidizers/Reducers shall be conducted by a Thermal Catalytic Oxidizer/Reducer expert to determine the expected catalyst changeout frequency for the final Thermal Catalytic Oxidizer/Reducer design. SELLER shall provide personnel qualifications to the BUYER for review.

3.13.2 Analysis shall be conducted considering operation of the Thermal Catalytic Oxidizers/Reducers at design conditions outlined in this specification and MDSs.

3.13.3 Analysis shall determine expected catalyst changeout frequency based on the gas composition and load information specified in the MDSs in Section 2 of the MR.

3.13.4 The design analysis for expected catalyst changeout shall assume that the offgas flow through the Thermal Catalytic Oxidizers/Reducers may vary as much as ±10% from the design flowrate specified in the MDSs in Section 2 of the MR.

3.13.5 The SELLER shall provide the documented results of the Thermal Catalytic Oxidizer/Reducer analysis with any graphical results, as applicable, in report form to the BUYER prior to fabrication.

3.14 Accessibility and Maintenance

3.14.1 BUYER's layout allows for necessary access and space requirements to facilitate maintenance during normal plant operation or scheduled shutdown.

3.14.2 Supplier's recommended accessibility and maintenance requirements for each piece of equipment shall be included in the SELLER's design and shown on layout drawings. Side access for replacement of the catalyst and related gaskets is required.

3.14.3 NOT USED

3.14.4 SELLER shall provide instructions and frequency of maintenance including lubrication, rotation, heating, and any other type of preventative maintenance that will preserve the equipment until the time it is put into operation, including:

- Up to 12 months outdoor storage prior to installation
- Outdoor preservation maintenance and inspection schedule
- Indoor (installed) but not operating preservation maintenance and inspection schedule
- Operating preservation maintenance and inspection schedule

3.14.5 Frequency of inspection and maintenance intervals during operation shall be in accordance with equipment SELLER's recommendations.

3.14.6 Equipment, instrumentation, and electrical components that are six feet over from ground level and require routine maintenance shall be provided with permanent work platforms with fixed ladders/stairs to perform maintenance.

3.14.7 Maintenance platforms and ladders, if applicable per 3.14.6, shall be designed to meet the requirements set forth in 29 CFR 1910, Occupational Safety and Health Standards for General Industry and AISC 9th Edition.

3.14.8 The maintenance platforms, if applicable per 3.14.6, shall be attached without welding after the equipment is installed in the HLW facility.

4 Materials

4.1 General

4.1.1 SELLER shall comply with specification 24590-WTP-3PS-G000-T0002, *Positive Material Identification (PMI)*.

4.2 Construction

4.2.1 Materials of construction shall have properties suitable for the service conditions defined in the MDSs.

4.2.2 The ASME and/or ASTM material numbers and grades shall be identified and a "Manufacturer's Material Certificate of Compliance" shall be provided for the housing, ducts, weld filler metal, and support framing integral to the Thermal Catalytic Oxidizer/Reducer and the associated Ammonia/Air Dilution assemblies. Material designations shall be indicated on the fabrication drawings and in the material lists.

4.2.3 Thermal Catalytic Oxidizer/Reducer and the associated Ammonia/Air Dilution skids shall be fabricated from structural steel shapes and plates properly reinforced to be self-supporting, capable of carrying the static loads of components and the stresses imposed during shipment, installation, and operation.

4.2.4 Thermal Catalytic Oxidizer/Reducer and the associated Ammonia/Air Dilution housings and outlet piping shall be fabricated from materials specified in the MDSs in Section 2 of the MR.

4.2.5 NOT USED

4.2.6 Where the BUYER has not specified material types, the SELLER shall select materials giving consideration to the design life of the equipment, compatibility with adjacent materials, compatibility with the process materials and conditions, environmental conditions, and coating requirements.

4.3 Prohibited Materials

4.3.1 As applicable, mercury, zinc, cadmium, or other low melting point materials and halogens shall not be used in direct contact with stainless steel. This prohibition also applies to use of tools, fixtures, paints, coatings and sealing compounds, and any other equipment or materials used by the SELLER in handling, assembly and storage of stainless steel parts or components.

4.3.2 Asbestos shall not be used in any component of the Thermal Catalytic Oxidizers/Reducers, the associated Ammonia/Air Dilution units, and appurtenances.

4.3.3 The prohibited materials list excludes materials that might be used for bearings, brazed joints, or instruments.

4.3.4 The equipment provided to the BUYER shall not contain any of the materials listed in 24590-WTP-LIST-CON-08-0001, *Restricted Materials List WTP Safety Assurance* unless BUYER (Safety Assurance) approval is obtained.

4.4 Insulation

4.4.1 The SELLER shall provide detailed insulation installation procedures complete with drawings showing methods and details for applying and securing insulation. Installation procedures and drawings shall include details related to applying and securing metal jacketing (if externally insulated), to the Thermal Catalytic Oxidizers/Reducers. The insulation procedures shall be in accordance with BUYER specification 24590-WTP-3PS-NN00-T0001 *Thermal Insulation for Mechanical Systems*, and this specification. The insulation installation procedures shall be reviewed by the BUYER prior to commencement of work to install insulation on the Thermal Catalytic Oxidizers/Reducers.

4.4.2 SELLER shall recommend cements, mastics, and adhesives that will be suitable for the maximum design temperature of the Thermal Catalytic Oxidizers/Reducers. The mixing of cements, mastics, etc., shall be done with deionized water.

4.4.3 NOT USED

4.4.4 NOT USED

4.4.5 Provide for removable/replaceable insulation on flanges, manholes, doors, and access openings.

4.4.6 Insulation thickness greater than three (3) inches applied to the exterior of the Thermal Catalytic Oxidizers/Reducers shall be applied in multiple layers with staggered joints. Each layer of multiple layer and double insulation shall be held in place separately.

4.4.7 Exterior insulation shall be jacketed with 304 stainless steel. The stainless steel jacketing shall be 0.024 inch thick flat and smooth sheet, and conform to ASTM A240. The jacketing shall be furnished in the annealed or soft condition with a regular 2B mill finish and have a factory applied moisture barrier.

4.4.8 Design jacketing with an overlap of 2 inch minimum between sections. Standard process industry practices shall be followed.

4.4.9 Design stainless steel jacketing exposed edges to be machine-bent or rolled to eliminate sharp corners.

4.4.10 NOT USED

4.4.11 NOT USED

4.4.12 NOT USED

4.4.13 NOT USED

4.4.14 All insulation components, including facings, mastics, and adhesives, shall meet ASTM E84 fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed. Ratings used are determined by Underwriters Laboratories Inc. (UL).

5 Fabrication

5.1 General

5.1.1 Fabrication of the thermal catalytic oxidizer/reducer units shall be in accordance with the requirements of 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication.*

5.1.2 Fabrication of piping shall meet the requirements of BUYER specifications 24590-WTP-3PS-PS02-T0001 Shop Fabrication of Piping, 24590-WTP-3PS-NWP0-T0001 *General Welding and NDE Requirements for Supplier Fabricated Piping*, and ASME B31.3.

5.1.3 NOT USED

5.1.4 NOT USED

5.1.5 All stainless steel metal working, grinding, cutting, machining and welding shall use tools and consumables dedicated and segregated from all others to prevent cross contamination. A dedicated work area for tools, equipment storage, parts storage and raw materials must be established to control contamination. Welding consumables for stainless steel welding must be segregated from other consumables.

5.2 Welding

5.2.1 Design and fabrication of the TCO pressure boundary shall be in accordance with specification 24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication*

5.2.2 Welding of the TCO pressure boundary shall be in accordance with specification 24590-WTP-3PS-MVB2-T0001, *Welding of Pressure Vessels, Heat Exchangers and Boilers.*

5.2.3 Fabrication of TCO piping shall be in accordance with 24590-WTP-3PS-PS02-T0001, *Shop Fabrication of Piping.*

5.2.4 Welding and NDE of TCO piping shall be in accordance with specification 24590-WTP-3PS-NWP0-T0001, *General Welding and NDE Requirements For Supplier Fabricated Piping.*

5.2.5 NOT USED

5.2.6 NOT USED

5.2.7 NOT USED

5.2.8 NOT USED

5.2.9 NOT USED

5.2.10 Welding of carbon structural steel shall be in accordance with AWS D1.1 and specification 24590-WTP-3PS-SS00-T0001, *Welding of Carbon Structural Steel.*

5.2.11 Welding of structural stainless steel shall be in accordance with AWS D1.6 and BUYER specification 24590-WTP-3PS-SS00-T0002, *Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel.*

5.2.12 NOT USED

5.2.13 NOT USED

5.3 Painting

5.3.1 Shop painting shall be in accordance with 24590-WTP-3PS-AFPS-T0001, Shop Applied Special Protective Coating for Steel Items and Equipment.

5.3.2 NOT USED

5.4 Assembly

5.4.1 NOT USED

5.4.2 NOT USED

5.4.3 NOT USED

5.4.4 The Thermal Catalytic Oxidizers/Reducers and the associated Ammonia/Air Dilution units shall have edges that are both smooth and not sharp to the touch.

5.4.5 NOT USED

5.4.6 NOT USED

6 Tests and Inspections

6.1 General

6.1.1 The SELLER shall provide all instruments, cables, and facilities necessary to perform any shop tests, the Factory Acceptance Tests (FAT) and NDE.

6.1.2 SELLER shall provide the necessary hardware, fan, pre heater, power, controls, temporary insulation, piping, and ductwork for the HLW TCOs and test equipment to set up and operate the HLW TCOs at the design conditions specified in the HLW MDS at the supplier's shop. The HLW TCOs shall operate at a negative pressure so the test shall include a temporary fan(s) setup which meets the HLW MDS design conditions and a temporary pre-heater to simulate the hot gas from the melters (as specified in the MDS).

6.1.3 SELLER shall provide the necessary hardware, power, controls and test equipment to set up and operate the Instrument Service Air (ISA) supply on the Ammonia/Air Dilution Skid at the conditions prescribed in the MDS.

6.1.4 Any non-conforming work shall be redone by the SELLER at SELLER's cost.

6.2 Personnel Qualifications

6.2.1 NDE personnel performing NDE shall work in accordance with the following BUYER specifications:

- 24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication*
- 24590-WTP-3PS-MVB2-T0001, *Engineering Specification for Welding of Pressure Vessel, Heat Exchangers and Boilers*
- 24590-WTP-3PS-SS00-T0001, *Engineering Specification for the Welding of Carbon* Structural *Steel*
- 24590-WTP-3PS-SS00-T0002, *Engineering Specification for the Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*
- 24590-WTP-3PS-NWP0-T0001, *Engineering Specification for General Welding and NDE Requirements for Supplier Fabricated Piping,*
- 24590-WTP-3PS-PS02-T0001, *Engineering Specification for Shop Fabrication of Piping*

6.3 Non-Destructive Examinations

6.3.1 NDE shall be in accordance with the following BUYER specifications:

- 24590-WTP-3PS-MV00-T0001, *Pressure Vessel Design and Fabrication*
- 24590-WTP-3PS-MVB2-T0001, *Engineering Specification for Welding of Pressure Vessel, Heat Exchangers and Boiler*
- 24590-WTP-3PS-SS00-T0001, *Engineering Specification for the Welding of Carbon* Structural *Steel*
- 24590-WTP-3PS-SS00-T0002, *Engineering Specification for the Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*
- 24590-WTP-3PS-NWP0-T0001, *Engineering Specification for General Welding and NDE Requirements for Supplier Fabricated Piping*
- 24590-WTP-3PS-PS02-T0001, *Engineering Specification for Shop Fabrication of Piping*

6.3.2 NDE procedures shall be submitted to BUYER for review prior to use.

6.3.3 Submittal of exposed radiographs is required. Original set of exposed radiographic film must be sent, along with technique and reader sheets. Film must be packaged in such a manner as to preclude moisture and handling damage.

6.4 Shop Tests

6.4.1 SELLER shall perform the FAT that demonstrates the function of the equipment. These tests shall be conducted in accordance with Section 6 of 24590-WTP-3PS-JQ07-T0001 Rev. 2, Section 6 of 24590-WTP-3PS-EKP0-T0001, Rev. 3, and additional requirements identified within this specification.

6.4.2 BUYER's Supplier Quality (SQ) representative shall witness the FAT, and BUYER's Engineering shall be present for the Functional Testing portion of the FAT.

6.4.3 Prior to notification by SELLER that a unit is ready for the BUYER to witness the Functional Test portion of the FAT, SELLER shall perform all other FAT mechanical and electrical inspections to ensure completed equipment is functioning and ready for the Functional Test. Any deficiencies shall be corrected prior to the Functional Test.

6.4.4 SELLER shall have unit up and ready for Functional Testing prior to the BUYER's team arriving on the day the Functional Test is to commence.

6.4.5 SELLER shall submit FAT inspection plan and Functional Test procedure for BUYER review prior to use by the SELLER. SELLER shall provide a signed copy of completed FAT inspection report (information only) to BUYER at time of notification that SELLER is ready for the Functional Test.

6.4.6 SELLER shall submit a report of FAT results.

6.4.7 Functional Test procedures shall be prepared by the SELLER in accordance with 24590-WTP-3PS-JQ07-T0001, Rev. 2, Section 11.3.2. As stated in 24590-WTP-3PS-JQ07-T0001, Rev. 2, the scope of functional testing shall be agreed to between the BUYER and SELLER via review of the proposed test procedure.

6.4.8 The following is a list of preliminary BUYER expectations for the HLW TCO Functional Test. This list is subject to change by the BUYER during review of proposed test procedure. Changes to these expectations, agreed to during review of the proposed test procedure, do not need to be reflected in a revision to this specification.

a. Test setup shall simulate the melter operating conditions per the mechanical data sheet.

   i. Pressure testing shall be performed in accordance with required testing specified in ASME B31.3-1996 or ASME BPV Code Section VIII Division I as applicable. In addition to these codes required pressure tests, additional testing shall be performed to further demonstrate the pressure boundary integrity of equipment which will be subject to internal pressure above atmospheric during normal equipment operation. Record on FAT datasheet.

   ii. Sensitive Leak Testing shall be performed on piping in accordance with ASME B31.3-1996 Section 345.8. Record on FAT datasheet.

   iii. Bubble Testing shall be performed on equipment designed and fabricated in accordance with ASME BPV Code Section VIII, Division I in accordance with ASME BPV Code Section V, Article 10. Record on FAT datasheet.

   iv. Obtain unit pressure drop measurements at ambient conditions and at heatup intervals specified by the BUYER. Record on FAT datasheet.

   v. Obtain catalyst bed seal measurements at ambient conditions and at heatup interval specified by the BUYER. Record on FAT datasheet.

   vi. Preheat the incoming air, prior to HOP-HTR-00001 and HOP-HTR-00007, to simulate the hot offgas from the melter.

   vii. Provide power and temporary controls for heater HOP-HTR-00001 and HOP-HTR-00007.

viii. Run the HLW TCO for 24 hours under this setup, prior to test objective testing.

b. Test objectives:

i. Verify the TCO heater, HOP-HTR-00001 and HOP-HTR-00007 provides the required heat to maintain temperature within the operating range as specified on the MDS.

ii. Verify the melter maximum flowrate of approximately 3092 ACFM can be achieved. The flowrate provided here is for information only and subject to change. Refer to the MDS for the actual flowrate.

iii. Verify the actual differential pressure drop is less than the allowable differential pressure drop of 12 inch water gauge. The pressure drop provided here is for information and subject to change. Refer to the MDS for the actual pressure drop. Record on FAT datasheet.

iv. Verify the TCO outlet temperature at TE 0336 or TE 2336 is less than 426 °F. The temperature provided here is for information and subject to change. Refer to the MDS for the actual temperature. Record on FAT datasheet.

v. NOT USED

vi. Verify no leaks at the access doors under operating conditions. Ultrasonic leak detectors like AccuTrak VPE-1000, SON-TECTOR 123 or equal are acceptable for leak testing around the access door gaskets.

vii. Verify unit pressure drop is within acceptable limits as stated in BUYER-approved FAT. Record on FAT datasheet.

viii. Verify the floor temperature under the TCO is less than 150°F. Record on FAT datasheet.

c. After the TCO unit has cooled, verify unit pressure drop is within acceptable limits as stated in BUYER-approved FAT. Record on FAT datasheet.

d. After the TCO unit has cooled, verify no deformation or degradation to the housing and internal components. Document findings on FAT datasheet.

e. After the TCO unit has cooled, obtain catalyst bed seal measurements and compare to measurements taken in Section 6.4.8.a.ii. Record on FAT datasheet.

f. After the TCO unit has cooled, demonstrate the catalyst can be removed and replaced with out a person breaking the plane of the access doors. It is acceptable if arms break the access door plane during catalyst removal or installation.

i. Supplier to submit a catalyst installation and removal procedure.

6.4.9 The following is a list of expectations for the Ammonia Skid Functional Test. This list is subject to change by the BUYER during review of proposed test procedure. Changes to these expectations, agreed to during review of the proposed test procedure, do not need to be reflected in a revision to this specification.

a. Test set up:

   i. Pressure testing shall be performed in accordance with required testing specified in ASME B31.3-1996 or ASME BPV Code Section VIII Division I as applicable. In addition to these codes required pressure tests, additional testing shall be performed to further demonstrate the pressure boundary integrity of equipment which will be subject to internal pressure above atmospheric during normal equipment operation. Record on FAT datasheet.

   ii. Sensitive Leak Testing shall be performed on piping in accordance with ASME B31.3-1996 Section 345.8. Record on FAT datasheet.

   iii. It is acceptable to use temporary air and controls to open and close valves on the Ammonia/Air Dilution Skid.

b. The SELLER shall provide the following air source:

   i. NOT USED

   ii. Dry, oil and dust-free Instrument Service Air (ISA) at 90-150 psig and with a dew point value of -40°F at 100 psig based on ISA 7.0.01.

c. Test objectives:

   i. Satisfactory results for 6.4.9.a criterion stated above.

   ii. Actuated valves are full-cycled a minimum of 3 times and flow instrument loops respond per the design.

6.4.10 NOT USED

6.4.11 NOT USED

6.4.12 NOT USED

6.4.13 SELLER provided lifting equipment such as, but not limited to, spreader beams, strong backs, and yokes, shall be tested in accordance with Section 9.4 of 24590-WTP-3PS-G000-T0003.

6.4.14 All overhead lifting points shall be proof tested. Test and examination certificates/documentation shall be provided to the BUYER for review. Lifts shall be conducted in accordance with a BUYER reviewed handling procedure.

6.4.15 Proof tests shall be conducted with at least the equipment weight.

6.4.16 After the proof tests, the lifting points shall be inspected:

6.4.17 The welds on fabricated lifting lugs shall be dye penetrant tested. Acceptance criteria shall be from the prevailing weld design code or standard.

6.4.18 Lift points shall be inspected for visual permanent plastic deformation of the material that may invalidate the design analyses for the lift point.

6.5 Site Tests

6.5.1 The BUYER startup personnel shall perform acceptance tests after initial installation to confirm the Thermal Catalytic Oxidizers/Reducers and the associated Ammonia/Air Dilution units meet the performance requirements specified in Section 3.4 of this specification.

7 Preparation for Shipment

7.1 General

The Thermal Catalytic Oxidizers/Reducers, catalysts, assemblies and the associated Ammonia/Air Dilution units shall be packaged, handled, and stored in accordance with BUYER specification 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling, and Storage Requirements.*

7.2 Tagging

7.2.1 A stainless steel nameplate shall be attached in a visible location to each Thermal Catalytic Oxidizer/Reducer and Ammonia/Air Dilution unit showing the manufacturer's name, shop location, date of manufacture, serial number, equipment rating, equipment tag numbers, weight of assembly and purchase order number. Instruments shall be tagged per 24590-WTP-3PS-JQ07-T0001, Rev. 2, Section 8.

7.2.2 Electrical/Control panels shall be tagged with component identification numbers per 24590-WTP-3PS-JQ07-T0001, Rev. 2, Section 3.6.8.

7.2.3 Mechanical subcomponents (valves, strainers, expansion/flex joints, filters, mixing chambers, etc) shall have component identification number engraved on a 1/16" minimum thick stainless steel tag with ¼" minimum character height, securely attached with 1/16" minimum diameter aircraft cable and ferrules.

7.2.4 Component identification numbers shall be as shown on BUYER's P&IDs or MDSs attached to the MR, or will be provided via BUYER mark up of SELLER submitted drawings.

7.3 Documentation

SELLER shall ensure that appropriate documentation is prepared and signed by the appropriate person(s), if required. The shipping documentation shall accurately reflect specific traceability to the items being shipped. Drawings (wiring diagrams), showing external terminations for BUYER use to connect to SELLER provided instrumentation, shall be marked with the BUYER's instrument tag numbers.

8 Quality Assurance

8.1 General Requirements

8.1.1 The SELLER's QAP Requirements are included in BUYER specification 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.1.2 SELLER's QAP Manual shall be submitted to BUYER for review in accordance with BUYER specification 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.1.3 SELLER's QAP, as a minimum, shall contain the requirements detailed on the CM Datasheet of Quality Assurance Program Requirements, attached to Section 2 of the MR.

8.1.4 For items designated quality level commercial (CM), no additional QA program requirements are mandated by BUYER beyond SELLER's commercial QA program.

8.2 Quality (CM) Requirements

8.2.1 SELLER shall have in place a QAP meeting the requirements of BUYER specification 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.2.2 NOT USED

8.2.3 The successful bidder must pass a pre-award survey by the BUYER. SELLER shall demonstrate that its quality program is in compliance with the quality requirements listed in the Supplier Quality Assurance Program Requirements Data Sheet.. The SELLER shall allow the BUYER, its agent, and DOE access to their facility and records pertaining to this purchase order for the purpose of Quality Assurance Audits and Surveillance at mutually agreed times.

8.2.4 SELLER shall submit their QAP and work plan to BUYER for review prior to commencement of work. The plan shall include documents and procedures to implement the work and include a matrix of essential Quality Assurance elements cross referenced with the documents/procedures.

8.2.5 NOT USED

8.2.6 NOT USED

8.2.7 NOT USED

8.3 Supplier Deviation

Each SELLER shall be required to identify and promptly document all deviations from the requirements of the procuring documents. In addition, the supplier shall be required to describe the recommended disposition for BUYER's acceptance based on appropriate analysis. Submittals of request for deviations from lower-tier suppliers shall be through the prime supplier to WTP. SELLER-proposed deviations from procurement documents shall be initiated by use of Supplier Deviation Disposition Request (SDDR) form in Section 2 of the MR.

9 Configuration Management

Equipment and/or components covered by this specification are identified with plant item numbers shown in the MDSs. Each item shall be identified in accordance with Tagging in Section 7.2 of this specification.

10 Documentation and Submittals

10.1 General

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

10.2 Submittals

The SELLER shall submit the following:

10.2.1 Drawings

Drawings shall be in accordance with ASME Y14.100 and show the following information:

10.2.1.1 The outline dimensions of each Thermal Catalytic Oxidizer/Reducer and Ammonia/Air Dilution units, including outline and detail drawings for each component. These drawings shall reflect the "as-shipped" configuration of the equipment and instrumentation.

10.2.1.2 Details of construction.

10.2.1.3 Mounting dimensions and information required for the design of supports and foundations.

10.2.1.4 Operating weight and center of gravity of each Thermal Catalytic Oxidizer/Reducer and Ammonia/Air Dilution unit.

10.2.1.5 The space required for the removal of components.

10.2.1.6 The location of access doors.

10.2.1.7 Thermal insulation and interface points with BUYER's foundation.

10.2.1.8 NOT USED

10.2.1.9 NOT USED

10.2.1.10 Wiring and schematic diagrams. Diagrams shall include wire gauges and fuse sizes applicable to the supplied units only.

10.2.1.11 The ASTM or equivalent designation for materials.

10.2.1.12 Nozzle locations for connections to BUYER's process and utility piping including electrical and instrumentation connections.

10.2.1.13 Piping and instrumentation diagrams (P&IDs).

10.2.2 Procedures

Procedures shall include but are not limited to:

10.2.2.1 SELLER's shipping preparation and storage procedures.

10.2.2.2 Startup, operation, shutdown and idle procedures/manual.

10.2.2.3 Catalyst changeout procedures.

10.2.2.4 Performance test procedures and acceptance criteria for shop tests.

10.2.2.5 Insulation installation procedures.

10.2.2.6 Surface preparation and coating procedures for components specifically fabricated for the TCOs/SCRs.

10.2.3 Inspection and Test Reports

10.2.3.1 NOT USED

10.2.3.2 NOT USED

10.2.3.3 Performance test reports for shop tests.

10.2.3.4 NOT USED

10.2.3.5 Reliability assessment.

10.2.3.6 NOT USED

10.2.3.7 NOT USED

10.2.4 Calculations

10.2.4.1 Seismic and Thermal analyses/calculations shall be submitted for BUYER's review and permission to proceed. Analyses shall include nozzle loadings and deflections for normal operation and design conditions.

10.2.4.2 NOT USED

10.2.4.3 NOT USED

10.2.5 Manuals

Manuals and instructions shall include:

10.2.5.1 Erection and installation manuals which provide complete, detailed procedures for installing and placing equipment in initial operation. The manuals shall include all erection and installation drawings. Refer to BUYER specification 24590-WTP-3PS-G000-T0003 *General Specification for Packaging, Handling and Storage Requirement*, for additional requirements.

10.2.5.2 Operation, accessibility and maintenance manuals which provide complete, detailed descriptions of components and appurtenances with data sheets showing design, construction and performance data for equipment. Manuals shall include drawings required for operation, maintenance and repair, maintenance requirements, instructions and operational troubleshooting guides.

10.2.5.3 Instruction manuals shall cover items purchased, including materials that the SELLER has obtained from a subcontractor. The SELLER shall obtain such manuals and lists, and submit them to the BUYER.

10.2.5.4 The SELLER shall provide instructions regarding transportation, site storage and preparation, and protection of equipment after installation and prior to operation. Refer to BUYER specification 24590-WTP-3PS-G000-T0003 *General Specification for Packaging, Handling and Storage Requirement*, for additional requirements.

10.2.6 Certificates of Conformance and Acceptance

10.2.6.1 SELLER shall provide Certificates of Conformance demonstrating compliance with all applicable standards, specifications, and drawings.

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

10.2.6.3 Attachment 7 provides the Certificate of Analysis (COA) for BASF Catalysts, LLC (VOCat 300S) used in Catholic University's Vitreous State Laboratory (VSL) testing. Prior to release for shipment SELLER shall provide the COA demonstrating the performance of the oxidation catalyst is equal to or better than the oxidation catalyst used in the reference VSL testing (Ref. MDS General Note 9) for BUYER's acceptance.

10.2.7 Schedules

Lists and schedules shall include:

10.2.7.1 Schedule of engineering and fabrication.

10.2.7.2 Parts list, and cost for parts and items subject to deterioration and replacement.

10.2.7.3 List of recommended spare parts. The spare parts list shall include names of the original equipment manufacturer with appropriate part numbers.

10.2.8 Materials Certificates/Statistics

10.2.8.1 Material Certificate of Compliance shall be submitted for components of each Thermal Catalytic Oxidizer/Reducer unit and each Ammonia/Air Dilution unit. Certificate shall include certified material test reports of chemical and physical properties for all stress components.

10.2.8.2 Manufacturer's Material Certificate of Compliance with ASME and/or ASTM material numbers and grades shall be provided for the housing, ducts, weld filler metal, and support framing integral to each Thermal Catalytic Oxidizer/Reducer and each Ammonia/Air Dilution assembly.

10.2.8.3 Material Safety Data Sheets (MSDSs).

10.2.9 Data

Data shall include:

10.2.9.1 BUYER's Mechanical Data Sheets, completely filled out by the SELLER, showing all information required to determine that the units are of the design and materials specified herein.

10.2.9.2 All data compiled during FAT testing.

10.2.9.3 NOT USED

10.2.10 NOT USED

11 References

Design changes incorporated by reference:

N/A

34.0 ANSI K61.1, American National Standard Safety Requirements for the Storage and Handling of Anhydrous Ammonia

Revision: 1999
Sponsoring Organization: Compressed Gas Association, Inc.

WTP Specific Tailoring

The following tailoring of ANSI K61.1 is required for use by the WTP project as an implementing standard for the safety related systems design.

Page 9; Section 5.1 Equipment and systems

Revise Section 5.1 as follows.

Not Applicable

Justification: Section allows the continued use or reinstallation of containers and systems designed and installed under earlier versions of codes and ANSI standards. WTP does not plan on using previously installed or design equipment. Therefore, Section 5.1 of this standard will not be implemented for this project.

Page 19; Section 6.3 Pressure relief devices

Revise Section 6.3.2 as follows:

Not Applicable

Justification: Section specifies relief valve design for underground containers. WTP does not plan to install underground containers. Therefore, Section 6.3.2 of this standard will not be implemented for this project.

Revise Section 6.3.3 as follows:

Not Applicable

Justification: Section specifies manhole design for relief for underground containers. WTP does not plan to install underground containers. Therefore, Section 6.3.3 of this standard will not be implemented for this project.

Page 19; Section 6.4 Installation of storage containers

Revise Section 6.4.4 as follows:

Not Applicable

Justification: Section specifies design requirements for the installation of underground containers. WTP does not plan to install underground containers. Therefore, Section 6.4.4 of this standard will not be implemented for this project.

Revise Section 6.4.5 as follows:

Not Applicable

Justification: Section specifies design requirements for the installation of underground containers. WTP does not plan to install underground containers. Therefore, Section 6.4.5 of this standard will not be implemented for this project.

Revise Section 6.4.7 as follows:

Not Applicable

Justification: Section specifies design requirements for the installation of underground storage systems. WTP does not plan to install underground storage system. Therefore, Section 6.4.7 of this standard will not be implemented for this project.

Revise Section 6.4.8 as follows:

Not Applicable

Justification: Section specifies design requirements for the installation of underground tanks. WTP does not plan to install underground tanks. Therefore, Section 6.4.8 of this standard will not be implemented for this project.

Page 20; Section 6.5 Reinstallation of containers

Revise Section 6.5 as follows:

Not Applicable

Justification: Section specifies requirements for reinstallation of containers. WTP does not plan to use previously used containers. Therefore, Section 6.5 of this standard will not be implemented for this project.

Pages 21-26; Section 7 Refrigerated storage

Revise Section 7 as follows:

Not Applicable

Justification: This section establishes design requirements for system using tanks for the storage of anhydrous ammonia under refrigerated conditions. WTP does not plan on a system using tanks for the storage of anhydrous ammonia under refrigerated conditions. Therefore, Section 7 of this standard will not be implemented for this project.

Pages 26-28; Section 8 Systems mounted on railcar structures (tank cars), other than DOT class 106A, for transportation of ammonia

Revise Section 8 as follows:

Not Applicable

Justification: This section establishes design requirements for tank cars for the rail transportation of ammonia. WTP does not plan to receive anhydrous ammonia by rail car. Therefore, Section 8 of this standard will not be implemented for this project.

Pages 31-32; Section 10 Systems using DOT portable tanks and cylinders

Revise Section 10 as follows:

Not Applicable

Justification: This section establishes requirements for cylinders (less than 1000 pounds), DOT portable tanks and DOT containers. WTP does not plan to receive anhydrous ammonia by container or cylinder. Therefore, Section 10 of this standard will not be implemented for this project.

Pages 32-34; Section 11 Systems mounted on farm wagons (implements of husbandry) for the transportation of ammonia

Revise Section 11 as follows.

Not Applicable

Justification: This section establishes requirements for equipment mounted on farm wagons for the transportation of ammonia. WTP does not plan to use farm wagons for the transportation of ammonia. Therefore, Section 11 of this standard will not be implemented for this project.

Pages 34-35; Section 12 Systems mounted on farm wagons (implements of husbandry) for the application of ammonia

Revise Section 12 as follows:

Not Applicable

Justification: This section establishes requirements for equipment mounted on farm wagons for the application of ammonia. WTP does not plan to use farm wagons for the application of ammonia. Therefore, Section 12 of this standard will not be implemented for this project.

Pages 35-37; Section 13 References

The references listed shall be constrained to the approved versions listed in the SRD or approved changes and equivalencies.

The following references shall be excluded:

ANSI/ASHRAE 15, American National Standard Safety Code for Mechanical Refrigeration

ANSI/IIAR 2, American National Standard for Equipment, Design and Installation of Ammonia Mechanical Refrigeration Systems

ANSI/ASME B31.5, American National Standard for Refrigeration Piping

ANSI/SAE J1513f, Refrigeration Tube Fittings

API Standard 620, Design and Construction of Large Welded Low-Pressure Storage Tanks

Justification: The above references are for the design of refrigerated storage systems. WTP does not plan to use a refrigerated anhydrous ammonia storage system. Therefore, these references will not be implemented for this project.

The following references shall be excluded:

40 CFR Part 280, Technical standards and corrective action requirements for owners and operators of underground storage tanks (UST)

Justification: The above reference is for underground storage tanks. WTP does not plan to use underground storage tanks for anhydrous ammonia. Therefore, these references will not be implemented for this project.

The following references shall be excluded:

CGA G-7, Guide to the Preparation of Precautionary Labeling and Marking of Compressed Gas Containers

ANSI/CGA V-1, American National Standard Compressed Gas Association Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections

Justification: The above references are for the use of cylinders and small (less than 1 ton) containers. WTP does not plan to use cylinders or small containers for anhydrous ammonia storage. Therefore, these references will not be implemented for this project.

The following references shall be excluded:

ANSI/ASAE S276, Slow Moving Vehicle Identification Emblem
ANSI/ASAE S338.2, Safety Chain for Towed Equipment

Justification: The above references are for the use of ammonia systems mounted on farm equipment. WTP does not plan to use farm equipment for anhydrous ammonia storage. Therefore, these references will not be implemented for this project.

26.0 ASME B31.3-1996, Process Piping

Revision: 1996
Sponsoring Organization: ASME

WTP Specific Tailoring

The following tailoring of ASME B31.3, *Process Piping*, is required for use by the WTP contractor as an Implementing Standard for: (1) the fabrication and installation of those portions of the C5V ductwork that are being embedded in concrete, (2) the use of ASME B16.9 welding tees in accordance with ASME B31.3-2002, (3) use of vacuum box leak testing, and (4) the ASME B31.3-1998, paragraph 345.2.3(c), allowance for not leak testing closure welds outside of inaccessible areas.

- The tailored sections of ASME B31.3 applicable to embedded ductwork will only be utilized to the extent that it will cover the fabrication, installation, and inspection (and associated testing) of Category D fluid service piping being used as C5 ductwork. Air testing requirements for this ductwork will be compliant with ASME AG-1. Below is a description of those portions of ASME B31.3 that apply to fabrication, installation, and inspection of Category D fluid service piping and the sections of the SRD that they will apply to.
- The tailored sections of ASME B31.3 applicable to welding tees will only be used for ASME B16.9 welding tees. As long as the stress intensification factors from ASME B31.3-2002 are used in the stress analysis for the welding tees, welding tees fabricated to either the 1996 or the 2002 edition of ASME B31.3 can be used. Below is a description of those portions of ASME B31.3, Appendix D, Table D300, that apply to welding tees and the section of the SRD to which they will apply.
- The tailored paragraphs of ASME B31.3 applicable to vacuum box leak testing, in lieu of hydrostatic or pneumatic leak testing, will only be used to leak test full penetration circumferential piping field butt welds inside an inaccessible area (as defined in Appendix H, Section 6.0) out to the first isolation component outside the inaccessible area. Further, if the 100 % volumetric inspection using ultrasonic examination per ASME B31.3 paragraph 344.6, is conducted for welds to be vacuum box tested, then the ultrasonic examination shall be conducted using a method that creates and maintains a reproducible computerized image(s) of the entire weld in the axial and radial direction.
- The tailored paragraphs of ASME B31.3 adopting the provisions of ASME B31.3 (c) - 1998 Addendum paragraph 345.2.3(c) are applicable to all ASME B31.3 piping in all facilities except for closure welds in inaccessible areas.

Piping providing a confinement function in accordance with SRD 4.4-3 will comply with the following sections of ASME B31.3-1996, *Process Piping*. These sections of ASME B31.3 are applicable for embedded ductwork.

Chapter 3, Materials

Chapter 5, Fabrication

Table 341.3.2, Visual acceptance criteria for Category D fluid service piping

Justification: Due to wall thickness requirements of duct embedded in concrete, piping materials are required. ASME B31.3 will apply to materials, fabrication, and inspection standards as appropriate. Testing requirements for nuclear air treatment systems will be consistent with ASME AG-1.

Piping providing a confinement function in accordance with SRD 5.1-2 will comply with the following sections of ASME B31.3-1996, *Process Piping*. These sections of ASME B31.3 are applicable for embedded ductwork.

Chapter 3, Materials

Chapter 5, Fabrication

Table 341.3.2, Visual acceptance criteria for Category D fluid service piping

Justification: Due to wall thickness requirements of duct embedded in concrete, piping materials are required. ASME B31.3 will apply to materials, fabrication, and inspection standards as appropriate. Testing requirements for nuclear air treatment systems will be consistent with ASME AG-1.

Piping providing a confinement function in accordance with SRD 4.2-2 will comply with ASME B31.3-1996, *Process Piping*, with the following modification:

In Table D300, the description of welding tee per ASME B16.9 shall be revised so it is consistent with that shown in Table D300 of ASME B31.3-2002:

		Stress Intensification Factor [Notes (2), (3)]			
Description	**Flexibility Factor k**	**Out-of-Plane, i_o**	**In-Plane i_i**	**Flexibility Characteristic, h**	**Sketch**
Welded tee per ASME B16.9 [Notes (2), (4), (6), (11), (13)]	1	$\frac{0.9}{h^{2/3}}$	$3/4\ i_o + 1/4$	$3.1\frac{\bar{T}}{r_2}$	Same as ASME B31.3-1996

This means that for welding tees per ASME B16.9, note 11 in Table D300 is also changed to:

(11) If $r_x \geq 1/8D_b$ and $T_c \geq 1.5\bar{T}$, a flexibility characteristic of $4.4\,\bar{T}/r_2$ may be used.

Justification: The use of a lower flexibility characteristic for welding tees per ASME B.16.9 in accordance with ASME B31.3-2002 will increase both the out-of-plane and in-plane stress intensification factors. The increased stress intensification factors will reduce the allowable out-of-plane and in-plane moments that can be applied to the welding tee and keep the calculated stress below the stresses allowable by ASME B31.3-1996.

Safety piping within the scope of SRD 4.2-2 shall comply with ASME B31.3-1996, Chapter V, Paragraph 345, using the following approach for vacuum box leak testing. Vacuum box leak testing, in lieu of hydrostatic or pneumatic leak testing, may be used to leak test full penetration circumferential piping, field butt welds inside an inaccessible area (as defined in Appendix H, Section 6.0) out to the first isolation component outside the inaccessible area, only under the following conditions:

Vacuum Box Leak Test Method - The vacuum box leak test shall be in accordance with a Bubble Test - Vacuum Box Technique method specified in ASME BPV Code, Section V, Article 10, Appendix II, subject to the requirements listed below:

(a) Sensitivity of the test shall be demonstrated to be not less than 1E-3 atm-ml/sec at 15 psig.

(b) The test pressure shall be a partial vacuum of at least 7 psi below atmosphere, applied to the outside of the weld.

(c) The required partial vacuum shall be maintained for at least 20 sec examination time.

In addition, the following limitations and restrictions shall apply to the application of vacuum box leak testing in lieu of a hydrostatic or a pneumatic leak test:

- Vacuum box leak testing will only be used to leak test circumferential piping field welds inside an inaccessible area (as defined in Appendix H, Section 6.0). This includes any welds in extensions of piping systems contained or originating in accessible areas between the inaccessible area boundary and the first isolation valve or device beyond the inaccessible area boundary;
- It shall only be used for piping field welds where required to avoid damage to components, ensure the safety to construction workers, perform leak tests of field welds where physical limitations prevent hydrostatic or pneumatic leak testing as prescribed in ASME B31.3-1996 paragraph 345.4 and paragraph 345.5 respectively;
- Pipe welds that are to be vacuum box leak tested will be assessed for suitability. The number of welds to be vacuum box leak tested shall be limited to a maximum of three welds between termination points (two termination or closure welds and one intermediate weld) on a given pipe system except where physical limitations prevent examination by hydrostatic or pneumatic leak testing. DOE will be informed of such exceptions, and may at its discretion and within 48 hours of being informed, respond to BNI on the suitability of the use of vacuum box leak testing for such instances. Termination points may be tanks, vessels, valves, etc. (Specifically excluded from the definition of termination points are junctions where the piping changes design class). This could be either the last two closure welds in an inaccessible area or the last closure weld in the inaccessible area and the last closure weld outside the

inaccessible area. In addition, vacuum box leak testing would be permitted for the connection welds between construction modules if this is limited to one module-to-module weld per piping run within the cells. This is in addition to termination welds on the piping run. A module is defined as a pre-leak-tested subassembly containing multiple pipe spools;

- Vacuum box leak testing shall be limited to full penetration girth butt welds, on straight pipe or between straight pipe and pipe components of the same nominal pipe size and same wall thickness on both sides of the weld at the weld location. The following configurations are candidates for vacuum box testing:

  (a) Straight pipe to straight pipe connection butt welds

  (b) Straight pipe to 90° elbow connection butt welds

  (c) Straight pipe to 45° elbow connection butt welds

  (d) Straight pipe to concentric reducer connection butt welds

  (e) Straight pipe to eccentric reducer connection butt welds

  (f) Straight pipe to butt welding tee connection butt welds

  (g) Straight pipe to butt welding reduced outlet tee connection butt welds

  (h) Straight pipe to valve nozzle connection butt welds

  (i) Straight pipe to tank or vessel nozzle connection welds

  (j) Straight pipe to safe-end of a weldolet connection butt welds - full penetration butt welded connection only

  (k) Straight pipe to pipe cap connection butt welds

  Prior to the application of vacuum box testing using any of the candidate configurations on piping butt welds at the WTP, the Contractor must successfully demonstrate to the DOE, for the candidate configuration, that (1) all portions of the weld to be inspected are visible and can be inspected in accordance with the ASME Boiler and Pressure and Vessel Code, Section V, Article 10, Appendix II - 1995; (2) the vacuum box can adequately maintain a partial vacuum of 7 psid; and (3) vacuum box leak testing can be accomplished in the time limits and other requirements established by this procedure. The DOE shall be advised at least 7 days in advance of any demonstration to qualify a new weld configuration so that they can witness the demonstration. The Contractor shall document any demonstration relied upon to justify the use of vacuum box leak testing on a new configuration. Further, vacuum box leak testing shall be conducted with a vacuum box that completely encapsulates the weld, at the test location;

- All welds shall be 100 % volumetrically inspected in accordance with ASME B31.3-1996, paragraphs 344.5 or 344.6. If the 100 % volumetric inspection is conducted using ultrasonic examination per ASME B31.3-1996 paragraph 344.6, then the ultrasonic examination shall be conducted using a method that creates and maintains a reproducible computerized image(s) of the entire weld in the axial and radial direction;

- It shall be limited to welds made using the Orbital welding machines. The only exception is that vacuum leak box testing may be used on manual welds if the 100 % volumetric inspection was conducted by radiography per ASME B31.3-1996 paragraph 344.5;

- The piping systems and or components on both sides of the weld to be vacuum box leak tested shall have been subjected to a hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.4, a pneumatic test in accordance with ASME B31.3-1996 paragraph 345.5, a combination pneumatic-hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.6, or in the case of components, leak tested in accordance with the Code or Standard applicable to the design of the component;

- At a minimum, a flexibility analysis in accordance with ASME B31.3-1996 paragraphs 319.4.2 (a) and (b) shall be required on any piping systems that contain welds that are to be vacuum leak box tested. In addition, a comprehensive flexibility analysis in accordance with ASME B31.3-1996 paragraphs 319.4.2 (c) and (d) shall be performed on any piping systems that contain welds that are to be vacuum box leak tested when the piping systems have a design temperature greater than or equal to 150 °F;
- For manual welds, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a) through (g) shall be invoked on any weld to be vacuum box leak tested with the exception that the requirement of subparagraph 344.7.1 (e) "... aided by liquid penetrant or magnetic particle examination when specified in the engineering design" shall not be required. For welds made using Orbital welding machines, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a), (b), (c), (d), and (g) shall be invoked. The requirements of 344.7.1 (e) and (f) shall not be required. The implementation of these requirements shall be documented in the weld inspection report;
- Pipe welds and the associated line numbers that are to be vacuum leak box tested shall be identified in advance of the testing. This identification shall be documented in the controlled document Weld List, which must include this information prior to the initiation of any vacuum box leak testing associated with those welds and line numbers. It is understood that the controlled document Weld List may need to be revised and updated periodically through the construction phase of the WTP Project; and
- The following special requirements shall be placed on the training programs used to certify the technicians that will be conducting the vacuum box leak tests:
  1. The BNI Construction Manager shall pre-approve the technician qualifying examination(s) for vacuum box leak testing;
  2. The BNI Construction Manager shall pre-approve the qualifications of each Level III technician preparing or giving the examinations for vacuum box leak testing;
  3. DOE ORP at their discretion shall reserve the right to observe any and/or all practical leak test examinations and review of the results of any and/or all written vacuum box leak test examinations;
  4. The minimum topical content of each Level II examination shall be specified by BNI, and approved by DOE;
  5. The 80 % correct criteria for passing the examination shall apply to each part of the three part examinations that are to be given;
  6. BNI shall provide reasonable assurance that they will take adequate measures to assure the integrity of written examination is maintained; and
  7. There shall be several versions of each examination in use to assure Level II knowledge and ability concerning vacuum box leak testing is confirmed.

Justification: The requirement for the vacuum box leak test sensitivity is consistent with the ASME B31.3 requirement for a sensitive leak test as given in ASME B31.3-1996 paragraph 345.8 and for at least 7 psi vacuum and an examination time of at least 20 seconds. The limitations in using vacuum box leak testing better define when this method can be used. DOE ORP may further change the definition and application of these special vacuum box leak testing criteria based on the Contractor's experience with their use, or the Contractor's request for a change.

Piping system closure welds outside of inaccessible areas (as defined in SRD Appendix H, Section 6.0) shall comply with the requirements of ASME B31.3-1998, subparagraph 345.2.3(c). When ASME B31.3-1998, subparagraph 345.2.3(c) is invoked the following restrictions shall apply:

- It shall not be invoked on any closure welds on piping systems in inaccessible areas as defined in Section 6.0 of Appendix H of the SRD. This includes any welds in extensions of piping systems contained or originating in inaccessible areas, between the inaccessible area boundary and the first isolation valve, or device beyond the inaccessible area boundary;
- It shall only be invoked on full penetration butt welds in straight pipe, full penetration butt welds at the safe-end of an equipment nozzle, or full penetration butt welds at the safe-end of branch connections. [The safe-end is defined as the piping to equipment nozzle connecting weld or the branch connection to branch piping connecting welds.];
- The requirements of ASME B31.3(c) - 1998, subparagraph 345.2.3 (c) shall be met;
- The piping systems and or components on both sides of the closure weld shall have been subjected to a hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.4, a pneumatic leak test in accordance with ASME B31.3-1996 paragraph 345.5, a combination pneumatic-hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.6, or in the case of components leak tested in accordance with the Code or Standard applicable to the design of the component;
- For manual welds, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a) through (g) shall be invoked with the exception that the requirement of subparagraph 344.7.1 (e) "...aided by liquid penetrant or magnetic particle examination when specified in the engineering design" shall not be required. For welds made using the Orbital welding machines, the requirements of ASME B31.3 -1996 paragraph 344.7.1 (a), (b), (c), (d), and (g) shall be invoked. The implementation of these requirements shall be documented in the weld inspection report;
- Piping welds and the associated line numbers for which the closure weld classification is invoked shall be documented in a controlled document Weld List;
- Piping components may include mechanical elements other than piping; and
- In addition, BNI shall incorporate these requirements into the appropriate specification. DOE-ORP may further change the definition and application on the use of closure welds based on the Contractor's experience with their use or the Contractor's request for a change.

Justification: This change does not change the safety function of any pressure boundary components. The requirement to leak test pressure boundary field welds is primarily to ensure the reliability of the welds in addition to the reliability provided by the other required examinations. The exception allowed by ASME B31.3-1998, paragraph 345.2.3 that the final weld connecting piping systems or components which have been successfully tested in accordance with paragraph 345 need not be leak tested provided the weld is examined in-process in accordance with paragraph 344.7 (a), (b), (c), (d), and (g) and passes with 100 % radiographic examination in accordance with paragraph 344.5 or 100 % ultrasonic examination in accordance with paragraph 344.6 provides adequate assurance that the weld is reliable and leak tight. The change continues to provide adequate safety since it requires that all piping closure welds that are not leak tested are in-process examined and 100 % volumetrically examined which exceeds the requirements of ASME B31.3-1996 for closure welds that are leak tested. The inability to hydrostatically or pneumatically leak test these closure welds does not affect the soundness of the welds.

9.0 AISC M016, Manual of Steel Construction, Allowable Stress Design (ASD)

Revision: 9th Edition
Sponsoring Organization: American Institute of Steel Construction

WTP Specific Tailoring

The following tailoring of M016 is required for use by the WTP contractor as an implementing standard for design of structural steel for Seismic Category III SSCs.

No specific section

Load combinations for design of structural steel members utilize those identified in UBC 97, Section 1612.3.

Justification: These load combinations represent the commercial requirements for allowable stress design of structural steel. Use of these load combinations will ensure compliance with the commercial design in accordance with the UBC.

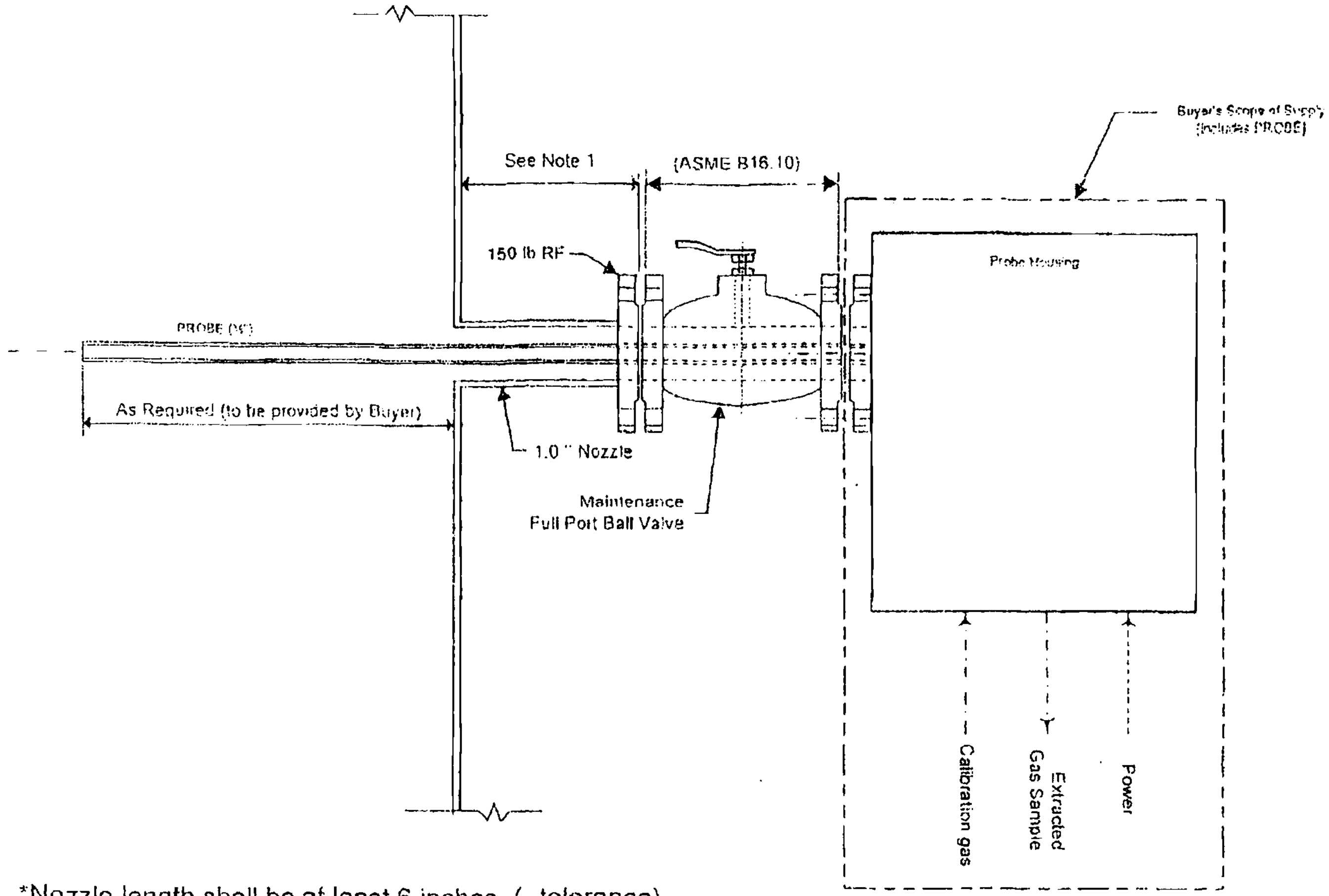
No specific section

Seismic detailing requirements shall be in accordance with UBC 97, Chapter 22, Division V, Section 2214, for moderate seismic risk structures.

Justification: The requirements contained in this section contain accepted industry practice for design of important commercial steel structures. Use of this section will ensure compliance with the commercial design in accordance with the UBC.

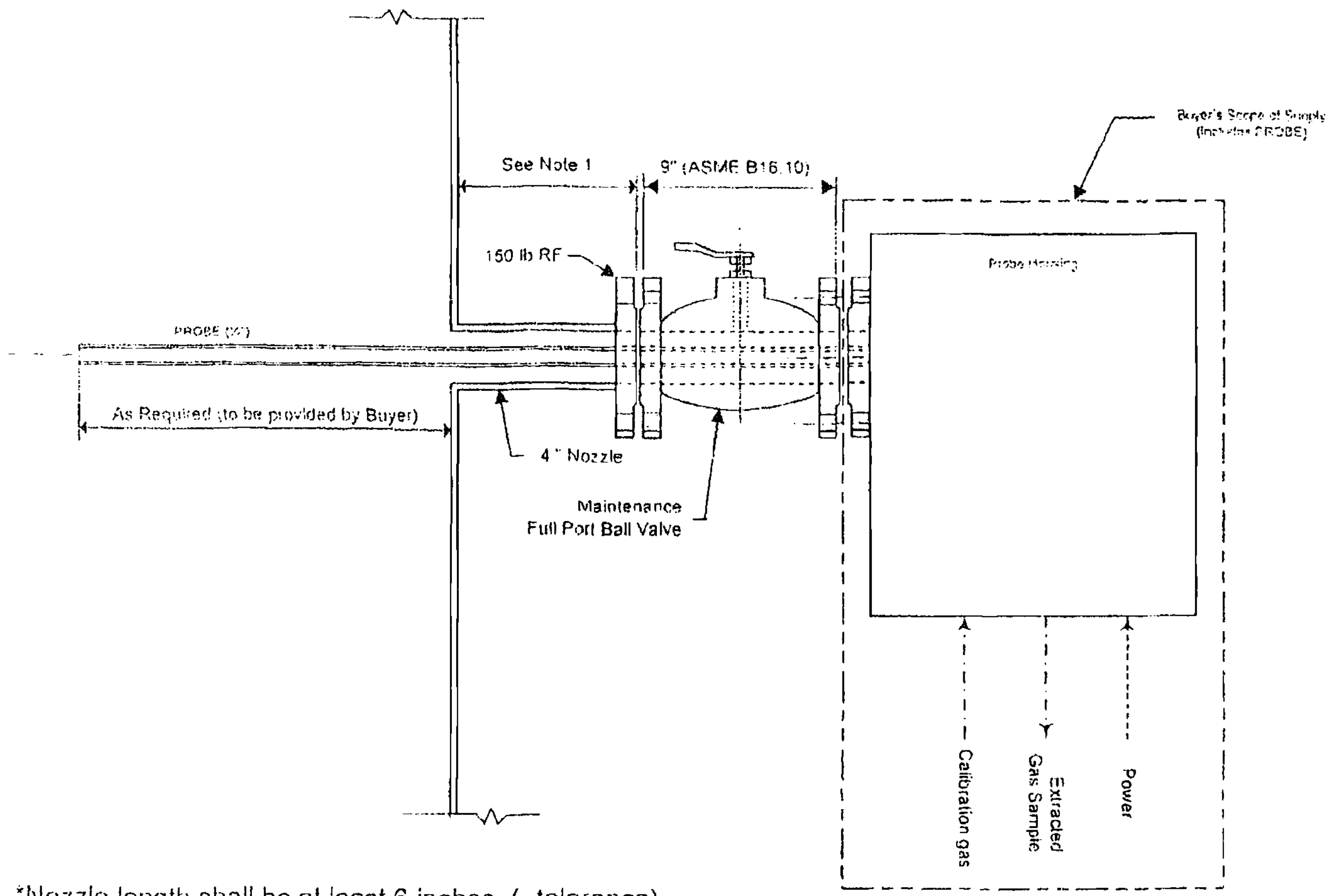
HLW SKID INTERFACE CONNECTIONS

SERVICE	NOZZLE NUMBER	SIZE	INTERFACE
HLW-MELTER 1 & 2			
AMMONIA GAS IN	NO 1	1"	FLG SW, A182-F304, 304L, CL300, SCH40S, RF
INST AIR IN	NO 2	2"	FLG WN, A105, CL150, STD WT, RF
PROCESS GAS IN	NO 1	14"	FLG WN, A182-F316/316L, CL150, .375", RF
PROCESS GAS OUT	NO 2	16"	FLG WN, A182-F316/316L, CL150, .375", RF
AMMONIA/AIR OUT	NO 3	6"	FLG WN, A182-F304/304L, CL300, SCH40S, RF
AMMONIA/AIR IN	NO 3	6"	FLG WN, A182-F304/304L, CL300, SCH40S, RF



Note 1: *Nozzle length shall be at least 6 inches (- tolerance).
*There shall be at least 3 inches (- tolerance) of clearance, for tightening bolts, between the surface of the insulation jacketing and the underside of the flange.

Scale: None
Connection for Non-Routine Sample Extraction
Secondary Offgas Flange Connection for Gas Monitor Probe with Ball Valve for Maintenance
Gas Extraction Connection



Note 1: *Nozzle length shall be at least 6 inches (- tolerance).
*There shall be at least 3 inches (- tolerance) of clearance, for tightening bolts, between the surface of the insulation jacketing and the underside of the flange.

Scale: None
Connection for Sample Extraction-Permanent Typical
Secondary Offgas Flange Connection for Gas Monitor Probe with Ball Valve for Maintenance
Gas Extraction Connection

Attachment 7

Certificate of Analysis for BASF Catalysts, LLC (VOCat 300S)

The Buyer will provide Certificate of Analysis (COA) for VOCat 300S when this information becomes available. Seller's use of the COA is described in Section 10.2.6.3.

Quarter Ending 12/31/10

24590-HLW-PCN-ENV-10-010

Hanford Facility RCRA Permit Modification Notification Form
Part III, Operating Unit 10
Waste Treatment and Immobilization Plant

Index

Submitted by Co-Operator:

D. M. Busche — Date: 9/24/10

Reviewed by ORP Program Office:

D. L. Noyes — Date: 10/21/10

Quarter Ending 12/31/10

24590-HLW-PCN-ENV-10-010

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this class 1 modification is to update GA drawing for the HLW Facility El. -21'-0" in Appendix 10.4 of the DWP.

The following GA is submitted to replace the drawing currently in Appendix 10.4:

Appendix 10.4			
Replace:	24590-HLW-P1-P01T-00001 Rev 8	With:	24590-HLW-P1-P01T-00001 Rev 9

This modification requests Ecology approval and incorporation into the permit the specific changes to this GA drawing that are identified by the revision note, clouds, and revision triangles since the last revision. Revision 8 was submitted in permit modification 24590-HLW-PCN-ENV-09-003 on 3/30/2010 and approved by Ecology on 4/29/2010. Changes are the result of ongoing design.

The following identifies changes on the attached drawing:

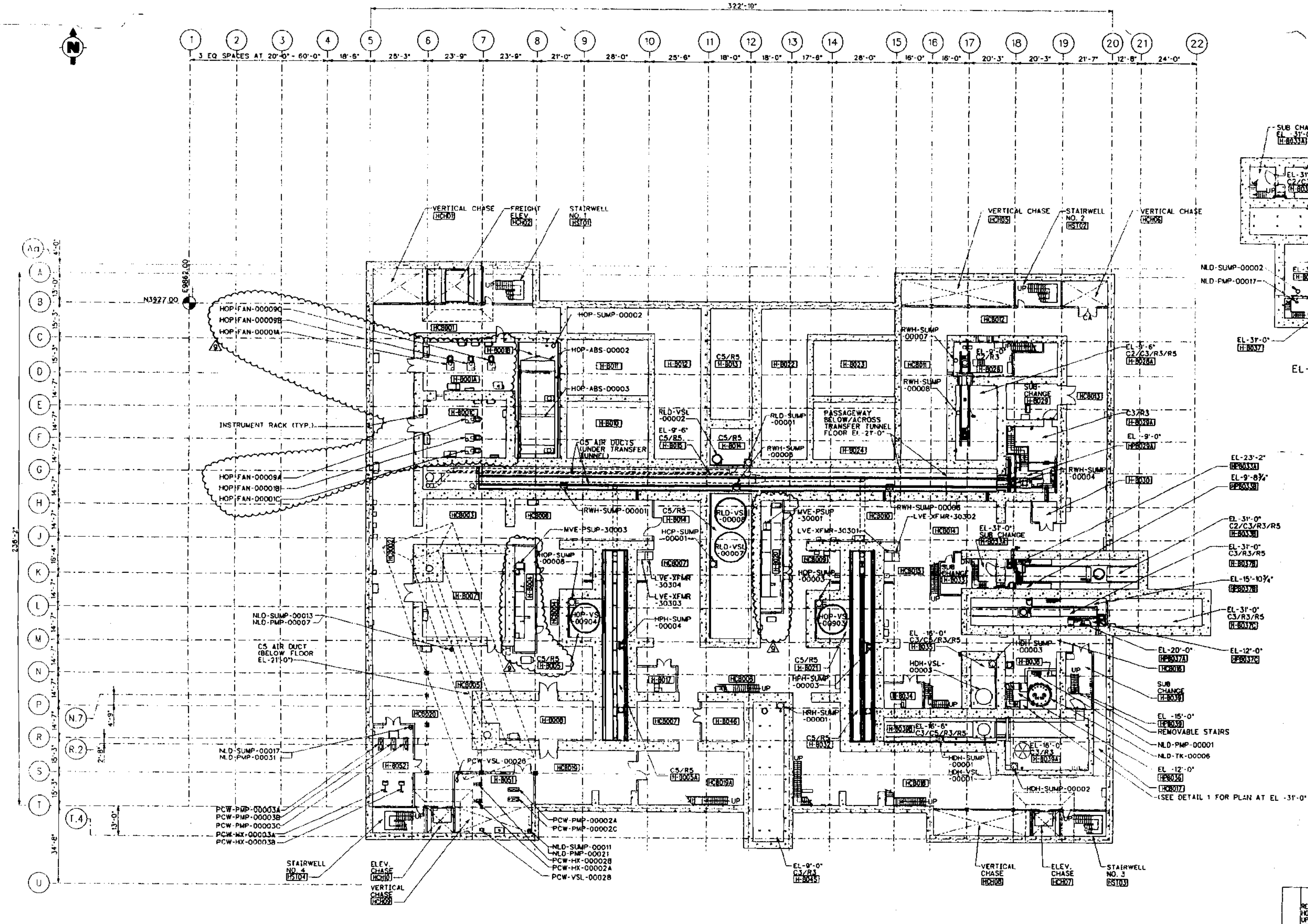
- Revised equipment locations in rooms H-B001A and H-B001C for HOP fan layout
- Updated rooms H-B004 and H-B020 based on vendor power supply equipment
- Removed holds 6 and 7

The following is a list of outstanding change documents that have not been incorporated into this modification:
None

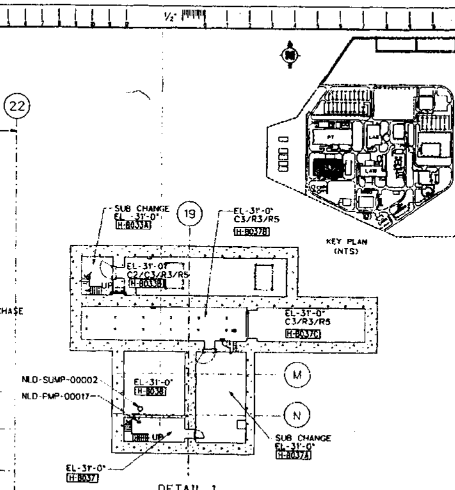
WAC 173-303-830 Modification Class:	Class 1	Class ¹1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number:
Enter wording of WAC 173-303-830, Appendix I Modification citation:
A.3 General Permit Provisions, Equipment replacement or upgrading with functionally equivalent components (e.g., pipes, valves, pumps, conveyors, controls)

Modification Approved/Concur: [X] Yes [ ] Denied (state reason below) Reason for denial:	Reviewed by Ecology: [signature] for 12.17.10 J. J. Wallace Date



PLAN AT EL -21'-0"
(FROM EL -31'-0" TO EL -9'-0")



DETAIL 1
EL -31'-0" DETAIL

NOTES:

1. ALL OPERATING AREAS ARE DESIGNATED C2/R2 UNLESS NOTED OTHERWISE.
2. ALL SUB CHANGE ROOMS ARE DESIGNATED C2/C3/R2 UNLESS NOTED OTHERWISE.
3. REFER TO DRAWING 24590-HLW-P1-P01T-00008, SECTION "A" FOR CONVERSIONS FROM HLW FACILITY ELEVATIONS TO SITE ELEVATIONS. (HLW FACILITY ELEVATION 0'-0" = SITE ELEVATION 682'-0" MSL).
4. FOR SITE REFERENCE SEE PLOT PLAN DRAWING 24590-BOF-P1-50-00001.
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. ADDITIONAL WALLS FOR COMMODITY ITS SEPARATION WILL BE ADDED AS REQUIRED BASED ON FINAL COMMODITY ROUTING.
7. FLOOR/LINER SLOPE IS REQUIRED IN ROOMS WITH SUMPS. SLOPE IS A MINIMUM OF 1% TOWARD THE SUMP.
8. ALL PLATFORMS HAVE THE SAME RADIOLOGICAL CLASSIFICATION AS THE ROOM THEY RESIDE IN UNLESS OTHERWISE NOTED.
9. ROOMS ARE OFFICIALLY IDENTIFIED BY ROOM NUMBERS ONLY. ROOM NUMBERS ARE ESTABLISHED AND CONTROLLED ON GENERAL ARRANGEMENT AND ASSOCIATED EQUIPMENT LOCATION DRAWINGS. ONLY ROOM NUMBERS ARE NEEDED TO IDENTIFY ROOMS ON ENGINEERING DISCIPLINE DOCUMENTS. WHILE ROOM NUMBERS ARE CONTROLLED, THE MOST COMMON NAME OF ROOMS ASSOCIATED WITH EACH ROOM NUMBER ARE SHOWN FOR REFERENCE ONLY ON ARCHITECTURAL FLOOR PLANS.

HOLDS:

6. NOT USED.
7. NOT USED.

LEGEND:

CA	CONTROLLED ACCESS
EE	EMERGENCY EXIT
H-0101	ROOMS, CELLS, CAVES (VAULTS) AND TUNNELS
HC0102	CORRIDORS & CONNECTING VESTIBULES
HM0103	MEZZANINES
HP0104	PLATFORMS
HCH01	CHASES
H-A101	ANNEX
HS101	STAIRWELL
	EQUIPMENT REMOVAL/PULL SPACE OR LAYDOWN AREA
	CONCRETE
	CHECKERED PLATE
	GRATING SPAN
	CONSTRUCTION ACCESS

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
9	REVISED ROOMS H-B001A, AND H-B001C FOR HOP FAN LAYOUT. UPDATED ROOMS H-B004, AND H-B020 FOR VENDOR POWER SUPPLY SIZE INCREASE. REMOVED HOLD 6 AND 7	JML	DSS			7-14-10
8	INCORP DCN 24590-HLW-PIN-P01T-00178 & 24590-HLW-PIN-P01T-00183. UPDATE ADR REV DELETED VERTICAL CHASE HCH04. ADDED ROOM CALLOUTS HCB007 & HCR003. ADDED HOLDS 6 & 7. PCW-PMP-00002C WAS PCW-PMP-00028.	EWB	NML	KH	JC MB	7/31/09
7	REMOVED PUMP PCW-00002C. REVISED ADR. REVISED RADIOLOGICAL CLASSIFICATIONS. ADDED NOTE 7 AND 8.	KAC	NML	DSS	CW JLC	2/5/08
0	ISSUED FOR DESIGN-SUPERSEDES 24590-HLW-P1-C01T-00001	TL	DG		MM SCF	4/18/02

REVISION HISTORY

ISSUED BY RPP-WTP PDC	PROJECT No.	24590
	SITE	HANFORD
	AREA	200E
	BUILDING No.	30

	BY	DATE
ORIGINATOR	T. LOGAN	4/18/02
CHECKER	D. COTT	4/18/02
APPROVER		4/18/02
REVIEWER	N/A	

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-HLW-ADR-PL-02-001 REV: 7

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

HLW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN AT EL -21'-0"

SCALE: 1/16"=1'-0"
24590-HLW-P1-P01T-00001 REV 9
"E" SIZE = 44x34
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED
07/08/2010 08:47:11 AM

This page intentionally left blank.

Quarter Ending June 30, 2010 24590-WTP-PCN-ENV-08-011

Hanford Facility RCRA Permit Modification Notification Form
Part III, Operating Unit 10
Waste Treatment and Immobilization Plant

Index

Submitted by Co-Operator: ~~Reviewed by~~ ORP Program Office:

DMBusche	5/13/10		7/12/10
D. M. Busche	Date	~~G. A. Girard~~ DELMAR L. NOYES	Date

Quarter Ending June 30, 2010 24590-WTP-PCN-ENV-08-011

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 modification is to update Permit Specification 24590-WTP-3PS-AFPS-TP006, *Engineering Specification for Field Applied Special Protective Coatings for Secondary Containment Areas.*

The following specification is being submitted to replace the specification currently in Appendix 7.7.

Appendix 7.7			
Replace:	24590-WTP-3PS-AFPS-TP006, Rev. 1	With:	24590-WTP-3PS-AFPS-T0006, Rev. 1

This modification requests Ecology approval and incorporation into the permit the specific changes to this specification that are identified by revision bars shown on the specification that have been issued since the last revision of the specification. Revisions are the result of ongoing design (changes from vendor preliminary data to vendor detailed design) and incorporates general criteria from a design verification review. The following identifies the significant changes that have been revised on the attached specification.

- Deleted Appendix D, *Room Finish Schedule Drawing References*
- Deleted Appendix H, *Manufacturer's Standard Coating Data Sheet*
- Added Appendix J, *Interface Installation Detail Drawings Reference*
- Added Section 2.1.1.1 which defines Subcontractor requirements and responsibilities for providing a job mockup for each coating system identified for installation
- Updated Sections 2.3.16 and 2.3.20 to clarify that classification of areas provides the maximum External dose for designated areas
- Updated Section 3.1.1, *American Society for Testing and Materials (ASTM)* reference list to verify that references are current and applicable for this version of the specification
- Updated Section 3.1.2, *Society for Protective Coatings (SSPC)* reference list to verify that references are current and applicable for this version of the specification
- Updated Section 3.1.5, *United States Department of Energy (DOE) Standards and Orders* reference list to verify that references are current and applicable for this version of the specification
- Updated Section 4.2 to clarify Subcontractor instructions pertaining to coating material prequalification testing
- Updated Sections 6.2.1.2 and 6.2.1.2.1 to clarify that the requirement applies to Rigid polymeric filler materials
- Updated Sections 6.2.1.4.1, 6.2.1.5.1, and 6.2.1.5.2 to clarify secondary containment requirement pertains to "DWP and/or Non-DWP" items as identified in the specification
- Updated Section 6.4.3 to clarify that reclaimed grit used for abrasive cleaning should be tested for the presence of grease as well as oil
- Updated Section 6.6.1 to clarify requirements for coating materials, thinners, solvents and cleaning materials used on stainless steel
- Updated Section 7.3.1 to clarify Subcontractor process instructions pertaining to surfaces which are found to be unacceptable for receiving application of special protective coating
- Updated Section 7.3.3.2 to clarify process and requirements for preparing surfaces to receive coating materials
- Updated Section 7.5, *Remedial Work* to add Sections 7.5.6, 7.5.7, 7.5.7.1, and 7.5.7.2
- Updated Section 9.1.4 to clarify shelf-life requirements for coating materials
- Updated Appendix B, Section 1.2.8 to include reference to National Fire Protection Association Standards NFPA 255 and NFPA 253. Added requirement for minimum Critical Radiant Flux rating for concrete floors

Quarter Ending June 30, 2010 24590-WTP-PCN-ENV-08-011

- Updated Appendix I Notes section to clarify that requirement pertains to "DWP and/or Non-DWP" items as identified in the specification

The following is a list of outstanding change documents that have not been incorporated into this modification:

- 24590-WTP-FC-C-08-0535
- 24590-WTP-FC-C-09-0102

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number:

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: ☑ Yes ☐ Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

Joanne J Wallace 11/4/10

S. Dahl Date

This page intentionally left blank.

ISSUED BY
RPP-WTP PDC

R11048631

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Field Applied Special Protective Coatings For Secondary Containment Areas

Content applicable to ALARA? ☒ **Yes** ☐ **No**

ADR No. 24590-WTP-ADR-ENG-03-004 **Rev** 5

Quality Level
CM
DOE Contract No. DE-AC27-01RV14136

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

1	3-16-09	[signature]	[signature]	[signature]	[signature]	[signature]
0	11/10/03	TRC	LDK	JH		DTS
REV	**DATE**	**BY**	**CHECK**	**REVIEW**	**E&NS**	**DPEM/EM**

SPECIFICATION No.	**Rev**
24590-WTP-3PS-AFPS-T0006	1

Revision History

Revision	Reason for Revision
0	Issued for Construction
1	Incorporate 24590-WTP-3PN-AFPS-00016 with modifications to section 6.6.1 to read "All coating materials, thinners, solvents and cleaning materials used on SS shall be shown to have a low leachable halogens content that shall not exceed 200ppm, total sulfur content shall not exceed 400 ppm sulfur. The total amounts of low melting point metals such as lead, zinc copper, tin, antimony and mercury shall not exceed one (1) percent and mercury shall not exceed 50 ppm."; 24590-WTP-3PN-AFPS-00017 with modifications to section 6.2.1.5.2 to remove "regulated tanks", modify Appendix I note 2 to remove "or contain regulated tanks" ; 24590-WTP-3PN-AFPS-00027; 24590-WTP-FC-C-05-0120; 24590-WTP-FC-C-06-0068; Add section 2.1.1.1 to incorporate job mock ups; Change section 4.2 to read "Only materials that are prequalified in accordance with Appendix B and the subcontractor has a current Appendix F shall be used."; Add to section 7.3.3.2 "Concrete shall be suitably roughened and textured using one of the specified methods of surface preparation during the coating system mock-ups performed and accepted by the CONTRACTOR."; Remove all section references on Appendix I Installation detail drawings; Add Appendix J to incorporate interface installation detail drawings; Delete Appendix D; Delete Appendix H

Contents

Appendices

1 Scope

1.1 This specification defines the minimum requirements for the field application of Special Protective Coating's (SPC's) applied onto concrete and steel surfaces that have been identified as a Secondary Containment area. The coating systems for concrete and steel surfaces are identified in Appendix C Table 2 and Appendix D of this specification. The CONTRACTOR shall identify the areas requiring secondary containment coatings in the appropriate room finish schedule for each facility (i.e., LAW, HLW, PTF, LAB & BOF). Unless indicated elsewhere in the subcontract documents, the field coating Work shall include-

- Touch up of shop or field coated carbon steel embeds prior to application of identified secondary containment coating system.
- Surface preparation and application of the applicable coating system for concrete and steel surfaces. Corner coving on floor/wall, wall/wall corners, around concrete, steel embed attachments, grouted anchor bolts and other items that create a corner or sharp transition in coating system direction.
- Saw cutting and chipping concrete as required by applicable installation detail.
- Surface preparation and application of a primer/sealer/barrier coat on shop coated steel embeds that have been determined unsuitable for the installation location exposure conditions in the secondary containment enclosure area or incompatible with the specified secondary containment coating system.

1.2 Finish color shall be as noted in Appendix E.

1.3 All SPC's are designated as Commercial Grade and non-safety. SPC quality program requirements must comply with DOE Order 414.1C as identified in Appendix A. The full order is not applicable (also refer to Section 5). **NQA-1 Quality Assurance requirements do not apply to the manufacture or application of SPC's.** However, SPC's used in high radiation areas (>2E8 rads over 40 years) shall be prequalified in accordance with Appendix B.

1.4 The Field application of all concrete and steel coatings will be performed at the WTP project located in the 200 East Area of the Hanford Site in Washington.

2 General

2.1 Responsibility

2.1.1 The SUBCONTRACTOR shall supply all personnel, coating materials and all necessary surface preparation, application, inspection and equipment including all Personal Protection Equipment (PPE), safety, rigging/access (as required), masking protection, containment, environmental control/dehumidification/ventilation equipment, area covering to protect from direct sunlight and inclement weather and all consumables. The SUBCONTRACTOR shall perform all pre-surface preparation, surface preparation, coating application, inspection and documentation for all SPC work.

2.1.1.1 The SUBCONTRACTOR shall perform a job mock up for each coating system identified for installation. Special concrete walls and floors or a sample area of the facility shall be provided by the CONTRACTOR for the mock ups. Each sample area shall be approximately 5'x5' in size. The mock up coating sample shall be applied in accordance with the specification and CONTRACTOR accepted procedures. Surface defects in the concrete shall be filled flush with the surface plane and shall result in a smooth, decontaminable finish when top-coated with the remainder of the coating system. The completed mock-up shall provide a surface finish acceptable to the CONTRACTOR. The accepted mock-up shall be used as a reference standard of quality for surface preparation and applied coating surface finish. At the CONTRACTOR's notification the SUBCONTRACTOR shall inspect all concrete surfaces scheduled for coatings to ensure they are suitable for performing the specified surface preparation and coating application. Within 72 hours of notification, the SUBCONTRACTOR shall notify the CONTRACTOR in writing, of items found to be damaged or otherwise unsuitable for surface preparation or coating application.

2.1.2 The SUBCONTRACTOR shall provide surface preparation of overlap or tie-in areas on stainless steel, concrete and carbon steel surfaces as required.

2.1.3 The SUBCONTRACTOR shall install flexible joint sealant, flexible epoxy filler material, foam backer rod, bond breaker tape and material where specifically identified for use by the CONTRACTOR.

2.1.4 The SUBCONTRACTOR shall store all coating materials in accordance with this Specification and CONTRACTOR accepted procedures. The coating system and associated coating materials shall be in accordance with Appendix C Table 1 Secondary Containment Coating Systems, Table 2 Secondary Containment Coating Materials and Appendix D Room Finish Schedule Drawing references or as otherwise identified by the CONTRACTOR. All coating materials shall be used on a first in first out basis where the oldest batch of any given material or component is used before batches with a later expiration date.

2.1.5 The SUBCONTRACTOR shall perform all inspections and tests contained in this Specification prior to acceptance by the CONTRACTOR.

2.1.6 The SUBCONTRACTOR shall provide application and inspection documentation for all coating Work accepted by the CONTRACTOR.

2.1.7 The SUBCONTRACTOR shall provide marking materials that are fully compatible with the coating system(s) specified. Marking materials shall be suitable for use on stainless steel.

2.1.8 The SUBCONTRACTOR shall provide environmental control equipment as necessary for surface preparation, coating application and curing.

2.1.9 The SUBCONTRACTOR shall only use inspection equipment that is currently calibrated and controlled by a calibration program accepted by the CONTRACTOR.

2.1.10 The SUBCONTRACTOR shall give CONTRACTOR a minimum of ten (10) working days written notice prior to the start of coating Work and coordinate all field coating Work with the CONTRACTOR on a daily basis prior to the start of daily coating Work.

2.1.11 The SUBCONTRACTOR shall give the CONTRACTOR at least twenty four (24) hours verbal notice for all agreed upon inspection witness and hold points.

2.2 Surfaces Not To Be Coated

2.2.1 The SUBCONTRACTOR shall verify weld hold-back areas on piping, hangers/supports, steel attachments, etc., in areas designated Secondary Containment prior to coating as follows.

- Four(4) inches for **field** welds

2.2.2 Rubber or similar nonmetallic parts.

2.2.3 Non-Ferrous metals unless otherwise specified.

2.2.4 Stainless Steel surfaces unless specifically required by the CONTRACTOR (areas where stainless steel is welded to carbon steel the coating overlap onto the stainless steel shall be at least 1" or as otherwise specified).

2.3 Definitions

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

2.3.2 Bug Holes- Small regular or irregular cavities resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation.

2.3.3 Curing Membrane - Materials applied to prevent the moisture in uncured concrete from evaporating too rapidly. Where Special Protective Coatings are being applied, the curing membranes or compounds should not contain paraffin, oil, silicone or other contamination that could compromise proper coating adhesion.

2.3.4 CONTRACTOR- Means BECHTEL NATIONAL, INC. (BNI) and all of its authorized representatives acting in their professional capacities.

2.3.5 Dry Film Thickness (DFT)- The thickness of an applied coating, once dry or cured. Usually expressed in mils (each mil is 1/1000 of an inch). Measured using a wet film thickness gage and calculating dry film thickness based on coating material volume solids. Alternatively measured using an ultra sonic dry film thickness device or using a destructive test that cuts the dry film and optically measures the dry film thickness.

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

2.3.7 Efflorescence- A white crystalline or powdery deposit on the surface of concrete. Efflorescence results from leaching of lime or calcium hydroxide out of the permeable concrete mass over time by water , followed by reaction with carbon dioxide and acidic pollutants.

2.3.8 Form Release Agents- Compounds such as glossy paint or other film forming release material applied to forms to allow easy removal of forms. Where Special Protective Coatings are being applied the form release agent should not impart a residue of paraffin, oil, silicone or other contaminant onto the surface that could compromise proper coating adhesion.

2.3.9 Hydration- The reaction of water with the calcium silicate, aluminate or aluminoferrite components of fine cement grains, necessary for the setting and densifying of concrete. Hydration results in the formation of calcium hydroxide and colloidal gels which occupy a larger volume than the original cement.

2.3.10 Hydrostatic Pressure- The pressure exerted by water at rest.

2.3.11 Holiday- A Pinhole, skip, discontinuity, or void in the applied coating film.

2.3.12 Laitance- A thin, weak, brittle layer of cement and aggregate fines in a concrete surface. The amount of laitance is influenced by the degree of working or amount of water in the concrete. For the application of Special Protective Coatings all laitance must be removed to sound, dense concrete.

2.3.13 Item- An all inclusive term used in place of any of the following: appurtenance, assembly, component, equipment, material, module, part, structure, sub-assembly, sub-system, system, unit or support systems.

2.3.14 Mfg. Std. Coating- A manufacturer's standard coatings system applied to off the shelf items or standard line items of routine manufacture that are not specifically manufactured for the WTP project.

2.3.15 NIST- National Institute of Standards and Technology.

2.3.16 "Non-Radiation" areas- For the purpose of Special Protective Coating (SPC), this is the quality designation for items **"<u>NOT</u>"** located in an area where radioactive material or items are transported, processed or stored or where they are located in an area where radioactive material or items are transported, processed or stored that are designated C2 and less, or R2 and less (24590-WTP-GPP-SRAD-0007 Classification of Areas provides the maximum external dose for each "R" designation and mean airborne contamination level for each "C" designation).

2.3.17 Outgassing- The upward and outward emission of air or moisture vapor from concrete or coatings.

2.3.18 Pinhole- Minute hole visible in the applied coating without magnification, that appear to penetrate one or more layers of the coating film.

2.3.19 Profile- The surface roughness resulting from surface preparation by abrasive blasting or other CONTRACTOR accepted methods (Refer to Section 7.3.4.3)

2.3.20 "Radiation" areas- For the purpose of Special Protective Coating (SPC), this is the quality designation for items that are located in an area where radioactive material or items are transported, processed or stored that are designated C3 and greater, or R3 and greater. (24590-WTP-GPP-SRAD-0007 Classification of Areas provides the maximum external dose value for each "R" designation and mean airborne contamination level for each "C" designation).

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

2.3.22 Supplier Deviation Disposition Report (SDDR)- A standard WTP project document that can be used by a vendor or SUBCONTRACTOR to identify an actual or potential deviation or discrepancy that requires engineering evaluation and disposition prior to acceptance.

2.3.23 Surface Hardeners- Compounds applied to a concrete surface to improve hardness, and to decrease permeability.

2.3.24 Surface Porosity- Permeability of the surface that allows absorption of vapors, moisture, chemicals, and coating liquids. Small interconnected voids that allow fluids to penetrate an otherwise impervious material.

2.3.25 SUBCONTRACTOR- Means the company, corporation, partnership, individual, or other entity to which this subcontract (purchase order/material requisition) is issued, its authorized representatives, successors, and permitted assigns.

2.3.26 Training and Certification- Training to include an understanding of the specification, CONTRACTOR accepted Work procedures and manufacturer's published instructions. Certification to include a documented performance test demonstrating quality Work acceptable to the CONTRACTOR. (Refer to Sections 4.6, 5.1.3.2, 5.1.7, 7.1.2, 8.1.1.1 and Appendix A)

2.3.27 RPP-WTP- River Protection Project-Waste Treatment Plant

2.4 Safety

2.4.1 All surface preparation and coatings Work shall comply with all applicable environmental and safety provisions, laws, regulations in local jurisdiction (e.g., County and State). Work being performed in the United Sates shall be in strict accordance with OSHA 29 CFR 1910, State and local safety and environmental requirements.

2.4.2 The SUBCONTRACTOR shall comply fully with OSHA Hazard Communication Standard 29CFR 1910. Material Safety Data Sheets (MSDS) for all materials, including thinners and cleaning solvents, shall be obtained from the materials manufacturer and made available at the place of application for review.

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

2.4.4 The SUBCONTRACTOR shall control safe working and environmental conditions employing items such as but not limited to barricades, masking/tarping, ventilation, dehumidification and safety watches to provide safe quality work from surface preparation through application, curing and inspection activities.

2.4.5 The SUBCONTRACTOR shall be responsible for proper disposal of liquid or solid waste generated during the work described herein (residual coating material, thinners, solvent, wipes, rags, etc.)

3 Applicable Documents

3.1 Codes and Standards

The latest applicable edition of the following codes, standards, specifications or WTP procedures form a part of this Specification.

3.1.1 American Society for Testing and Materials (ASTM)

ASTM E337-02 (Reapproved 2007)
Test for Relative Humidity by Wet-and-Dry Bulb Psychrometer

ASTM D412-98, 98 (Reapproved 2002), 06 (Editorial Revision 2008)
Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension

ASTM D1653-93 (Reapproved 1999), 03, 03 (Reapproved 2008)
Standard Test Methods for Water Vapor Transmission for Organic Coating Films

ASTM D3912-95 (Reapproved 2001)
Standard Test Method for Chemical Resistance of Coatings Used in Light-Water Nuclear Power Plants

ASTM D3276-00, 05, 07
Standard Guide for Painting Inspectors (Concrete and Masonry Substrates)

ASTM D4060-01, 07
Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser

ASTM D4082-02
Standard Test Method for Effects of Gamma Radiation on Coatings for Use in Light-Water Nuclear Power Plants

ASTM D4138-94 (Reapproved 2001), 07
Test Method for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means

ASTM D4227-99 (Reapproved 05), 05
Practice for Qualification of Journeyman Painters for Application of Coatings to Concrete Surfaces of Safety Related Areas in Nuclear Facilities

ASTM D4228-99 (Reapproved 05), 05
Practice for Qualification of Journeyman Painters for Application of Coatings to Steel Surfaces of Safety Related Areas in Nuclear Facilities

ASTM D4258-83 (Reapproved 2005), 05
Practice for Surface Cleaning of Concrete for Coating

ASTM D4259-88 (Reapproved 2006)
Standard Practice for Abrading Concrete

ASTM D4262-83 (Reapproved 2005), 05
Standard Test Method for pH for Chemically Cleaned or Etched Concrete Surfaces
ASTM D4263-83 (Reapproved 2005)
Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4285-83 (Reapproved 2006)
Test Method for Indicating Oil or Water in Compressed Air
ASTM D4414-95 (Reapproved 2007)
Practice for Measurement of Wet Film Thickness of Organic Coatings by Notch Gages
ASTM D4417-93(Reapproved 1999), 03
Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4537-91 (Reapproved 1996), 04
Standard Guide for Establishing Procedures to Qualify and Certify Inspection Personnel for Coating Work Inspectors in Nuclear Facilities.
ASTM D4541-02
Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D4940-98 (Reapproved 2003)
Test for Conductimetric Analysis of Water Soluble Ionic Contaminants of Blasting Abrasives
ASTM D5139-90 (Reapproved 2001)
Standard Specification for Sample Preparation for Qualification Testing of Coatings Used in Nuclear Power Plants
ASTM D5144-00
Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants
ASTM D5498-01
Standard Guide for Developing a Training Program for Coating Work Inspectors in Nuclear Facilities.
ASTM D6132-97, 04, 08
Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Over Concrete Using an Ultrasonic Gage
ASTM D6237-98, 03
Standard Guide for Painting Inspectors (Concrete and Masonry Substrates)

3.1.2 The Society for Protective Coatings (SSPC)

SSPC-AB1-91 (Editorial Revision 2004) -91 (Editorial Revision 2007)
Mineral and Slag Abrasive
SSPC-PA2-96, 04
Measurement of Dry Paint Thickness with Magnetic Gages
SSPC-SP1-82 (Editorial Revision 2004)
Solvent Cleaning
SSPC-SP6-00, 07
Commercial Blast Cleaning
SSPC-SP7-00, 07
Brush -Off Blast Cleaning
SSPC-SP10-00, 07
Near-White Metal Blast Cleaning
SSPC-SP11-87 (Editorial Revision 2004)

Power Tool Cleaning to Bare Metal
SSPC-SP12-95, 02
Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC-SP13-97 (Reapproved 2003)
Surface Preparation of Concrete
SSPC-Vis 1-02 (Editorial Revision 2004)
Visual Standard for Abrasive Blast Clean Steel
SSPC-Vis 3-93, 04
Visual Standard for Power and Hand Tool Cleaning

3.1.3 Occupational Safety and Health Administration (OSHA)

OSHA 29 CFR 1910	Occupational Safety and Health Standards

3.1.4 WTP Project Documents

24590-WTP-GPP-SRAD-007	Classification of Areas
24590-WTP-3PS-AFPS-T0004	Field Applied Special Protective Coatings for Concrete Surfaces
24590-WTP-3PS-AFPS-T0003	Field Applied Special Protective Coating for Steel items and Equipment.
24590-WTP-3PS-AFPS-T0002	Special Protective Coating Limited-Combustible Testing Protocol
24590-WTP-3PS-AFPP-T0001	Painting (Professional Line Products) 09912

3.1.5 Department of Energy (DOE)

DOE Std. 1066-97	DOE STANDARD Fire Protection Design Criteria
DOE Order 414.1C Change 1 Issued 6/17/07	Quality Assurance

3.1.6 National Fire Protection Association (NFPA)

NFPA 801 2003 Edition	Standard For Fire Protection For Facilities Handling Radioactive Materials

4 Submittals

4.1 SUBCONTRACTOR shall submit detailed written procedures for the following-

- Material receiving, marking, storage, handling
- Surface preparation
- Environmental control
- Application
- Curing
- Inspection and testing

- Touch-up/repair
- Application personnel qualification and Inspector qualification (G321-E, category 28.0)
- Proposed documentation forms. The final procedure and documentation forms shall be submitted for the CONTRACTOR's approval (G321-E category 15.0).

(The above items can be grouped into a common procedure where appropriate)

4.2 Only materials that are prequalified in accordance with Appendix B and the subcontractor has a current Appendix F shall be used. **Coating material prequalification testing is only required of the coating manufacturer and not the Special Protective Coating Application SUBCONTRACTOR.**

4.3 The SUBCONTRACTOR shall identify the specific products by manufacturer and catalog number and shall submit the coating manufacturer's latest published product data sheet application instructions and Material Safety Data (MSDS). Conflicts, if any, between the SUBCONTRACTOR's normal procedures, the coating manufacturer's recommendations, and this Specification shall be brought to the attention of the CONTRACTOR for resolution and written permission to proceed (G321- E category 11.0). The SUBCONTRACTOR shall submit original Coating Manufacturer's Product Identity Certification Records for each and every batch of coating material purchased for use on the WTP project. (Refer to Appendix F) (Refer to G321 V category 13.0)

4.4 The SUBCONTRACTOR shall complete and submit a daily inspection record as a part of the Work procedures that includes all elements provided in Appendix G as a minimum. An entry for wet bulb is not required when the accepted device used to measure humidity and dew point does not require a wet bulb. (Refer to Section 8.1.9 and 10.2) (G321-V category 13.1)

4.5 The SUBCONTRACTOR shall submit with coating procedures a Supplier Quality Assurance Program Data Sheet (Appendix A) appropriate for the activity being performed (e.g. manufacture of SPC's or application of specified SPC's). The SUBCONTRACTOR shall identify their Quality Assurance Program (QA) Plan documents and paragraph references on the QA Program Data Sheet. All required QA Plan elements and corresponding SUBCONTRACTOR's identified documents are subject to CONTRACTOR's evaluation and verification.

4.6 The SUBCONTRACTOR shall provide a personnel training and certification plan for applicators and inspectors. (Refer to Sections, 5.1.3.2, 5.1.7, 7.1.2, 8.1.1.1 and Appendix A).

4.7 The SUBCONTRACTOR shall supply with their coating procedures a list of previous project case histories, where they applied coating materials similar to the materials specified herein. This list shall include the type of item coated, the project name, a project client contact name and phone number, if possible, for verification.

4.8 Color samples shall be submitted prior to the start of Work. Colors shall be as defined in Appendix E or as otherwise defined by the CONTRACTOR. Color samples shall be 1' x 1' in size. At least five sets of all colors shall be submitted. The type of panel used and the coating material used for the color samples shall be as agreed upon with the CONTRACTOR.

5 Quality Assurance

5.1 General

5.1.1 The SUBCONTRACTOR shall control the quality of items and services to meet the requirements of this Specification, applicable codes and standards referenced herein, and associated subcontract documents. The SUBCONTRACTOR shall prepare and maintain documentation to provide evidence of compliance with CONTRACTOR accepted procedures and this Specification. A copy of the coating inspection documentation shall be included in the shipping documentation.

5.1.2 The SUBCONTRACTOR, including any lower-tier organizations , shall be subject to surveillance inspection by the CONTRACTOR's representative until completion or termination of the subcontract. This surveillance inspection does not relieve the SUBCONTRACTOR from the responsibility for conformance to the requirements of procurement documents, this specification and CONTRACTOR accepted procedures.

5.1.3 The SUBCONTRACTOR shall maintain a quality assurance plan for items located in "Non-Radiation and Radiation" areas, as defined in Section 2.3 that addresses as a minimum, the elements and implementing procedures called for in the Supplier Quality Assurance Program Data Sheet, Appendix A.

5.1.3.1 Quality Assurance Plan (QAP)

5.1.3.1.1 A written QAP must be developed, implemented, and maintained.

5.1.3.1.2 The QAP must describe the organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing the Work.

5.1.3.1.3 The QAP must describe management processes, including planning, scheduling, and resource considerations.

5.1.3.2 Personnel Training and Qualification.

5.1.3.2.1 Personnel must be trained and qualified to ensure they are capable of performing their assigned Work.

5.1.3.2.2 Personnel must be provided continuing training to ensure that job proficiency is maintained.

5.1.3.3 Quality Improvement.

5.1.3.3.1 Processes to detect and prevent quality problems must be established and implemented.

5.1.3.3.2 Items, services, and processes that do not meet established requirements must be identified, controlled, and corrected according to the importance of the problem and the Work affected.

5.1.3.3.3 Correction must include identifying the causes of problems and working to prevent recurrence.

5.1.3.3.4 Item characteristics, process implementation, and other quality-related information must be reviewed and the data analyzed to identify items, services, and processes needing improvement.

5.1.3.4 Documents and Records.

5.1.3.4.1 Documents must be prepared, reviewed, approved, issued, used, and revised to prescribe processes, specify requirements, or establish design.

5.1.3.4.2 Records must be specified, prepared, reviewed, approved, and maintained.

5.1.3.5 Work Processes.

5.1.3.5.1 Work must be performed to established technical standards and administrative controls using approved instructions, procedures, or other appropriate means.

5.1.3.5.2 Items must be identified and controlled to ensure their proper use.

5.1.3.5.3 Items must be maintained to prevent their damage, loss, or deterioration.

5.1.3.5.4 Equipment used for process monitoring or data collection must be calibrated and maintained.

5.1.3.6 Design.

5.1.3.6.1 NA

5.1.3.7 Procurement.

5.1.3.7.1 Procured items and services must meet established requirements and perform as specified.

5.1.3.7.2 Prospective suppliers must be evaluated and selected on the basis of specified criteria.

5.1.3.7.3 Processes to ensure that approved suppliers continue to provide acceptable items and services must be established and implemented.

5.1.3.8 Inspection and Acceptance Testing.

5.1.3.8.1 Inspection and testing of specified items, services, and processes must be conducted using established acceptance and performance criteria.

5.1.3.8.2 Equipment used for inspections and tests must be calibrated and maintained.

5.1.3.9 Management Assessment.

5.1.3.9.1 NA

5.1.3.10 Independent Assessment.

5.1.3.10.1 NA

5.1.4 The SUBCONTRACTOR shall provide the CONTRACTOR's representative with a Work activity schedule and shall notify the CONTRACTOR of all required inspection points prior to the scheduled date for coating activities (Refer to Section 2.1.10 and 2.1.11 herein).

5.1.5 If the SUBCONTRACTOR's proposed Work plan or procedures differ from the requirements of this Specification, the SUBCONTRACTOR shall specifically identify and explain all differences in writing, using an SDDR or other appropriate WTP project document, and submitted to the CONTRACTOR for review and approval prior to proceeding with a known deviation after the fact.

5.1.6 All pre-established witness and hold points shall be witnessed by the CONTRACTOR unless a written waiver has been issued.

5.1.7 All personnel shall receive training in the specific project coating requirements and the associated CONTRACTOR accepted work procedures that are relevant to their individual work assignments.

5.1.7.1 Painter/coating application personnel used to prepare the surface and apply coatings shall be trained, qualified and certified in accordance with the SUBCONTRACTOR's procedures accepted by the CONTRACTOR.

5.1.7.2 The SUBCONTRACTOR's coating Work inspectors shall have previous experience in coating inspection and shall receive documented training in the specific project coating requirements, ASTM standards and other relevant standards including the CONTRACTOR accepted Work procedures. All coating inspectors shall be trained, qualified and certified Level I inspectors meeting the requirements of Section 8.1.1.1. Inspector training, qualification and certification shall also comply with the SUBCONTRACTOR's document(s) identified on the submitted Supplier QA Program Data Sheet (Appendix A).

6 Materials

6.1 Coating Materials

6.1.1 All Special Protective Coating (SPC) secondary containment materials applied to concrete or steel items located in "Radiation" areas are prequalified in accordance with Appendix B. All SPC's applied to the building structure in "Radiation" areas or in any of the process buildings shall employ Approved coating materials as defined in Appendix B.

6.1.2 The Volatile Organic Compound (VOC) content of all materials shall comply with Federal, State and Local or other Regulatory requirements that have jurisdiction. The maximum allowable VOC for this project is 3.8 lbs./gal (450 gms/liter)

6.1.3 Coating materials including the primer intermediate and finish coat on a given item, shall all be from the same manufacturer as identified in Appendix C.

6.1.4 Secondary Containment repair materials shall be the same as those originally used or shall be those recommended by the manufacturer or shown to be compatible with the original coating and acceptable to the CONTRACTOR. Repair materials shall be in pre-measured units, and only complete kits shall be mixed. Splitting or breaking down pre-measured units of multi-component coating materials may be considered if the SUBCONTRACTOR prepares a procedure that requires accurate measurement of all materials and the SUBCONTRACTOR's QC inspector monitors/verifies each and every mix. This procedure must be submitted to the CONTRACTOR for review and permission to proceed.

6.1.5 Appendix D Room Finish Schedule Drawing References and Appendix C Tables contain the specified Special Protective Coatings for the WTP project. Appendix C contains the generic coating systems and approved coating materials. The generic coating system (primarily Epoxy or Epoxy Novolac materials) used on concrete and steel in secondary containment areas shall be coordinated with the generic coating materials indicated in the Architectural Room Finish Schedules (Appendix D Drawing Reference) for LAW, HLW, PTF, LAB and selected areas of BOF and their physical location. The Architectural Room Finish Schedules will identify coating materials for Secondary containment based on evaluation of chemical exposure , temperature and mechanical abuse based on a case by case criteria and specifically tailored for the conditions / exposure that is to be expected.

6.1.6 Appendix F is the Coating Manufacturer's Product Identity Certification Record. This document is required from the coating manufacturer for each component of each batch of coating material (manufactured coating material not individual ingredients).

6.1.7 Appendix G is an example for a Surface Preparation and Coating Inspection Form. This form or a form that contains the same information is required for daily inspection documentation.

6.2 Patching/Filler Materials

6.2.1 Materials used to patch or fill holes, shrinkage cracks, and defects in the concrete shall meet the following requirements:

6.2.1.1 For holes larger than 1/2" in its largest dimension, the filler may be a non-shrink structural concrete grout with a slump sufficient to fill holes on a vertical or overhead surface while staying flush with the surface plane. The concrete structural grout shall be compatible with the SPC system specified for use on the concrete surface. Compatibility shall be verified by applying the SPC over a cast sample of the structural concrete grout followed by a pull off adhesion of at least 200 psi per ASTM D4541 using test procedures applicable for type II and type IV instruments listed in Annex A.2 and A.4.

6.2.1.2 For holes up to 2" in its largest dimension, the filler may be a 100% solids proprietary rigid polymeric filler material as recommended by the SPC manufacturer with a slump sufficient to fill holes on a vertical or overhead surface while staying flush with the surface plane. Rigid polymeric fillers using a curing compound, catalyst or accelerator that develop heat during the cure process shall not cause blowholes in the applied filler that requires subsequent repair. The polymeric filler may be applied in more than one application to fill large voids flush with the concrete surface plane of concrete to steel embed surface plane. The proprietary polymeric filler material shall be compatible with the SPC system specified for use on the concrete surface. Compatibility shall be verified by applying the SPC over a cast sample of the proprietary filler material followed by a pull off adhesion of at least 200 psi per ASTM D4541 using test procedures applicable for type II and type IV instruments listed in Annex A.2 and A.4.

6.2.1.2.1 Rigid polymeric filler materials used in R5 areas where the 40 year accumulated radiation level will be greater than 2E8 rads that are not made with the same generic resin type shall be radiation tolerance tested in combination with the SPC system specified for use in that particular area. The specimens shall be prepared for testing as follows:

- Using the standard concrete test blocks identified in Appendix B, drill a hole 1/2" x 1/2" in each face of each block. Fill the hole with the proposed filler material flush with the surface plane of the block. Apply the SPC systems identified for use in the R5 areas. Perform radiation tolerance testing per Appendix B.

6.2.1.3 For stable non moving cracks fill flush with the surface plane using a 100% solids proprietary polymeric filler material recommended by the SPC manufacturer as defined in section 6.2.1.2. Large cracks shall be routed out as shown on Appendix I installation detail 4.

6.2.1.4 Construction Joints

6.2.1.4.1 For construction joints (other than those at inside wall to wall or wall to floor corners) in walls or floors, within areas required for secondary containment "Dangerous Waste Permitting (DWP and/or Non-DWP), a formed or created (e.g., saw-cut) rectangular slot shall be provided by others, centered on the construction joint after the concrete is placed and cured, apply specified coating system primer in the joint, then install a bond breaking tape in the base of the joint. Install the flexible epoxy filler flush with the concrete surface and overcoat the joint with the specified coating system. Refer to Appendix I installation detail 3B.

6.2.1.5 For coving in corners (filler material with 2" radius) use a flexible epoxy filler material. Where coving materials will serve as a water stop, the prequalification requirements in Appendix B section 1.2.10 apply.

6.2.1.5.1 Secondary Containment (DWP and/or Non-DWP) areas that do not have free flowing drains must use the glass reinforced coving installation detail. Refer to Appendix I for installation details 2A and 2B.

6.2.1.5.2 Secondary containment (DWP and/or Non-DWP) areas that have free flowing floor drains, do not require the glass reinforced coving detail (Refer to Appendix I for installation details 1A and 1B).

6.2.1.5.3 If the proximity of permanent plant equipment or material (e.g. drains, ladder, piping, electrical, ect.) prohibits the full 2" radius coving, the coving radius may be reduced to accommodate the coating installation.

6.3 Batch Information

6.3.1 Each container of coating material received and used by the SUBCONTRACTOR shall be marked with the following:

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

6.4 Abrasives

6.4.1 Abrasives for blast cleaning shall be clean, free of oil or contaminants, and dry. The particle size shall be capable of producing the specified surface texture or surface profile. Mineral and slag abrasives shall meet the requirements of SSPC AB-1. The first batch/lot of non packaged abrasives shall be tested for water soluble contaminants and the conductivity shall not exceed 1,000 microsiemens/cm when tested in accordance with ASTM D4940 Section 1.0-2.0. Abrasives used at the RPP-WTP project site shall be < 1% silica.

6.4.2 When using reclaimed steel grit/shot abrasive, the particle size shall be capable of producing the specified surface texture . All reclaimed abrasives shall be tested for water-soluble contaminants and conductivity. Conductivity shall not exceed 1000 microsiemens when tested in accordance with ASTM D 4940 Section 1.0-2.0. All reclaimed abrasives shall be tested for oil and grease contamination using the water floatation test at the beginning of each shift.

6.4.3 Reclaimed grit used for abrasive cleaning shall be tested for the presence of oil and grease by immersing a sample of spent abrasive in clean tap water and checking for oil flotation. Tests shall be made at the start of blasting and every four (4) hours thereafter. If oil is evident, the contaminated abrasive shall be cleaned or replaced. All surfaces blasted since the last successful test shall be completely cleaned of contamination then re-blasted using clean abrasive.

6.4.4 Expendable abrasive (Green Diamond / Black Beauty) shall be used on a once only basis and then discarded.

6.5 Water Quality

6.5.1 Water used for wet abrasive blasting or high pressure water jetting shall be clean tap or potable water and shall not exhibit any evidence of an oily sheen.

6.6 Coating Over Stainless Steel (SS)

6.6.1 All coating materials, thinners, solvents and cleaning materials used on SS shall be shown to have a low leachable halogens content that shall not exceed 200ppm, total sulfur content shall not exceed 400 ppm sulfur. The total amounts of low melting point metals such as lead, zinc copper, tin, antimony and mercury shall not exceed one (1) percent and mercury shall not exceed 50 ppm.

7 Application

7.1 General

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

7.1.2 All painters and other personnel used to apply coatings on to concrete and steel items shall be individually qualified and certified in accordance with the SUBCONTRACTOR's accepted written procedures that includes classroom training on the WTP Project Specification. Guidance for qualifying painters/application personnel are contained in ASTM D4228 and ASTM 4227 Section 1-10 and Figure #2 or other as accepted by the CONTRACTOR.

7.1.3 The secondary containment coating Mock ups shall have been satisfactorily completed and accepted by the CONTRACTOR prior to starting production work on a given area. That does not mean that all mock ups for all coating systems must be completed prior to the start of work, but at least the mock ups for the coating systems that are scheduled for facility production shall be completed prior to start of work with those coating systems.

7.2 Pre-Surface Preparation

7.2.1 Prior to mechanical cleaning, the surfaces to be coated shall be cleaned in accordance with SSPC SP1 to remove oil, grease, dirt, silicone, marks made with waxy or greasy makers, graffiti, curing compounds or form release residue or other foreign matter that could interfere with the proper bonding of the coating contamination of this type shall be removed by steam cleaning or solvent washing in accordance with ASTM D4258 Section 1.0 - 9.0. The SUBCONTRACTOR shall inspect floor for surface hardeners. Surface hardeners shall be removed prior to applying Special Protective Coatings.

7.2.2 Inspection of surfaces exhibiting fins, ridges, and sharp projections or surfaces that require repair of honeycomb areas, tie rod holes, and cavities that are greater than 1/2" in its largest dimension (i.e., length, width or depth) or cracks wider than 1/8" shall be performed by the SUBCONTRACTOR and includes a punch list to the CONTRACTOR. These defects must be removed or corrected prior to applying any coating.

7.2.3 All sharp corners that are scheduled to receive Special Protective Coatings shall be included in punch list and rounded to a radius of no less than 1/8" by others.

7.2.4 The SUBCONTRACTOR shall inspect all joint details and the configuration of the finished concrete sections in relation to the application of materials as shown in installation details shown in Appendix I Secondary Containment Installation Details and the requirements of this specification.

7.2.5 Any remaining sharp edges, weld spatter, or burrs, fins, ridges, tie rods, projections found after the start of coating Work shall be completely removed by grinding or other means. Pneumatic tools shall not be used unless they are fitted with effective oil and water traps on the exhaust air. If the steel embeds exhibits salt deposits or were shipped or stored so that the surface could have been contaminated with soluble salts (e.g., above deck ship transport, truck transport on dirt roads close to ocean, storage), the area shall be pressure water washed (e.g., 2,000-5,000 psi) with demineralized water to remove the soluble salt contamination as possible prior to abrasive blasting/water jetting.

7.2.6 Floor/Wall and Wall/Wall coving shall be installed using the same flexible epoxy filler material defined in section 6.2.1.5 or a filler material as recommended by the coating manufacturer and accepted by the CONTRACTOR. Coving shall be installed after concrete surface preparation and shall comply with the installation details in Appendix I.

7.2.7 To insure a seal and a smooth transition from concrete surfaces onto steel embed plates, the concrete shall be chipped away from the edge of the embed plate at least ½" and at least ¼" below the surface plane of the embed plate. The chipped away area shall be filled flush between the concrete and steel embed plate using the same rigid filler material defined in section 6.2.1.2 or a filler material as recommended by the coating manufacturer and accepted by the CONTRACTOR. (refer to Appendix I).

7.2.8 To provide a structurally sound termination of a floor coating, a perimeter key shall be placed in the floor (refer to Appendix I).

7.3 Surface Preparation

7.3.1 Prior to the start of Work, the SUBCONTRACTOR shall examine all surfaces to be coated to determine their acceptability for the specified coating application Work. If the surfaces are found to be unacceptable, the SUBCONTRACTOR shall either return the surface to an acceptable condition or immediately notify the CONTRACTOR in the punch list (section 7.2.2) if the repairs are outside the scope of work. Coating Work shall not commence until corrective action has been taken. Starting Work prior to completion of corrective action shall preclude any subsequent claim by the SUBCONTRACTOR. The CONTRACTOR may require corrective action at the SUBCONTRACTOR's expense.

7.3.2 The abrasive mixture and the compressed air shall be clean, dry and oil free. Moisture traps, in addition to oil and water separators mounted on the compressor, shall be used in compressed air lines to remove oil and moisture from air close to the point of use. (refer to Section 7.3.4.4 and 8.1.6)

7.3.3 Concrete Surfaces

7.3.3.1 Floors, walls shall be free of curing compounds, laitance, dirt or other residue that could interfere with proper adhesion of the coating system.

7.3.3.2 Concrete shall be suitably roughened and textured using one of the specified methods of surface preparation during the coating system mock-ups performed and accepted by the CONTRACTOR. To achieve a clean roughened surface suitable for the specified coating systems, surfaces may be dry abrasive blasted, wet abrasive blasted (Refer to ASTM D4259 Sections 1.0-10.0) or cleaned and roughened by high pressure (10,000 psi to 25,000 psi) water jetting using a rotating head hand lance or self propelled robot (Refer to SSPC SP12 Appendix C and D for a description and operation and SSPC SP13 Sections 3.0-6.0). Small areas may be prepared using grinders or sanders as accepted for use during mock-ups. Needle guns may only be used if followed by full abrasive blasting or water jetting to remove weakened/crushed concrete surface layer to sound dense concrete and only when the procedure has been shown to result in a coating adhesion of 200 psi minimum.

7.3.3.3 In addition, floors may be acid etched using 20 % citric acid solution when accepted by the CONTRACTOR. Acid etched surfaces shall be pH tested in accordance with ASTM D4262 Sections 1.0-8.0. The pH shall be no more than 1.0 pH lower or 2.0 pH higher than the pH of the potable rinse water. A suitable texture shall be achieved that will be agreed upon during the mock up coating application. A detailed procedure on the use, clean up and disposal of acid etching materials/rinse must be provided for review and acceptance by the CONTRACTOR.

7.3.4 Carbon Steel Surfaces

7.3.4.1 Prior to blast cleaning, items to be coated shall be visibly dry with the surface temperature of at least 5°F above the dew point. Concrete surfaces shall be determined suitably cured as defined by the CONTRACTOR.

7.3.4.2 Carbon steel surfaces to be coated shall be blast cleaned in accordance with the surface preparation requirements specified in Appendix D. Where abrasive blasting will damage the items or is impractical, SSPC-SP11 Power Tool Cleaning to Bare Metal may be substituted only in limited areas and only with CONTRACTOR's written permission to proceed.

7.3.4.3 Abrasive blasting of carbon steel shall result in an angular surface profile 1.5 to 3.0 mils as measured using a Testex Press-O-Film replication tape in accordance with ASTM D4417 method C.

7.3.4.4 The recycled abrasive mix shall be maintained clean of contaminants by continuous effective operations of cleaning machine scalping and air wash separators. Reclaimed grit used for abrasive cleaning shall be tested for the presence of oil/grease by immersing a sample of spent abrasive in clean tap water and checking for oil flotation. Tests shall be made at the start of blasting, and every four (4) hours thereafter. If oil is evident, the contaminated abrasive shall be cleaned or replaced. All surfaces blasted since the last successful test shall be completely cleaned of contamination then re-blasted using clean abrasive. Blast cleaning shall not be performed in the immediate area where coating or curing of coated surfaces is in progress unless a vacuum system is employed that contains dust. All surfaces and equipment which are not to be coated shall be suitably protected from blast cleaning.

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

7.3.4.6 If visible rust occurs or if the cleaned surface becomes wet or otherwise contaminated, these surfaces shall be re-cleaned to the specified standard. Cleaned surfaces remaining un-coated overnight shall be re-cleaned to the specified cleanliness prior to applying the coating. Where Concrete and Carbon Steel interface and are proposed to be coated in one operation every effort will be made to apply coating to the steel before surface deterioration.

7.3.4.7 After surface preparation is complete and before coating, pressurized air or a vacuum cleaning shall be used to remove all dust and abrasive residue. The air shall be clean and dry as verified in accordance with Section 8.1.6 so as not to contaminate the prepared surface. The operator shall ensure that all dust and abrasive residues are removed from the surface of blast profiles when vacuum cleaning is carried out.

7.3.4.8 Machined surfaces shall be protected from damage due to blasting and coating operations.

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

7.3.5 The abrasive mixture and the compressed air shall be clean, dry and oil free. Moisture Traps, in addition to oil and water extractor mounted on the compressor, shall be used in compressed air lines to remove oil and moisture from air close to the point of use. (refer to Section 7.3.4.4 and 8.1.6)

7.3.6 Where galvanized steel falls into secondary containment areas and requires a coating, the surface shall be cleaned per SSPC SP1 and allowed to dry. The galvanizing shall then be pretreated using a phosphoric acid solution (e.g., Amchem Galva-Prep) or brush blasted per SP7 as recommended by the manufacturer of the coating material intended for use. After flushing the acid off using potable water, the surface area contacted by the acid and the rinse water shall be tested for pH. The pH shall be as indicated in specification section 7.3.3.3.

7.3.7 Damaged galvanized steel shall be cleaned per SSPC SP11 using a 3M Clean-N-Strip disc and wheel, a flapper wheel with a 60-80 grit size or a slow variable speed sander using 60-80 grit sanding disc. All galvanizing to be coated shall be pretreated as indicated in specification section 7.3.6.

7.4 Coating Application

7.4.1 Prior to applying Special Protective Coatings (SPC's) the concrete surface shall be dry as determined by the plastic sheet method in accordance with ASTM D4263 sections 1.0-8.0.

7.4.2 Coatings shall be applied in accordance with CONTRACTOR accepted procedures (refer to Section 4.1). The coating manufacturer's recommendations for the application temperature and curing temperatures versus times (between coats and after last coat) of the specified material shall be considered when determining minimum and maximum cure to recoat time intervals. Application and curing temperatures above or below the limits allowed by this specification (Refer to Section 7.4.5) shall be submitted to the CONTRACTOR for review and permission to proceed.

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

7.4.4 Bug holes, cracks and construction joints shall be filled flush with the concrete surface plane or as identified in Appendix I Secondary Containment Installation Details using a structural concrete grout, Five Star V/O or Five Star Vertical patch or CONTRACTOR accepted alternate structural concrete grout or polymeric filler. Structural Concrete grout shall be applied prior to applying the first coat or by applying the proprietary polymeric filler listed in Appendix C Table 2 for the selected coating system or CONTRACTOR accepted equal. Proprietary filler materials may be applied before or after the primer sealer coat where acceptable to the specific coating manufacturer. The filler technique shall be developed during the mock up to minimize the occurrence of pinholes in the finish coats.

7.4.5 Coatings shall be applied only when the surfaces to be coated are free of curing compound, free of concrete laitance, clean, properly textured and dry. The substrate temperature shall be a minimum of 5°F above the dew point during coating application and until the applied coating is no longer moisture sensitive per the coating manufacturer's published data or written recommendations. The substrate and air temperature during coating application and curing shall be a minimum of 50°F (Inorganic zinc primers 40°F) and a maximum of 110°F. The relative humidity during coating application shall not exceed 85 percent. Measure humidity in accordance with ASTM E 337 (Sections 1.0-19.0). Deviations from the above listed minimum and maximum substrate/air temperature and humidity limits may be allowed when in accordance with the coating manufacturer's published data or written recommendations and are accepted by the CONTRACTOR. The one firm limit is that the minimum substrate or air temperature shall not be less than 35°F regardless of the coating manufacturer's published or written recommendations.

7.4.6 The SUBCONTRACTOR shall record all batch numbers for each coating component used along with other information necessary for the CONTRACTOR to relate the batch to the area or item for which it was applied. (Refer to Appendix G)

7.4.7 All coatings shall be thoroughly mixed until they are smooth and free from lumps, then strained through a screen of at least 30 mesh. Heavy bodied materials that will not flow through a 30-mesh screen are exempt from straining. All coatings that could settle in the container during application must be kept under continuous mechanical agitation to ensure coatings expend their solid contents and do not settle during application.

7.4.8 Alternating coats shall have a visible color difference to insure full coverage over previous coats.

7.4.9 Dry film thickness of each coating shall be in accordance with Appendix C Table 2 Secondary Containment Prequalified Coating Materials or as specified in the subcontract document (Refer to Section 8.3.6). The film thickness of concrete primer sealer may be measured using a wet film thickness gage. The primer sealer must be tinted to a color that allows visual verification that it has been applied. At floors, walls and ceilings that only require a clear sealer, the sealer shall not require tinting.

7.4.10 The minimum and maximum drying times between coats shall be in strict accordance with the coating manufacturer's latest published technical data sheets or written recommendations.

7.4.11 Runs, sags, voids, drips, overspray, loss of adhesion, bubbling, peeling, pinholes or inadequate cure are not permitted and shall be corrected using CONTRACTOR accepted repair procedures.

7.4.12 Application equipment that will be reused such as spray equipment, brushes and rollers shall be cleaned using the coating manufacturer's recommended solvents/cleaners.

7.5 Remedial Work

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

7.5.2 Repair of Dry Film Thickness (DFT) deficiencies

7.5.2.1 Defects such as runs, sags, overspray and embedded particles shall be corrected by sanding to remove the defect. When the defects are in the finish coat, all areas sanded must be overcoated with the finish coat. If the DFT of primer or intermediate coat is reduced to less than the specified minimum, the area shall be abraded with 60-80 grit sand paper or flapper wheel and an additional layer of coating shall be applied until sufficient thickness is achieved. If noticed during application, the sags or runs may be brushed out.

7.5.3 Repair of Damage

7.5.3.1 All damaged and loosely adhering coating shall be removed and the surface thoroughly cleaned using a vacu-blaster or high pressure water jetting, 60-80 grit sanding disc, 60 - 80 grit sandpaper, 60-80 grit flapper wheel or 3M Clean-N-Strip. Edges of the breaks shall be feathered to insure a smooth transition and the designated number of prime and finish coats shall be applied. Care shall be taken to insure adjacent coatings are not heat damaged, polished or burnished.

7.5.4 Loss of adhesion, delamination, blisters, bubbling and fish eyes in the applied coating requires the affected area of coating to be removed and reapplied in accordance with this Specification.

7.5.5 Pinholes shall be filled or otherwise repaired prior to the application of the final coat. Pinhole repairs in the final coat shall blend in and not be visually obvious.

7.5.6 (Later)

7.5.7 Touch-up Coating and Sealing of Steel Items Attached by Post-installed Concrete Anchors.

7.5.7.1 Post-installed anchors that attach carbon steel items to concrete surfaces require the mechanical joint formed between the concrete and carbon steel attachment to be sealed. Carbon steel anchors and the anchored carbon steel item shall also receive coating touch-up.

7.5.7.2 Stainless steel post-installed anchors that attach stainless steel items to concrete surfaces require the mechanical joint formed between the concrete and attachment to be sealed.

Stainless steel post-installed anchors and stainless steel attachments do not require touch-up coating.

8 Inspection

8.1 General

8.1.1 The SUBCONTRACTOR shall have the full responsibility for the coating application quality in accordance with this Specification and shall be responsible for stopping Work activities when conditions develop that could adversely affect the quality. All Work is subject to the CONTRACTOR's inspection surveillance.

8.1.1.1 All coating Work inspection personnel shall be trained, qualified and certified in accordance with the SUBCONTRACTOR's accepted procedures. The inspectors shall meet or exceed the minimum requirements for a Level I coatings inspector as described in ASTM D4537 Section 6.0. At least one inspector shall meet the minimum requirements for a Level II inspector as described in ASTM D4537 Section 1.0-8.0. The SUBCONTRACTOR shall conduct an examination, a performance evaluation and issue a certification for each inspector in accordance with ASTM D4537 Section 9.0. The Level II inspector shall supervise the Work of all Level I's. The SUBCONTRACTOR's inspector must demonstrate his/her capability of using the inspection equipment and performing all the required inspections. The SUBCONTRACTOR's inspector training, qualification and certification plan and associated procedures shall satisfy the requirements of ASTM D4537, Sections 1.0-8.0 using the guidelines provided in ASTM D5498 including classroom training on the WTP specifications applicable to coating inspection. Additional coating work inspection guidance is found in ASTM D6237 and ASTM D3276 which shall be used in developing procedures for training and certifying coating work inspectors.

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

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

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

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

8.1.6 Prior to using compressed air, the quality of the air downstream of the separator shall be tested in accordance with the requirements of ASTM D4285 by blowing the air onto a clean white blotter or cloth for two (2) minutes at a distance of no more than twelve (12) inches to check for any contamination, oil, or moisture. This test shall be performed at the start of work and at not more than four (4) hour intervals. The test shall also be made after any interruption of the air compressor operation or as required by the CONTRACTOR. The air shall be used only if the test indicates no visible contamination, oil, or moisture. If contaminants are evident, the equipment deficiencies shall be corrected and the air stream shall be re-tested. Moisture separators shall be bled continuously. All lines shall be tested individually prior to use. Surfaces determined to have been blown down or blasted with contaminated air shall be cleaned of all contamination then re-blasted with clean air and abrasive. Coatings determined to have been applied using contaminated air shall be removed and reapplied using clean air.

8.1.7 Inspection points shall be established as follows:

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

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

8.1.9 The SUBCONTRACTOR shall keep the records indicated below, and submit these records to the CONTRACTOR (refer to Section 4.4 and Appendix G). The following lists the frequencies:

Coating/Inspection Step		**Required Frequency**
1.	Pre-Surface Prep and Surface Preparation/Profile/Texture	100% visual on Pre-Surface/100% on Surface Prep Cleanliness/Steel profile first item of each type per shift and every 20 items thereafter/Concrete 100% visual for cleanliness and texture.
2.	Environmental/Air Quality	At the start of work and every 4 hours thereafter or more often during changing conditions.
3.	Recirculated Abrasive	At the start of work and as required with a minimum of every 4 hours thereafter
4.	Thickness	SSPC-PA2- 5 spot readings per 100 sq.ft. on large surfaces or steel items, surfaces or steel items < 100 sq.ft. 4 spot readings on each surface or steel item, and 2 spot readings on steel items less than 4 inches. (e.g., valves, fittings, components, etc.)
5.	Visual on Applied Coating	100% of all items

8.2 Surface Preparation Inspection

8.2.1 Verify bug holes, voids, cracks and construction joints are properly filled. This is not necessary if filler is applied after surface preparation and sealer coat application.

8.2.2 Verify environmental conditions and compressed air quality (refer to Section 7.3.5, 7.3.4.1, 7.4.5)

8.2.3 Verify recycled abrasive is grease and oil free (refer to Section 7.3.5).

8.2.4 Verify surface cleanliness and texture.(refer to Sections 7.3.3.1, 7.3.3.2, 7.3.4.2 and 7.3.4.3).

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

8.3 Coating Application

8.3.1 Environmental conditions and compressed air quality shall be verified per Sections 7.3.4.1, 7.3.5, 7.4.5 and 8.1.9.

8.3.2 Dry coating thickness (DFT) on steel items shall be measured with a magnetic film thickness gage such as an Elektro-Physik "Mikrotest" or Positector 2000, 6000 or CONTRACTOR accepted equal in accordance with SSPC PA2. Steel items and individual items on equipment less than one hundred (100) sq.ft. in surface area shall have at least four (4) evenly spaced spot readings per item. Equipment or equipment components less than four (4) inches in its largest dimension only require two (2) evenly spaced spot reading per item.

8.3.3 Dry coating thickness (DFT) on concrete shall be measured using a Wet Film Thickness (WFT) gage (Refer to ASTM D4414 Sections 1.0-10.0 applicable to procedure A) and calculating thickness based on coating material volume solids (added thinners require recalculation of volume solids) or by using a nondestructive ultrasonic tester such as the Positector 100 or accepted equivalent (Refer to ASTM D6132 Sections 1.0-11.0). Each 100 sq.ft. shall receive 5 evenly spaced gage readings. Areas less than 100 sq.ft. in surface area shall have at least 2 evenly spaced spot readings per area.

8.3.4 Wet film thickness gages shall be of high quality steel or stainless steel, with a maximum blade width of 1.5", that can be purchased with calibration certifications. Wet film thickness gages shall be visually inspected for paint residue and physical damage at the start of work and every 4 hours thereafter during use.

8.3.5 The Dry Film Thickness gage shall have a minimum of a zero to 40 mil or zero to 60 mil working range and shall be checked for calibration accuracy in accordance with SSPC-PA2 at the start of each shift against certified coating thickness calibration standards for non-magnetic coating of steel traceable to NIST or CONTRACTOR's accepted alternative standards. The calibration standards shall be in the 1.5 mil to 40.0 mil range, unless otherwise specified. Any surface with a measured thickness outside of the limits described in section 7.4.9 shall be rejected. These areas shall be reworked or re-cleaned and re-coated at the SUBCONTRACTOR's expense prior to acceptance by the CONTRACTOR.

8.3.6 When dry film thickness becomes debatable or indeterminate, the CONTRACTOR reserves the right to require the use of destructive testing using a Tooke gage in accordance with ASTM D4138 Sections 1.0-9.0 or by nondestructive ultrasonic testing in accordance with ASTM D6132 Sections 1.0-11.0 to verify dry film thickness. All areas damaged by destructive testing shall be repaired by the SUBCONTRACTOR.

8.3.7 Runs, sags, voids, drips, overspray, loss of adhesion, bubbling, pinholes, peeling, or inadequate cure are not permitted and shall be repaired or reworked.

9 Storage, Handling and Shipping

9.1 Coating Materials

9.1.1 Coating materials shall not be stored in direct sunlight or exposed to inclement weather (e.g., rain, snow, sleet, freezing rain, dew point condensation, see also section 9.1.5). Materials shall remain under cover until ready to use.

9.1.2 Coatings, thinners, cleaning solvents and other flammable materials stored at any location, shall be kept away from combustion sources and shall be stored in metal flammable material storage cabinets meeting NFPA and OSHA standards. Thinners and solvents shall be transported to the point of use in approved safety containers meeting OSHA standards.

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

9.1.4 Coating materials shall have a minimum of 120 days of its shelf life remaining at the time the shipment arrives at the project site or the SUBCONTRACTOR's warehouse.

9.1.5 Coating materials that are older than twenty four (24) months from the date of manufacture or that exceed the manufacturer's shelf life, if less than twenty four (24) months, shall not be used and shall be placed on HOLD and segregated from other coating materials. Where the coating material has exceeded its shelf life and can be shown to have been stored as specified herein, a one-time extension for no less than three (3) months and no more than six (6) months may be issued by the coating manufacturer. The shelf life extension shall be based on laboratory testing of retain samples taken at the time of manufacture or by testing a sample of the actual coating material in question. Where testing verified an outdated coating material still complies with its original design criteria, it is acceptable for shelf life extension. Expiration date stickers, provided by the coating manufacturer, shall be affixed to each container prior to release from HOLD. The stickers shall include the product number, batch/lot number, the new expiration date and suitably marked to indicate that they came from the coating manufacturer. A new Appendix F shall be provided by the coating manufacturer that includes the test results and specifically indicate that the new Appendix F was provided to document shelf life extension including new expiration date. Coating materials that have not been stored or handled in accordance with sections 9.1.1, 9.1.6, 9.1.7 and 9.1.8, may not have their shelf life extended.

9.1.6 Coating material shall be protected from moisture, direct sunlight and temperatures below 40°F or above 100°F unless otherwise allowed by the coating manufacturer's latest published instructions and accepted by the CONTRACTOR.

9.1.7 Coating material containers where the airtight seal has been broken or any of the contents are lost, shall not be used.

9.1.8 Coating material containers shall not be opened except for immediate use.

9.1.9 Unused material shall be returned to storage as soon as possible at the end of each Workday. Materials left out for more than ten (10) hours in an uncontrolled storage area (areas without environmental controls or environmental monitoring that are exposed to ambient weather) shall not be used and shall be placed in a segregated hold area until final disposition then removed from the job site if rejected. No water borne coatings shall be stored in areas where the temperatures are below 40°F.

9.1.10 All required coating material certifications for each batch of material delivered to the job site shall be available at the time of material receipt. Materials delivered to the shop or field without the required documentation shall not be used and the SUBCONTRACTOR shall tag and place discrepant materials into a hold area clearly separated from acceptable material. Once the required documentation is received or otherwise corrected and found to be acceptable, the discrepant material may then be taken off hold status and used.

10 Documentation

10.1 The SUBCONTRACTOR shall provide a record of all materials used (Regarding individual batch numbers, refer to Appendix F).

10.2 The SUBCONTRACTOR shall provide a record of all required daily inspections (Example-Appendix G) that includes pre-surface preparation, compressed air cleanliness, environmental conditions, surface preparation and roughness, location of field repairs coated, application, visual inspection, dry film thickness, and all touch up/repair. This record shall include the coating and thinner materials used and the ID of the items coated to provide traceability.

10.3 All quality documentation shall be available for review by the CONTRACTOR representative within twenty four (24) hours from the time it is generated.

10.4 SUBCONTRACTOR documentation forms or the way that the actual Work will be documented shall be provided by the SUBCONTRACTOR as part of the procedures submittal for review by the CONTRACTOR.

11 Design Changes Incorporated by Reference

11.1 The following is a listing of design changes that are identified by reference and do not require modification to the specification.

Design Change Document
(none at this time)

* Denotes a new entry for this revision of the specification.

Appendix A
Supplier Quality Assurance Program Requirements Data Sheet

DOE ORDER 414.1C REQUIREMENTS

The following marked QA Program Elements of DOE ORDER 414.1C apply and are subject to CONTRACTOR evaluation and verification (see also exhibit J in subcontract documents)

DOE O 414.1A	N/A	PROGRAM ELEMENTS	SUPPLIER DOCUMENT AND PARAGRAPH REFERENCES TO BE COMPLETED BY THE SUPPLIER
X		PROGRAM	
X		PERSONNEL TRAINING & QUALIFICATION	
X		QUALITY IMPROVEMENT	
X		DOCUMENTS & RECORDS	
X		WORK PROCESSES	
	X	DESIGN	Coating manufacturers and coating applicators "Design" for Special Protective Coatings provided by 24590-WTP-3PS-AFPS-T0006
X		PROCUREMENT	
X		INSPECTION & ACCEPTANCE TESTING	
	X	MANAGEMENT ASSESSMENT	
	X	INDEPENDENT ASSESSMENT	

SIGNATURE OF SUPPLIER REPRESENTATIVE ______________________

0		Issue for Use				
REV.	DATE	REASON FOR REVISION	BY	CHECKED	APPROVED	QA

Special Protective Coatings For Secondary Containment Areas.	JOB NO. 24590-101
	DATA SHEET NO.
	REV. 0

Appendix B
WTP Project Special Protective Coating (SPC) Material Prequalification Requirements for Secondary Containment.

1.0 Prequalification Testing for Radiation Areas

1.1 All the coating material prequalification testing shall be performed by the coating manufacturers listed in Appendix C. Coating systems listed as "Prequalified" have been fully tested and all data has been reviewed and accepted. Only those systems listed as Prequalified may be used.

1.2 Coating systems that will be applied on items that will be located inside "Radiation" areas shall satisfy the following test requirements:

1.2.1 Radiation Tolerance Testing: Coating systems shall be tested for tolerance to radiation exposure as a complete system in accordance with the requirements of ASTM D4082 and as follows:

1.2.1.1 For coating systems to be used in areas where the total anticipated accumulate dose will not exceed 2E8 rads, no radiation tolerance testing is required.

1.2.1.2 For coating systems to be used in areas where the total anticipated accumulated dose is >2E8 rads up to 1E9 rads, test the coatings at 1E9 rads.

1.2.1.3 For coating systems to be used in areas where the total anticipated accumulated dose is >1E9 rads, the test radiation level shall equal or exceed the highest anticipated accumulated dose.

1.2.1.4 The acceptance criteria for the irradiation test shall be "no defects" as described in ASTM D4082. In addition to the defects stated in ASTM D4082, also check the coating on the test specimens for softening. The coating shall not soften because of the irradiation exposure.

1.2.2 Decontamination Testing: Generic Special Protective Coating materials such as two component or three component Epoxy, and Epoxy Novolac's, type have historically shown very good decontamination and chemical resistance properties and are suitable for use on the WTP project. Other generic coating materials located in areas that will require operational decontamination must be able to withstand the decontamination chemicals and temperatures that will be used as part of the decontamination process.

1.2.3 Abrasion Resistance Testing: In addition to radiation tolerance testing of coating systems that will be applied to surfaces inside "Radiation" areas or on items that will be located inside "Radiation" areas, those coating systems and selected "Non-Radiation" area coating systems shall satisfy the following test requirements:

1.2.3.1 Coating systems for use -in secondary containment areas, where abrasion will be a factor in the in-service performance of the coating system, shall be tested in accordance with ASTM D4060. The weight loss shall not exceed 175 mg per 1000 cycles when a CS-17 wheel is used with a 1000-g load.

1.2.4 Adhesion Testing: Coating systems shall be tested for adhesion in accordance with the requirements of ASTM D4541 and ASTM D5144 Section 5.5.1. The minimum adhesion value shall be 200 psi for coatings applied to concrete or steel substrates.

1.2.5 Chemical Resistance Testing: Perform chemical resistance testing on coating systems in chemical exposure areas in accordance with the requirements of ASTM D3912 Section 6.3. The test reagents and test duration of the tests shall be governed by the anticipated service conditions. The test shall last for 5 days for secondary containment coating systems and for coating systems where cleanup of spills will not be immediate, for 24 hours.

If the test duration exceeds 24 hours, examine the test specimens after each 24-hour period and report the condition of the specimens after each 24-hour interval. Examine and report the condition of the specimens in accordance with the requirements of ASTM D3912, Sections 7 and 8. The test reagents and concentrations shall be as follows:

1.2.5.1 Chemical Reagents and Concentrations that may require testing

- 2.0, 5.0 & 12.2 Molar HNO3
- 0.25, 2.0, 5 & 19 Molar NaOH
- 3.27 Molar Sr(NO3)2
- 7.4 Molar NaNO2
- 4.4 Molar NaMnO4

1.2.6 Test Specimen Preparation: Test specimens shall be prepared in accordance with the requirements of ASTM D5139. The surface preparation methods utilized for radiation tolerance, adhesion and chemical resistance testing shall be representative of those proposed for use. If more than one surface preparation method is proposed for use, each proposed surface preparation method shall be tested independently. The size of the test specimens shall be appropriate for the test being carried out. The minimum size of test specimens shall be 2" X 4" X ¼" for steel substrates and 2" X 2" X 4" for concrete substrates.

1.2.7 Infra Red (IR) Scan: The coating manufacturer shall run an IR scan of the prequalification batch of the liquid component of each coating system to maintain as a record of that formulation. The IR scans shall be maintained indefinitely for all coating systems that are accepted for use by RPP/WTP and shall be identified and submitted with the test documentation for each coating system. Thereafter, the manufacturer shall certify that each subsequent batch of an accepted coating system was manufactured with the same formulation, raw materials, production methods, and quality control standards as the coating materials originally tested and accepted for use by the RPP/WTP (refer to the statement included on the Coating Manufacturer's Product Identity Certification Record in Appendix F).

1.2.8 Flame Spread and Smoke Developed: All Special Protective Coatings that will be applied on the building structure (e.g., concrete walls, floors, ceilings, structural steel) located in the LAW, HLW, PTF, LAB and areas of BOF that transport, process or store radioactive materials or items, shall comply with the requirements of NFPA 801, DOE Standard 1066, NFPA 255 and NFPA 253 as defined in specification 24590-WTP-3PS-AFPS-T0002 Special Protective Coatings Limited-Combustible Testing Protocol. Concrete floors are required to have a minimum Critical Radiant Flux rating of 0.45 watts/cm^2. The Maximum allowable flame spread for the building structure walls and ceiling is 25 and the maximum allowable smoke developed is 50. Concrete floors, equipment, piping, and steel items installed in the building do not require flame spread and smoke developed testing.

1.2.9 Volatile Organic Compounds (VOC): The VOC content of all Special Protective Coatings shall not exceed 3.8 lbs./gal (450 grams/liter). If the VOC requirement in the location where the coating is being applied is less than the 3.8 lbs./gal, the local (e.g., a facility offsite in Tri-Cities area) requirements take precedence and must be met.

1.2.10 Prequalification Testing for Flexible Epoxy Filler Material Acting as a Water Stop

1.2.10.1 Permeability testing of flexible epoxy filler material shall be preformed in accordance with ASTM D1653 method B. Permeability shall be similar to epoxy coating materials.

1.2.10.2 Radiation tolerance testing of flexible epoxy filler material shall be performed per ASTM D4082 when installed in areas where the 40 year integrated dose exposure is expected to be greater than 2E8 rads. The flexible epoxy filler shall exhibit residual flexibility and remain bonded to the substrate.

1.2.10.3 Elongation of the flexible epoxy filler material shall be at least 50% when tested in accordance with ASTM D412.

1.2.10.4 Abrasion resistance testing of flexible epoxy filler material per ASTM D4060 is not required.

1.2.10.5 Adhesion testing of the flexible epoxy filler material to concrete shall be performed in accordance with ASTM D4541 and ASTM D5144. The adhesion shall be 200psi minimum.

1.2.10.6 Chemical resistance testing of the flexible epoxy filler material shall be performed per section 1.2.5 above. The testing results shall be reported.

1.2.10.7 Aging shall be demonstrated by at least 10 years of successful field service in secondary containment applications or other similar application. Accelerated aging testing may also be used such as radiation tolerance testing at 2E8 rads minimum (see Section 1.2.1 above).

1.2.10.8 Crack-filling- Due to the thick viscous nature of the flexible epoxy filler material, it is only required to be mechanically forced into the cracks, primarily bridging over the cracks creating a thick well bonded protective barrier.

2.0 Prequalification Testing for Non-Radiation Areas

Special Protective Coating materials or systems that will be applied on items that will be located in "Non-Radiation" areas have the same prequalification requirements as listed in Appendix "B" Section 1.0 except no radiation tolerance testing is required.

Appendix C
Table 1- Secondary Containment Coating Systems

Usage Type	Thickness Groups Concrete/ Steel	Resin Type/ Surface Type	Coating System Description	Prequalified Coating Systems						
				Ameron	Carboline	ICI-Devoe	Dudick	Inter-National	Sherwin Williams	Remarks
		FLOOR COATING SYSTEMS								
SC	T4	ECF	Heavy Spray or Self Leveling Epoxy Floor Coatings (Epoxy primer and one coat of epoxy finish)	AM07	CA07	DE07	DD07	IN07	SW07	When the room finish schedule specifies system designation SC-E it includes this concrete floor coating system.
SC	T4	NCF	Heavy Spray or Self Leveling Epoxy Novolac Floor Coatings (Epoxy Novolac primer and one coat of epoxy Novolac finish)	AM08	CA08	DE08	DD08	(none)	SW08	When the room finish schedule specifies system designation SC-N it includes this concrete floor coating system.
		WALL and SUMP COATING SYSTEMS								
SC	T2	ECW	Epoxy Wall & Sump Coatings (Fill bug holes flush, apply 1 coat of epoxy primer and two coats of epoxy finish)	AM15	CA15	(none)	(none)	IN15	SW15	When the room finish schedule specifies system designation SC-E it includes this concrete wall coating system.
SC	T2	NCW	Epoxy Novolac Wall & Sump Coatings (Fill bug holes flush, apply 1 coat of epoxy Novolac primer and two coats of epoxy Novolac finish)	AM16	CA16	(none)	(none)	IN16	SW16	When the room finish schedule specifies system designation SC-N it includes this concrete wall coating system.
		STEEL EMBED COATING SYSTEMS								
SC	T4	ESE	Epoxy Coatings for Embed Plates and Support Steel, (Touch up existing shop coating or abrasive blast and apply two coats of Epoxy Finish)	AM19	CA19	(none)	(none)	IN19	SW19	When the room finish schedule specifies system designation SC-E it includes this steel coating system.
SC	T5	NSE	Epoxy Novolac Coatings for, Embed Plates and Support Steel (Touch up existing shop coating or abrasive blast and then apply two coats of Epoxy Novolac Finish)	AM20	CA20	(none)	(none)	IN20	SW20	When the room finish schedule specifies system designation SC-N it includes this steel coating system.

SC = Secondary Containment

ECF = Epoxy Concrete Floors; NCF = Epoxy Novolac Concrete Floors; ECW = Epoxy Concrete Walls; NCW = Epoxy Novolac Concrete Walls

ESE = Epoxy Steel Embeds; NSE = Epoxy Novolac Steel Embeds

Appendix C
Table 2 Secondary Containment Prequalified Coating Materials

WTP Concrete System Code	Surface Type	Appendix C Table 1 Mfg. System Code	Coating Mfg.	Concrete Filler (flush)	Mfg. Products	Required Dry Film Thickness (Mils) **
SC-T4-ECF	Concrete Floors	AM07	Ameron	None	X00701 / Nu Klad 120A	1-2 / 40-60 = 41-62 mils
SC-T4-ECF	Concrete Floors	CA07	Carboline	None	Semstone 5401 / Semstone 140SL+SAND / 140SL	4-6 / 10-15 / 30-50 =44-71 mils
SC-T4-ECF	Concrete Floors	DE07	Devoe	Futura- Bond 320 Gel	Pre Prime 167/ Devmat 111	1-2 / 40-60 = 41-62 mils
SC-T4-ECF	Concrete Floors	DU07	Dudick	None	Primer 67 / Polymer Alloy 2500 FR	4-6 / 40-60 = 44-66 mils
SC-T4-ECF	Concrete Floors	IN07	International	Intercryl 320	Interseal 670HS / Interzone 954	2-4 / 45-55 = 47-59 mils
SC-T4-ECF	Concrete Floors	SW07	Sherwin Williams	Kem Cati-Cote HS or Steel-Seam FT910	Macropoxy 920 / Cor-Cote HP SL Mortar	1.5-2 / 38.5-58 = 40-60 mils
SC-T4-NCF	Concrete Floors	AM08	Ameron	None	X00701 / Nu Klad 120A / Amercoat 91	1-2 / 34-50 / 6-10 = 41-62 mils
SC-T4-NCF	Concrete Floors	CA08	Carboline	None	Semstone 5401 / 145SL+SAND / 145SL.	4-6 / 40-60 = 44-66 mils
SC-T4-NCF	Concrete Floors	DE08	Devoe	Futura- Bond 320 Gel	Pre Prime 167/ Devmat 111	1-1.5 / 40-60 = 41-61.5 mils
SC-T4-NCF	Concrete Floors	DU08	Dudick	None	Primer 67 / Polymer Alloy 2100 FR	4-6 / 40-60 = 44-66 mils
SC-T4-NCF	Concrete Floors	SW08	Sherwin Williams	Kem Cati-Cote HS or Steel-Seam FT910	Cor Cote HCR / Cor Cote HCR SL Mortar.	4-6 / 36-54 = 40-60 mils
SC-T2-ECW	Concrete Walls	AM15	Ameron	Nuclad 114A	Amerlock 400 / Amerlock 400	4-8 / 4-8=8-16 mils
SC-T2-ECW	Concrete Walls	CA15	Carboline	Semstone 195	Carbogard 1340 / Carbog890C705 / C890S800	1-2 / 4-5 / 4-5=10-14 mils
SC-T2-ECW	Concrete Walls	IN15	International	Intercyrl 320	Intergard 345 / 345 / 345	4-6 / 4-6 / 4-6=12-18 mils

WTP Concrete System Code	Surface Type	Appendix C Table 1 Mfg. System Code	Coating Mfg.	Concrete Filler (flush)	Mfg. Products	Required Dry Film Thickness (Mils) **
SC-T2-ECW	Concrete Walls	SW15	Sherwin Williams	Kem Cati-Cote HS or Steel-Seam FT910	Macropoxy 920 / Macropoxy 646 / Macropoxy 646	1-2 / 3-7 / 4 -7=8-16 mils
SC-T2-NCW	Concrete Walls	AM16	Ameron	Nu Klad 114A	Amercoat 91 / Amercoat 91	4-8 / 4-8=8-16 mils
SC-T2-NCW	Concrete Walls	CA16	Carboline	Semstone 195	Carbogard 1340 / Phenoline1205FR0700 / 1205FRS800	1-2 / 5-6 / 5-6=12-16 mils
SC-T2-NCW	Concrete Walls	IN16	International	Intercyrl 320	Intertherm 228 / 228 / 228	2-4 / 4-6 / 4-6=10-16 mils
SC-T2-NCW	Concrete Walls	SW16	Sherwin Williams	Kem Cati-Cote HS or Steel-Seam FT910	Macropoxy 920 / Phenicon HS / Phenicon HS /	1.5-2.0 / 3-7 / 4-7=8.5-16 mils

WTP Steel System Code	Surface Type	Appendix C Mfg. System Code	Coating Mfg.	Steel Primer	Mfg. Products	Required Dry Film Thickness (Mils) **
SC-T4-ESE	Steel Embeds	CA19	Carboline	*Carbozinc 859	Carbogard 890 / 890	3-5 / 4-6 / 4-6 = 11-17 mils
SC-T4-ESE	Steel Embeds	IN19	International	*Interzinc 52	Intergard 475HS / 475HS	3-5 / 4-6 / 4-6 = 11-17 mils
SC-T4-ESE	Steel Embeds	SW19	Sherwin Williams	*Zinc Clad IV	Macropoxy 646 / 646	3-5 / 4-6 / 4-6 = 11-17 mils
SC-T4-ESE*	Steel Embeds	AM19	Ameron	*Amercoat 68HS	Amerlock 385 / 385	3-5 / 4-6 / 4-6 = 11-17 mils
SC-T5-NSE	Steel Embeds	AM20	Ameron	* Amercoat 68 HS	Amercoat 91 / 91	3-5 / 6-12 / 6-12 = 15-29 mils
SC-T5-NSE	Steel Embeds	CA20	Carboline	*Carbozinc 859	Phenoline1205 / 1205	3-5 / 5-6 / 5-6 =13-17 mils
SC-T5-NSE	Steel Embeds	IN20	International	*Interzinc 52	Intertherm 228 / 228	3-5 / 4-6 / 4-6 = 13-17 mils
SC-T5-NSE	Steel Embeds	SW20	Sherwin Williams	*Zinc Clad IV	Phenicon HS / Phenicon HS	3-5 / 6-8 / 6-8 = 16-21 mils***

NOTES TO APPENDIX C Table 2

* Note 1- This is a steel coating system shown on the room finish schedule for steel embedded in concrete and structural steel that requires the listed touch up primer and finish coating for chemical resistance. The steel coating system shall be from the same coating manufacturer as the concrete coating system.

** Note 2- The dry film thickness limitations listed in this column are based on testing to the NFPA 801-2003 and DOE STD 1066 flame spread and smoke developed requirements. The listed dry film thicknesses are the maximum allowed for wall coatings. The maximum total film thickness listed in this column includes the residual filler. Differences in dry film thickness from one coating manufacturer's system to another is due to NFPA 801 and DOE STD 1066 flame and smoke independent laboratory testing results.

*** Note 3- Using system SC-T5-NSE (SW20) from Sherwin Williams as an example, the required dry film thickness is determined by reading from left to right, the first coat is Zinc Clad IV applied at 3-5 mils, the slash separates the second coat which is Phenicon HS applied at 6-8 mils, the slash separates the third coat which Phenicon HS applied at 6-8 mils. An additional slash would define a fourth coat and so on. The total dry film thickness is listed after the equal sign.

Appendix D
Deleted

Appendix E
Color Scheme

1.0 The finish coat on all steel items and equipment other than electrical shall be ANSI* 70 Gray or approved substitute to ANSI color standard. (*American National Standards Institute)

2.0 The finish coat on standard electrical components and cabinets shall be ANSI 61 Gray or approved substitute to ANSI color standard.

3.0 Finish coat on floor coatings and sumps shall match Benjamin Moore color 2143-50 Old Prairie or approved substitute.

4.0 ~~Finish coat on wall coatings shall match Benjamin Moore color 2143-60 Moonlight White or~~ approved substitute.

5.0 Floor coatings color shall transition over the standard coving and up the wall 6"(-0" +1"). The ~~thickness on the floor/wall coving and wall above the floor coating shall match the wall coating~~ thickness. For gypsum board walls refer to drawing 24590-WTP-A3-A10T-04200002, WTP process Building Architectural Common Interior Wall Details, using detail #4, Detail for typical rated wall base at concrete floor.

Appendix F
Coating Manufacturer's Product Identity Certification Record

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

(For multi-component products, provide data for all components. Provide the standard range and actual batch values for each test)

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

COMMENTS:

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

Signed: ________________ Date: ________________

Title: ________________ Company: ________________

Appendix G
Surface Preparation and Coating Inspection Form

Page __ of ___

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

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

PRE-SURFACE PREPARATION:
SP-1:__________________ MASKING/PROTECTION:__________ SURFACE DEFECTS:______________

SURFACE PREPARATION:
METHOD:______________ ABRASIVE TYPE/SIZE/STORAGE:______________________
RECYCLED ABRASIVE OIL FLOATATION TEST:__________ABRASIVE CONDUCTIVITY TEST:______________
CLEANLINESS SPEC:__________ ACTUAL:__________PROFILE SPEC:__________ ACTUAL:__________
EQUIPMENT:____

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

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

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

______________/______________
INSPECTOR'S SIGNATURE/DATE

Appendix H
Deleted

Appendix I
Secondary Containment Installation Typical Details

- Installation Detail 1A-Floor /Wall Junction
- Installation Detail 1B-Wall/Wall Junction
- Installation Detail 2A-Reinforced Floor/Wall Junction
- Installation Detail 2B-Reinforced Wall/Wall Junction
- Installation Detail 3A-Reserved
- Installation Detail 3B-Construction Joint
- Installation Detail 4-Crack Repair
- Installation Detail 5A-Embed Plates without Steel Attachment
- Installation Detail 5B-Embed Plates with Steel Attachment
- Installation Detail 6-Perimeter Key
- Installation Detail 7-Floor or Wall Steel Embed With Stainless Steel Plate Overlay

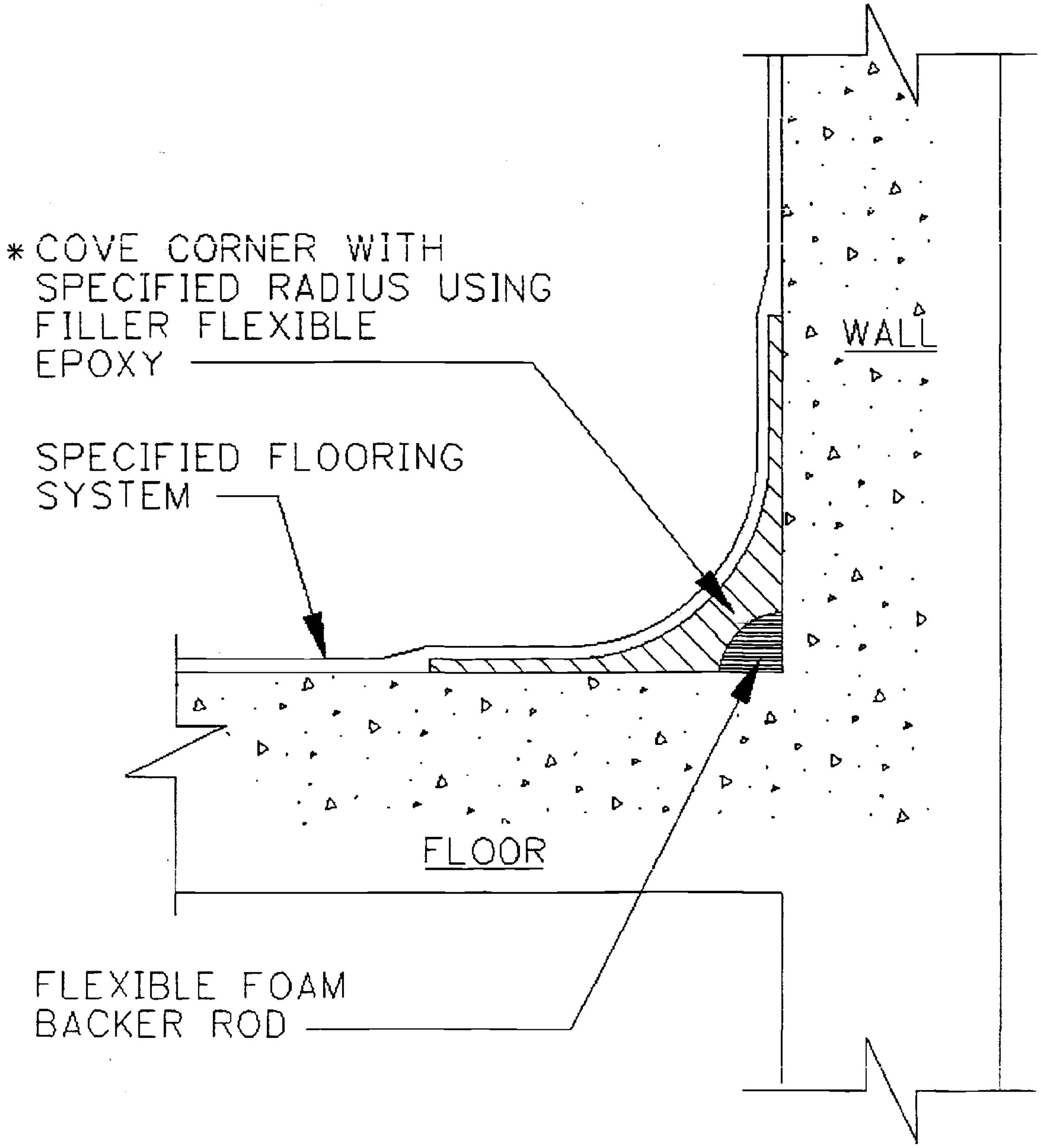
Notes-

1. Details 1A and 1B are used for areas containing ancillary equipment with normally open floor drains, which do not contain tanks. (DWP and/or Non-DWP affecting)
2. Details 2A and 2B are for areas that do not have normally open floor drains. (DWP and/or Non-DWP affecting)
3. RESERVED
4. Detail 3B is to be used for construction joints within the limits of the secondary containment lining. The 3B construction joint detail, formed or created (e.g., saw-cut) rectangular slot, shall be centered over the existing concrete construction joint (Refer to Section 6.2.1.4.1). (DWP and/or Non-DWP affecting)
5. Detail 4 is only to be used for large cracks other than minor shrinkage cracks. (DWP and/or Non-DWP affecting)
6. Detail 5A, 5B, 7 are to be used for embedded steel plates, angles, penetrations etc. The perimeter of all embeds shall be chipped back and filled as shown on detail 5A.

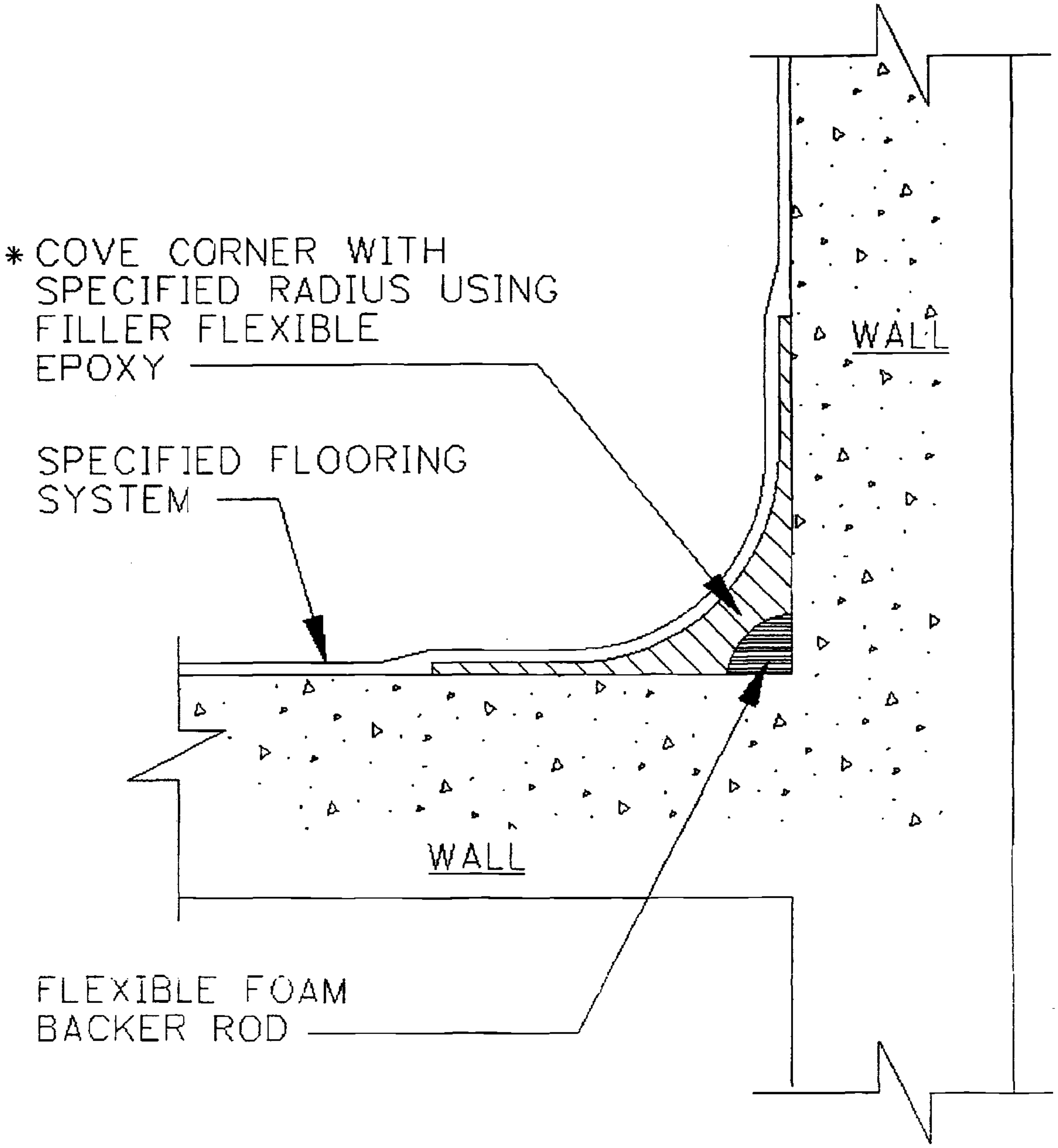
Areas containing free flowing floor drains shall use the rigid polymeric filler material. Areas that do not contain free flowing floor drains and within a flood zone shall use flexible polymeric epoxy filler material. (DWP and/or Non-DWP affecting)

7. **Detail 6 is only used where the coating system terminates in the middle of a floor. (DWP and/or Non-DWP affecting)**

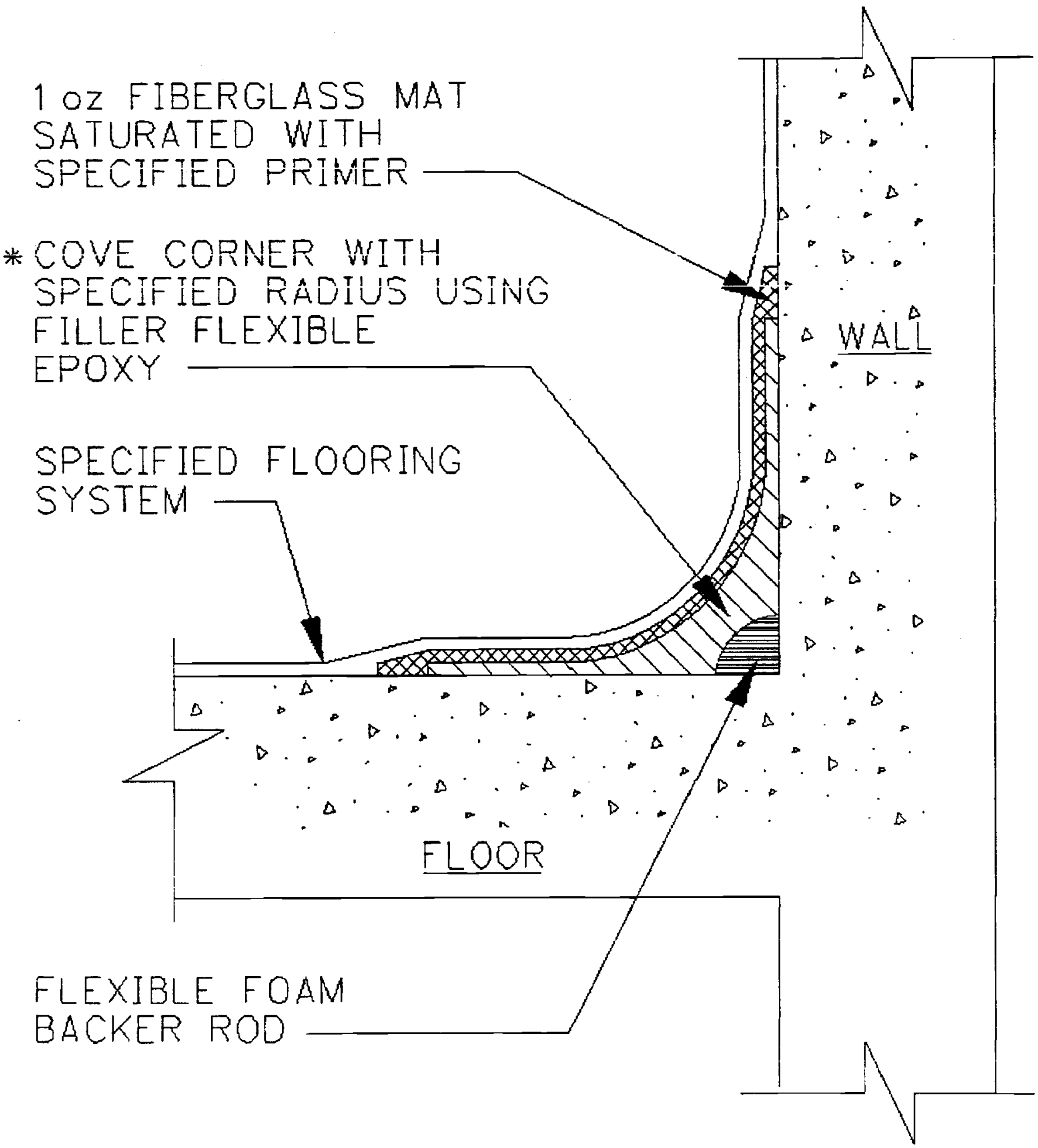
INSTALLATION DETAIL 1A - FLOOR/WALL JUNCTION



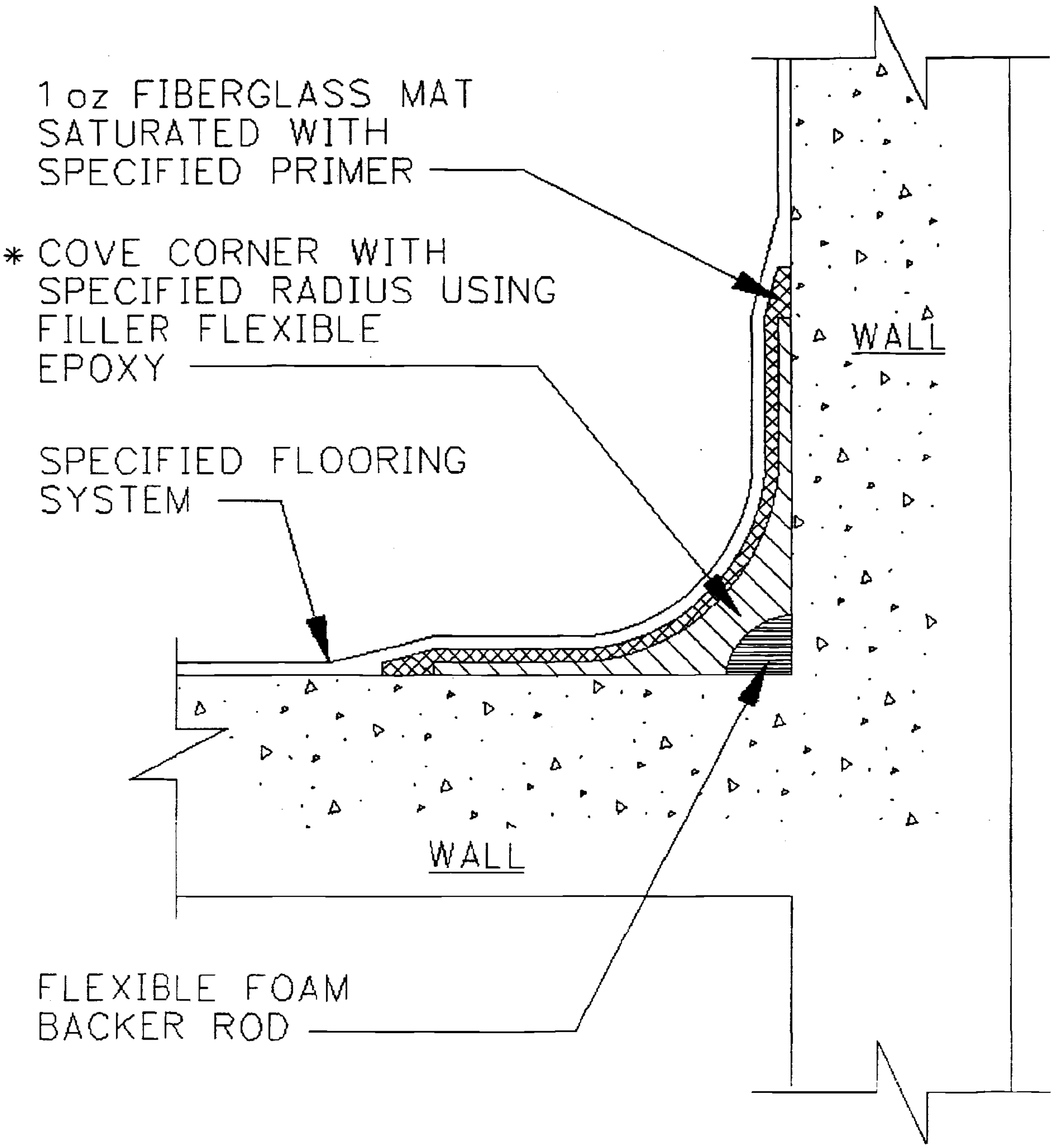
INSTALLATION DETAIL 1B - WALL/WALL JUNCTION



INSTALLATION DETAIL 2A
REINFORCED FLOOR/WALL JUNCTION

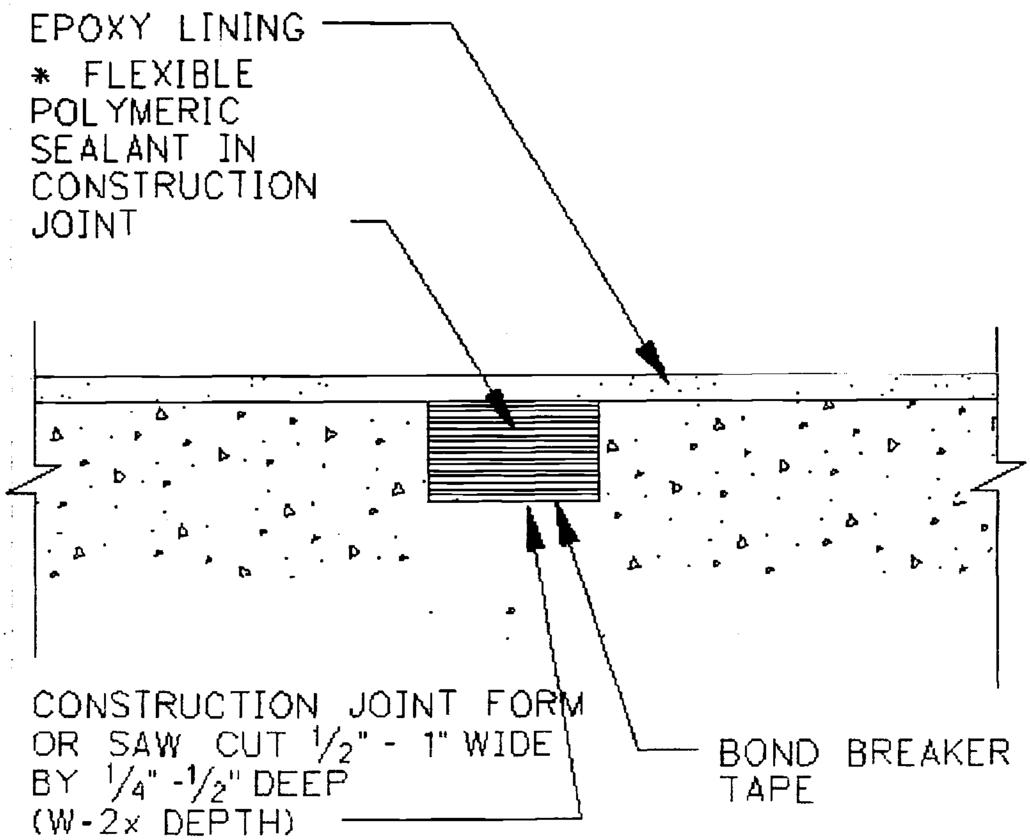


INSTALLATION DETAIL 2B
REINFORCED WALL/WALL JUNCTION



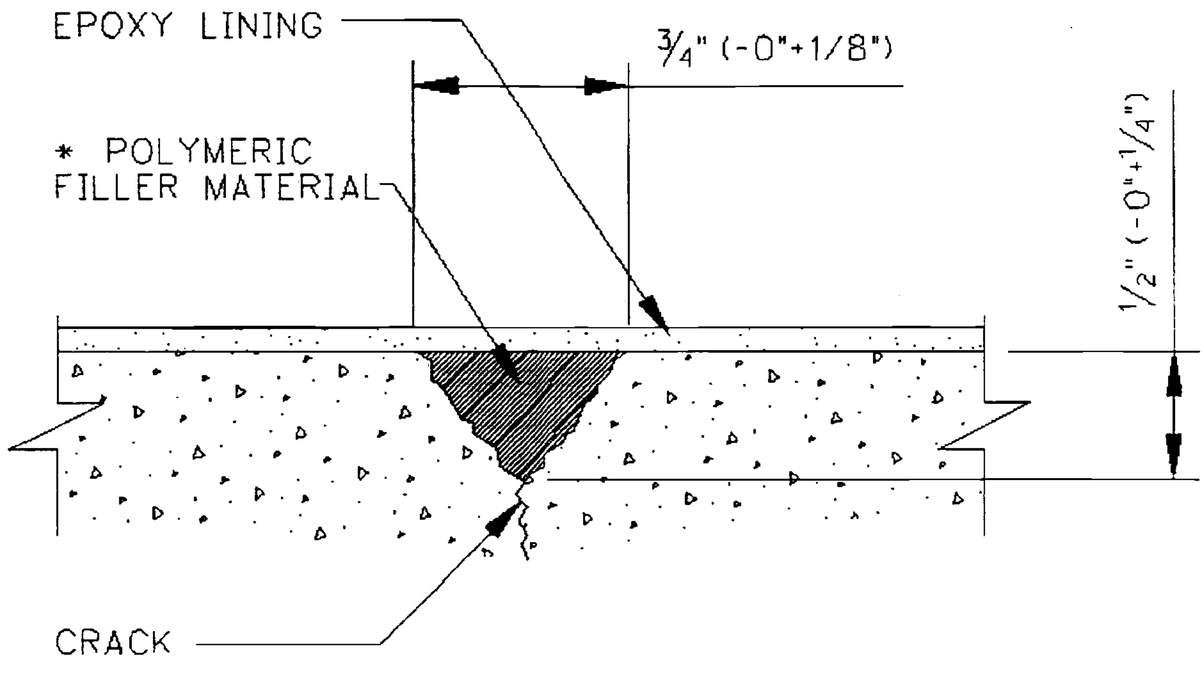
INSTALLATION DETAIL 3A - RESERVED

INSTALLATION DETAIL 3B - CONSTRUCTION JOINT



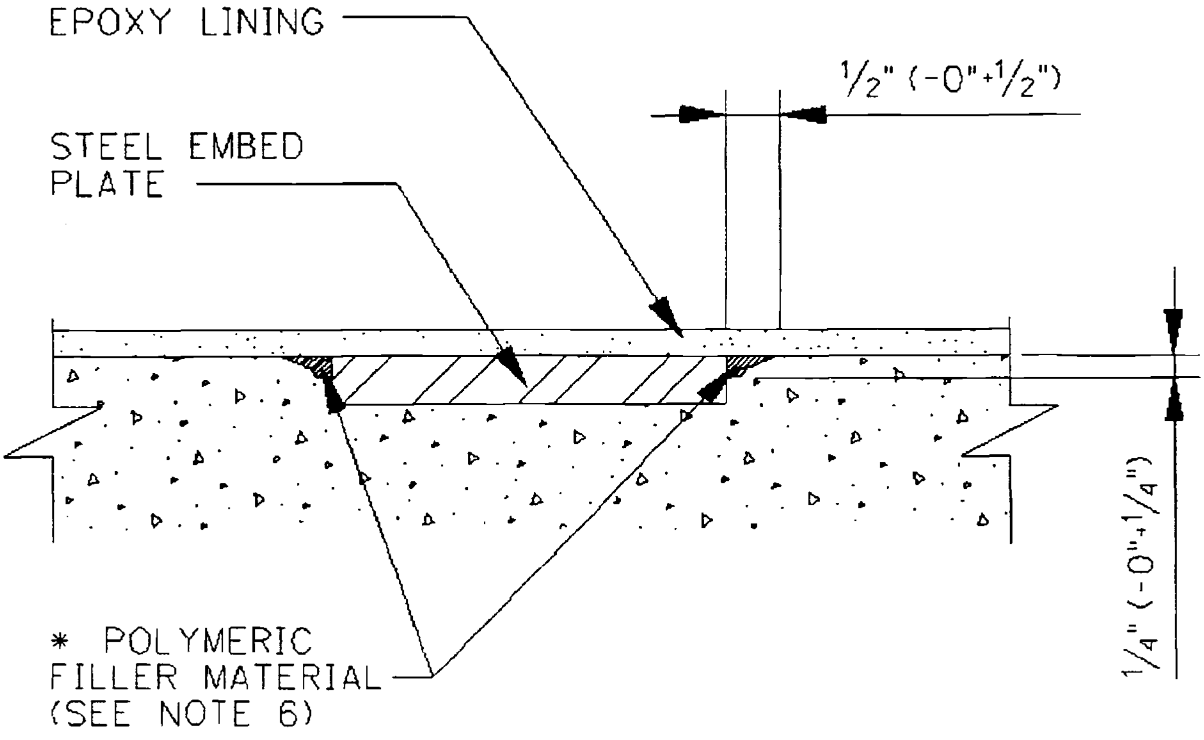
CONCRETE FLOOR/WALL

INSTALLATION DETAIL 4 - CRACK REPAIR



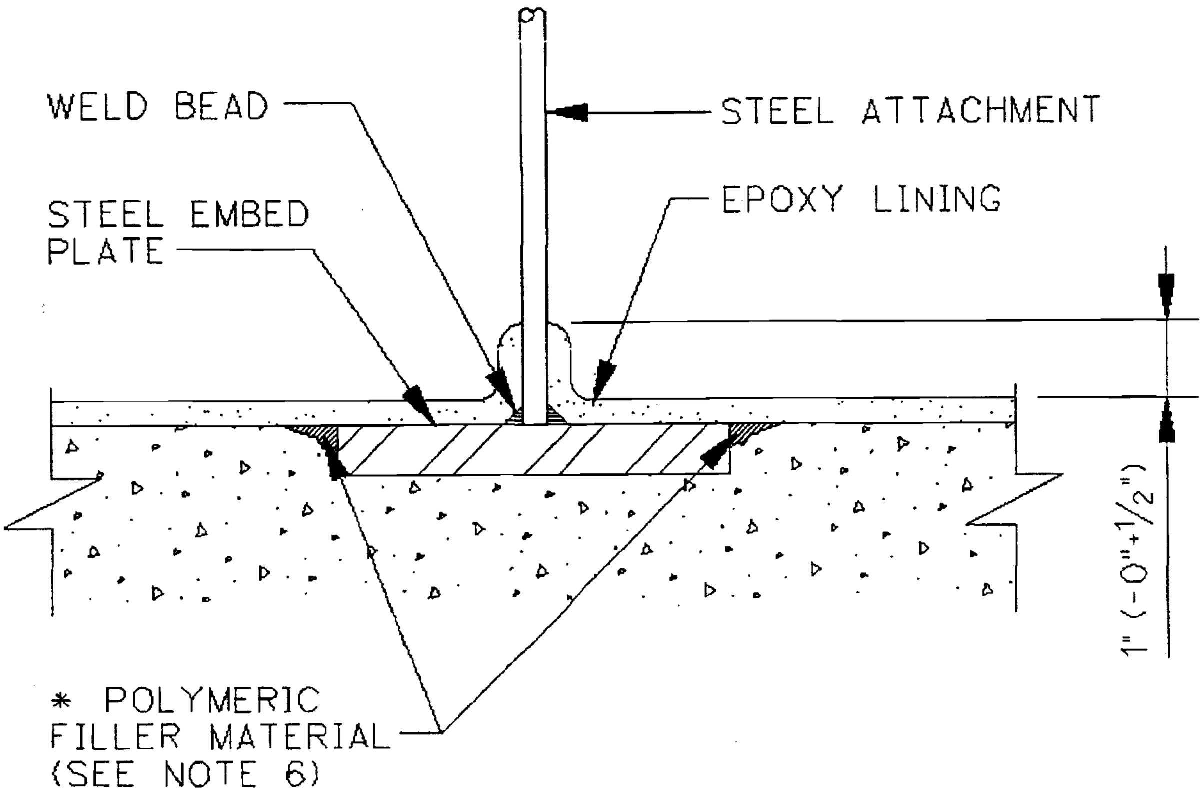
CONCRETE FLOOR/WALL

INSTALLATION DETAIL 5A - EMBED PLATES WITHOUT STEEL ATTACHMENT



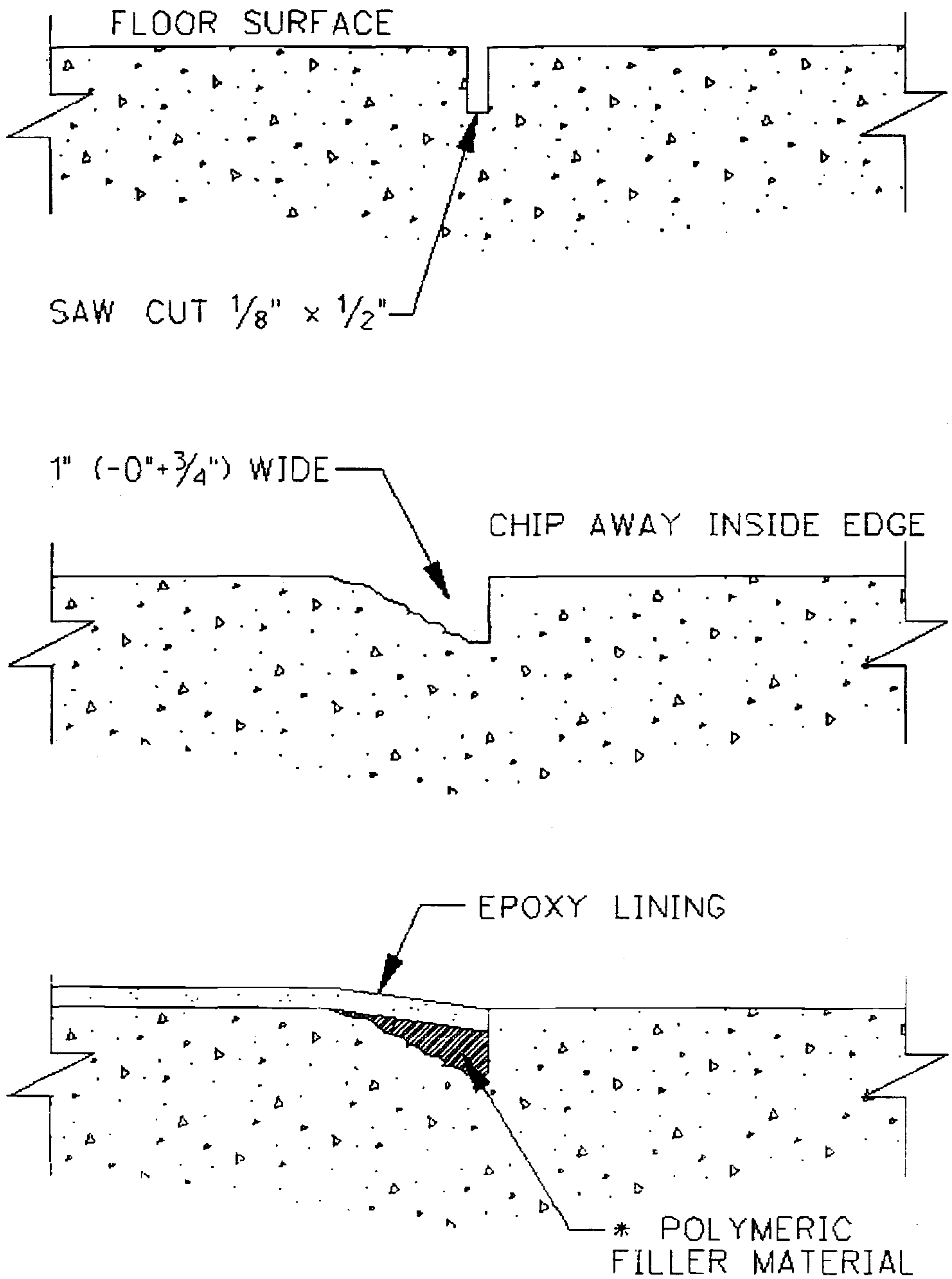
CONCRETE FLOOR/WALL

INSTALLATION DETAIL 5B - EMBED PLATES WITH STEEL ATTACHMENT

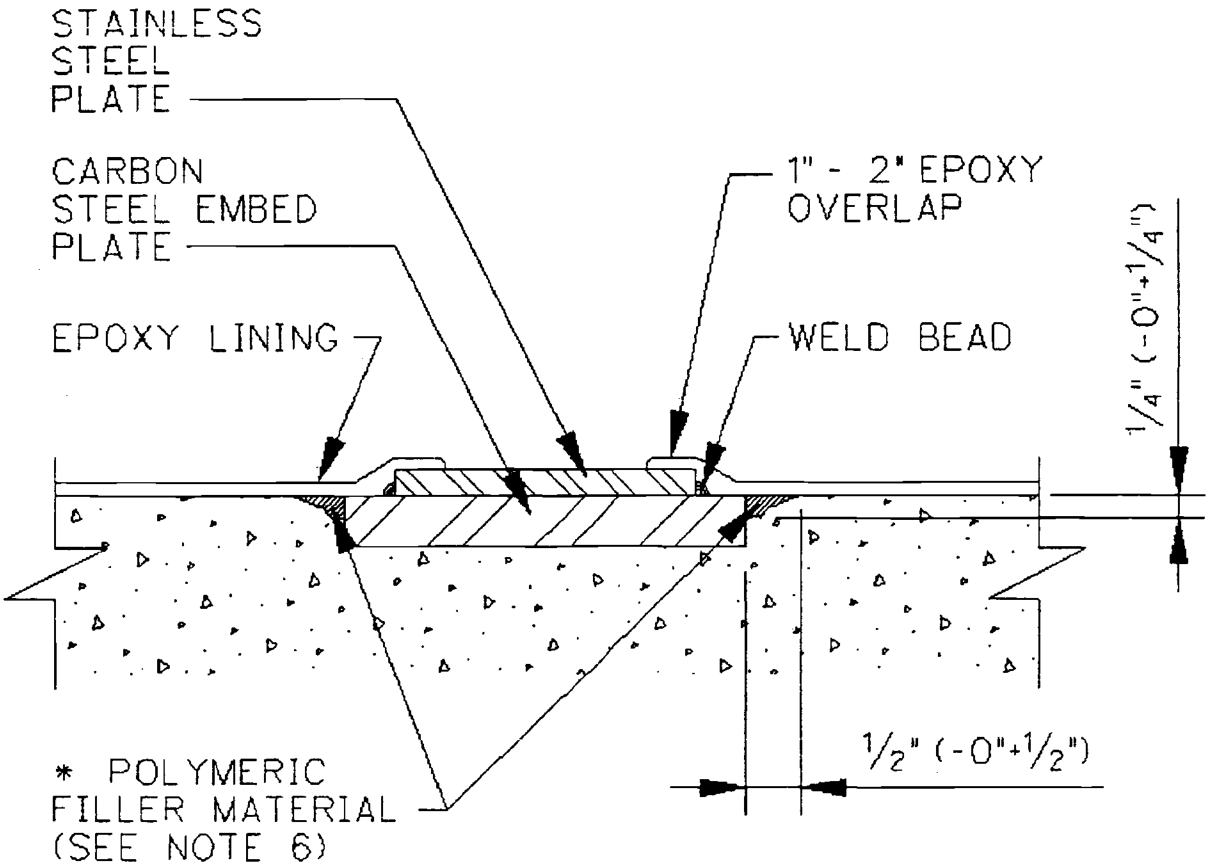


CONCRETE FLOOR/WALL

INSTALLATION DETAIL 6 - PERIMETER KEY



INSTALLATION DETAIL 7 - FLOOR OR WALL STEEL EMBED WITH STAINLESS STEEL PLATE OVERLAY



CONCRETE FLOOR/WALL

Appendix J
Interface Installation Detail Drawing References

The table below lists the drawing numbers for Secondary Containment Interface Installation Details. The latest issued revision of these drawings shall be used.

DRAWING NO.	DRAWING TITLE
24590-WTP-DD-S13T-00050	Civil/Structural Standard Secondary Containment Coating Details Electrical Interfaces
24590-WTP-DD-S13T-00051	Civil/Structural Standard Secondary Containment Coating Details Embedment Interfaces
24590-WTP-DD-S13T-00052	Civil/Structural Standard Secondary Containment Coating Details Steel Interfaces
24590-WTP-DD-S13T-00053	Civil/Structural Standard Secondary Containment Coating Details Concrete Interfaces
24590-WTP-DD-S13T-00054	Civil/Structural Standard Secondary Containment Coating Details Mechanical Interfaces
24590-WTP-DD-S13T-00056	Civil/Structural Standard Secondary Containment Coating Details Commodity Support Interfaces