This document was too large to scan as a single document. It has been divided into smaller sections.

Section 14 of 14

Document Information			
Document #	0602648		
Title	DRAFT WTP DANGEROUS WASTE PERMIT		
Date	10/04/2006		
Originator	HEDGES JA	Originator Co.	DOEC
Recipient	SCHEPENS RJ, KLEIN K, WILKINS WS	Recipient Co.	DOE-ORP, DOE-RL, BNI
References	WA7890008967		
Keywords			
Projects	RPP		
Structure			

THIS PAGE INTENTIONALLY
LEFT BANK

Drawings and Documents

Attachment 51 – Appendix 10.6
High Level Waste Building
Mechanical Drawings

The following drawings have been incorporated into Appendix 10.6 and can be viewed at the Ecology Richland Office. **New drawings are in bold lettering.**

Drawing/Document	*Description*
24590-HLW-MO-HDH-P0012001, Rev 1	Equipment Assembly Drawing for HDH Canister Rinse Bogie
24590-HLW-MO-HDH-P0012002, Rev 1	Equipment Assembly Drawing for HDH Canister Rinse Bogie
24590-HLW–MO-HSH-P0072, Rev 0	Equipment Assembly Drawing: HLW-HSH-Design Proposal Drawing Decontamination Tank
24590-HLW-MOD-HMP-P0001, Rev 1	**Mechanical Data Sheet: HLW Melter 1**
24590-HLW-MOD-HMP-P0002, Rev 0	**Mechanical Data Sheet: HLW Melter 2**
24590-HLW-MAD-HOP-P0010, Rev 0	Mechanical Data Sheet: HOP-HEPA-00001A
24590-HLW-MAD-HOP-P0011, Rev 0	Mechanical Data Sheet: HOP-HEPA-00002A
24590-HLW-MAD-HOP-P0012, Rev 0	Mechanical Data Sheet: HOP-HEPA-00001B
24590-HLW-MAD-HOP-P0013, Rev 0	Mechanical Data Sheet: HOP-HEPA-00002B
24590-HLW-MAD-HOP-P0014, Rev 0	Mechanical Data Sheet: HOP-HEPA-00007A
24590-HLW-MAD-HOP-P0015, Rev 0	Mechanical Data Sheet: HOP-HEPA-00008A
24590-HLW-MAD-HOP-P0016, Rev 0	Mechanical Data Sheet: HOP-HEPA-00007B
24590-HLW-MAD-HOP-P0017, Rev 0	Mechanical Data Sheet: HOP-HEPA-00008B
24590-HLW-MAD-HOP-P0018, Rev 2	Centrifugal Blower Data Sheets for HOP-FAN-00001A/B/C and HOP-FAN-00009A/B/C
24590-HLW-MAD-HOP-P0019, Rev 0	Centrifugal Blower Data Sheets for

	HOP-FAN-0000B
24590-HLW-MAD-HOP-P0020, Rev 0	Centrifugal Blower Data Sheets for HOP-FAN-00001C
24590-HLW-MAD-HOP-P0035, Rev 0	Centrifugal Blower Data Sheets for HOP-FAN-00009A
24590-HLW-MAD-HOP-P0036, Rev 0	Centrifugal Blower Data Sheets for HOP-FAN-00009B
24590-HLW-MAD-HOP-P0037, Rev 0	Centrifugal Blower Data Sheets for HOP-FAN-00009C
24590-HLW-MAD-HOP-P0038, Rev 0	Centrifugal Blower Data Sheet: HOP-FAN-00008A/8B/8C/10A/10B/10C
24590-HLW-MAD-PJV-P0004, Rev 0	Mechanical Data Sheet for PJV-HEPA-00004A
24590-HLW-MAD-PJV-P0005, Rev 0	Mechanical Data Sheet for PJV-HE;A-00005A
24590-HLW-MAD-PJV-P0006, Rev 0	Mechanical Data Sheet for PJV-HEPA-00004B
24590-HLW-MAD-PJV-P0007, Rev 0	Mechanical Data Sheet for PJV-HEPA-00005B
24590-HLW-MED-HOP-P0012, Rev 1	Mechanical Data Sheet for HOP-HX-00002
24590-HLW-MED-HOP-P0013, Rev 0	Mechanical Data Sheet for HOP-HTR-00001B/2A/5A/5B
24590-HLW-MED-HOP-P0017, Rev 1	Mechanical Data Sheet for HOP-HX-00004
24590-HLW-MED-PJV-P0002, Rev 0	Mechanical Data Sheet for PJV-HTR-00002
24590-HLW–MKD-HOP-P0014, Rev 1	Mechanical Data Sheet for HOP-ABS-00002
24590-HLW-MKD-HOP-P0016, Rev 0	Mechanical Data Sheet for HOP-SCB-00001/2
24590-HLW-MKD-HOP-P0017, Rev 0	Mechanical Data Sheet for HOP-ABS-00003
24590-HLW-MKD-HOP-P0019, Rev 0	Mechanical Data Sheet for HOP-SCO-00002
24590-HLW-MKD-HOP-P0020, Rev 0	Mechanical Data Sheet for HOP-SCO-00003
24590-HLW-MK-HOP-P0001001, Rev 0	Equipment Assembly Drawing for HOP-SCB-00001/2 Sheet 1 of 4

24590-HLW-MK-HOP-P0001002, Rev 0	Equipment Assembly Drawing for HOP-SCB-00001/2 Sheet 2 of 4
24590-HLW-MK-HOP-P0001003, Rev 0	Equipment Assembly Drawing for HOP-SCB-00001/2 Sheet 3 of 4
24590-HLW-MK-HOP-P0001004, Rev 0	Equipment Assembly Drawing for HOP-SCB-00001/2 Sheet 4 of 4
24590-HLW-MVD-HDH-P0003, Rev 2	Mechanical Data Sheet for HDH-VSL-00003
~~24590-HLW-MVD-HDH-P0006, Rev 1~~	~~Mechanical Data Sheet for HDH-VSL-00002~~
24590-HLW-MVD-HDH-P0006, Rev 2	**Mechanical Data Sheet for HDH-VSL-00002**
24590-HLW-MVD-HDH-P0009, Rev 0	Mechanical Data Sheet for HDH-VSL-00001
~~24590-HLW-MVD-HDH-P0012, Rev 0~~	~~Mechanical Data Sheet for HDH-VSL-00004~~
24590-HLW-MVD-HDH-P0012, Rev 1	**Mechanical Data Sheet for HDH-VSL-00004**
24590-HLW–MVD-HOP-P0001, Rev 2	Mechanical Data Sheet for HOP-VSL-00903
24590-HLW-MVD-HOP-P0007, Rev 0	Mechanical Data Sheet for HOP-HEME-00001A/1B/2A/2B
24590-HLW–MVD-HOP-P0012, Rev 1	Mechanical Data Sheet for HOP-VSL-00904
24590-HLW-MVD-HOP-P0015, Rev 0	Mechanical Data Sheet for HOP-ADBR-00001A/B
24590-HLW-MVD-HOP-P0016, Rev 0	Mechanical Data Sheet for HOP-ADBR-00002A/B
24590-HLW-MVD-RLD-P0005, Rev 0	Mechanical Data Sheet for RLD-VSL-00007
24590-HLW-MVD-RLD-P0007, Rev 1	Mechanical Data Sheet for RLD-VSL-00008
24590-HLW-MVD-RLD-P0008, Rev 1	Mechanical Data Sheet for RLD-VSL-00002
24590-HLW-MV-HDH-P0003, Rev 1	Equipment Assembly Drawing for HDH-VSL-00003

24590-HLW-MV-HDH-P0004, Rev 1	Equipment Assembly Drawing for HDH-VSL-00002, Sheet 1 of 2
24590-HLW-MV-HDH-P0005, Rev 1	Equipment Assembly Drawing for HDH-VSL-00002, Sheet 2 of 2
24590-HLW-MV-HDH-P0006, Rev 0	Equipment Assembly Drawing for HDH-VSL-00004, Sheet 1 of 2
24590-HLW-MV-HDH-P0007, Rev 0	Equipment Assembly Drawing for HDH-VSL-00004, Sheet 2 of 2
24590-HLW–MV-HOP-P0001, Rev 2	Equipment Assembly Drawing for HOP-VSL-00903
24590-HLW-MV-HOP-P0002001, Rev 0	Equipment Assembly Drawing for HOP-HEME-00001A/1B Sheet 1 of 3
24590-HLW-MV-HOP-P0002002, Rev 0	Equipment Assembly Drawing for HOP-HEME-00001A/1B Sheet 2 of 3
24590-HLW-MV-HOP-P0002003, Rev 0	Equipment Assembly Drawing for HOP-HEME-00001A/1B Sheet 3 of 3
24590-HLW–MV-HOP-P0003, Rev 2	Equipment Assembly Drawing for HOP-VSL-00904
24590-HLW-MV-RLD-P0002, Rev. 0	Equipment Assembly Drawing for RLD-VSL-00002
24590-HLW-MV-RLD-P0003, Rev. 0	Equipment Assembly Drawing for RLD-VSL-00007
24590-HLW-MV-RLD-P0004, Rev. 0	Equipment Assembly Drawing for RLD-VSL-00008
WTP-M-219151-1 Sheet 5, Rev 3	**HLW Melter Assembly Drawings**
WTP-M-219151-3 Sheet 8, Rev 3	**HLW Melter Assembly Drawings**
WTP-M-219151-3 Sheet 9, Rev 3	**HLW Melter Assembly Drawings**
WTP-M-219151-3 Sheet 10, Rev 3	**HLW Melter Assembly Drawings**
WTP-M-219151-3 Sheet 11, Rev 3	**HLW Melter Assembly Drawings**
RESERVED	RESERVED

RPP-WTP	DATA SHEET HIGH LEVEL WASTE MELTER 1	Data Sheet Number	24590-HLW-M0D-HMP-P0001
		Plant Item Number	24590-HLW-ME-HMP-MLTR-00001
		This bound document contains a total of 1 sheet	

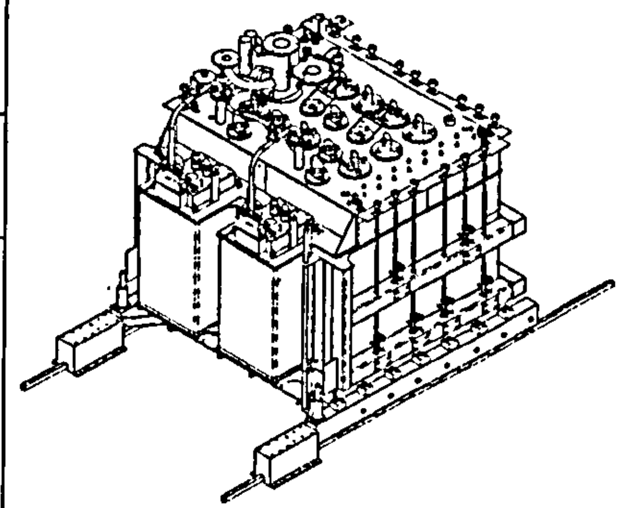
System: HMP
Project: RPP-WTP
Project No: 24590
Site: Hanford
Function: Convert blended HLW slurry and glass formers into glass and deliver glass to canisters

Reference Documents:
24590-HLW-3PS-AE00-TP001, Engineering Specification for High Level Waste Melters
deleted
deleted
deleted
deleted

WALTER PAUL DROSACK
STATE OF WASHINGTON
PROFESSIONAL ENGINEER

4/27/06

EXPIRES 6/6/07



ISSUED BY
RPP-WTP PDC

R10673689

MECHANICAL

	Units			Units	
Melter Design Life	years	5	Melter Base, Rail Center to Center Distance	inches	148.00
Maximum Outside Dimensions (L x W x H)	inches	172 x 164 x 146	Maximum Assembled Weight, Empty	pounds	174,000
Plant Elevation, top of rail	ft-in	2 - 11	Maximum Assembled Weight with Glass	pounds	198 000

PROCESS

Design Glass Production	MT/D	3.0	Thermal load to cave from melter (idle and feed modes)	kW	35 max
Glass Tank Volume	ft^3	144	Melter Cooling Water	GPM	50 (nominal)
Glass Tank Surface Dimensions (L x W)	inches	60 x 96	Melter Cooling Water	Delta T (°F)	15 (nominal)
Max Operating Glass Depth	inches	44			
Design Glass Operating Temperature (max)	°F	2200			

ELECTRICAL

Electrodes, kW	600 maximum
Start-up Heaters, kW	183 total maximum
Discharge Chamber, kW	56 max per chamber

CONTROLS AND INSTRUMENTATION

deleted
deleted

MAJOR COMPONENTS - Materials

Melter Shell and Base	A500, A36, 304L, C276	Cooling Panels	C276, 316L
Melter and Discharge Chamber Lids	304L, Alloy 690	Discharge Chamber Trough and Dam	Alloy 690
Electrodes	Alloy 690	Film Cooler	Alloy 690

REPLACEABLE COMPONENTS

	Number	Design Life (months)		Number	Design Life (months)
Feed Nozzle	2	60	Discharge Chamber Lid Assembly	2	30
Film Cooler	1	60	Discharge Chamber Vent Line	2	60
Air Lift Lance	2	60	Discharge Chamber Vent Insert	2	60
Level Probe	1	12	Discharge Chamber Thermowell	4	60
Plenum/Glass Pool Thermocouple	2	4	Discharge Chamber Thermocouple	4	12
Plenum/Glass Pool Thermowell	2	9	Electrode Thermocouple Assembly	3	12
Refractory Thermocouple Assy	2	12	Plenum View Camera	1	12
Bubblers	6	2	Start-up Heaters	5	3

NOTES

Note 1: Contents of this document are Dangerous Waste Permit affecting.

Note 2: 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 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.

Date	Rev	Reason for Revision	Prepared	Checked	Approved
4/27/06	1	Revised to correct typographical error	Mark Hall	Lloyd Drosman/Lisa Han	
1/31/2005	0	Issued for Permitting Use	Mark Hall	Lawrence Curtis	Walt Eaton

RPP-WTP	DATA SHEET HIGH LEVEL WASTE MELTER 2	Data Sheet Number: 24590-HLW-MOD-HMP-P0002 Plant Item Number: 24590-HLW-ME-HMP-MLTR-00002 This bound document contains a total of 1 sheet

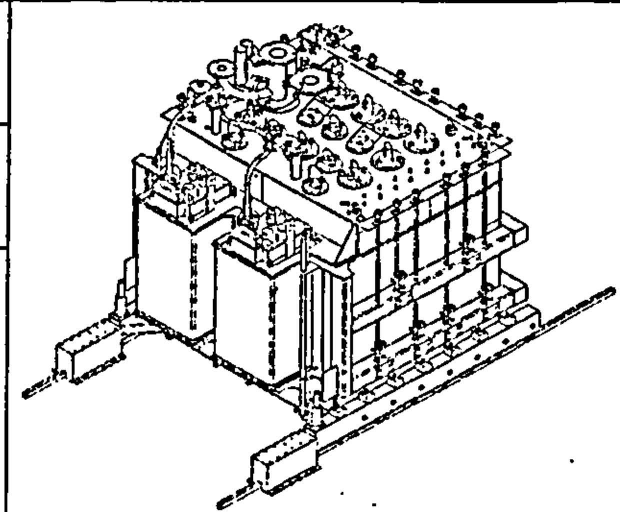
System: HMP
Project: RPP-WTP
Project No: 24590
Site: Hanford
Function: Convert blended HLW slurry and glass formers into glass and deliver glass to canisters

Reference Documents:
24590-HLW-3PS-AE00-TP001, Engineering Specification for High Level Waste Melters
deleted
deleted
deleted
deleted

WALTER PAUL DROSJACK STATE OF WASHINGTON 41231 REGISTERED PROFESSIONAL ENGINEER

1/31/05

EXPIRES 6/6/05



MECHANICAL

	Units			Units	
Melter Design Life	years	5	Melter Base, Rail Center to Center Distance	inches	148.00
Maximum Outside Dimensions (L x W x H)	inches	172 x 164 x 146	Maximum Assembled Weight, Empty	pounds	174,000
Plant Elevation, top of rail	ft-in	2-11	Maximum Assembled Weight with Glass	pounds	198 000

PROCESS

Design Glass Production	MT/D	3.0	Thermal load to cave from melter (idle and feed modes)	kW	35 max
Glass Tank Volume	ft^3	144	Melter Cooling Water	GPM	50 (nominal)
Glass Tank Surface Dimensions (L x W)	inches	60 x 96	Melter Cooling Water	Delta T (°F)	15 (nominal)
Max Operating Glass Depth	inches	44			
Design Glass Operating Temperature (max)	°F	2200			

ELECTRICAL

Electrodes, kW	600 maximum
Start-up Heaters, kW	183 total maximum
Discharge Chamber, kW	56 max per chamber

CONTROLS AND INSTRUMENTATION

deleted
deleted

MAJOR COMPONENTS - Materials

Melter Shell and Base	A500, A36, 304L, C276	Cooling Panels	C276, 316L
Melter and Discharge Chamber Lids	304L, Alloy 690	Discharge Chamber Trough and Dam	Alloy 690
Electrodes	Alloy 690	Film Cooler	Alloy 690

REPLACEABLE COMPONENTS

	Number	Design Life (months)		Number	Design Life (months)
Feed Nozzle	2	60	Discharge Chamber Lid Assembly	2	30
Film Cooler	1	60	Discharge Chamber Vent Line	2	60
Air Lift Lance	2	60	Discharge Chamber Vent Insert	2	60
Level Probe	1	12	Discharge Chamber Thermowell	4	60
Plenum/Glass Pool Thermocouple	2	4	Discharge Chamber Thermocouple	4	12
Plenum/Glass Pool Thermowell	2	9	Electrode Thermocouple Assembly	3	12
Refractory Thermocouple Assy	2	12	Plenum View Camera	1	12
Bubblers	5	2	Start-up Heaters	5	3

NOTES

Note 1: Contents of this document are Dangerous Waste Permit affecting

Note 2: 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 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

Date	Rev	Reason for Revision	Prepared	Checked	Approved
1/31/05	0	Issued for Permitting Use	Mark Hall	Lawrence Cutler	W. Eaton

ISSUED BY
RPP-WTP PDC

R10482355

R10660667

BECHTEL	MECHANICAL DATA SHEET: VESSEL	PLANT ITEM No. 24590-HLW-MV-HDH-VSL-00002

ISSUED BY RPP-WTP PDC

Project	RPP-WTP	P&ID	24590-HLW-M6-HDH-P0001
Project No	24590	Process Data Sheet	24590-HLW-MTD-HDH-00001 (2)
Project Site	Hanford	Vessel Drawing	24590-HLW-MV-HDH-P0004, P0005
Description:	Canister Decon Vessel 1		

Reference Data

Charge Vessels (Tag Numbers)	Not Required
Pulsejet Mixers / Agitators (Tag Numbers)	Not Required
RFDs/Pumps (Tag Numbers)	Not Required

Design Data

Quality Level		CM	Fabrication Specs	24590-WTP-3PS-MV00-TP001		
Seismic Category		SC-III	Design Code	Generally to ASME VIII Div 1		
Service/Contents		Nitric Acid, Water, Ceric Nitrate	Code Stamp	No		
Design Specific Gravity		1.25	NB Registration	No		
Maximum Operating Volume	gal	212 with Canister in Vessel	Weights (lbs)	Empty	Operating	Test
Total Volume	gal	630	Estimated	3400	21,200	21,200
Environmental Qualification (2)		N/A	Actual *			

Inside Diameter	inch	30			Wind Design		None
Length/Height (TL-TL)	inch	220 (OAL) (2)			Snow Design		None
		Vessel Operating	Vessel Design	Coil/Jacket Design	Seismic Design		24590-WTP-3PS-MV00-TP002 24590-WTP-3PS-FB01-T0001
Internal Pressure	psig	Atm	15	Note 1	Seismic Base Moment *	ft-lb	
External Pressure	psig	Atm	Atm	Note 1	Postweld Heat Treat		None
Temperature	°F	149	225	Note 1	Corrosion Allowance	inch	0.04
Min. Design Metal Temp	°F	40			Hydrostatic Test Pressure *	psig	

Note: 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 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.

ERIC B. ISERN
STATE OF WASHINGTON
33449
REGISTERED PROFESSIONAL ENGINEER
12/6/05
EXPIRES: 07/28/07

This Bound Document Contains a total of 3 Sheets.

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	REVIEWER	APPROVER
2	12/27/05	Issued for Permitting Use	C. Thompson	B. Makadia / L. Han	C. Slater	J. Julyk
1	3/24/04	Issued for Permitting Use	K. Brightman	B. Balakrishnan	C. Slater	M. Hoffmann
0	10/29/02	Issued for Permitting Use	J. Jackson	C. Slater	N/A	S. Kirk

BECHTEL	MECHANICAL DATA SHEET: VESSEL	PLANT ITEM No. 24590-HLW-MV-HDH-VSL-00002

Materials of Construction

Component	Material	Minimum Thickness / Size	Containment
Lid Assembly	B-265 2	See Drawing	N/A
Shell	B-265 2	See Drawing	N/A
Bottom Head	B-265 2	See Drawing	N/A
Support	B-265 2	See Drawing	N/A
Shaft	304SS Minimum	N/A	N/A
Bearings	304SS Minimum	N/A	N/A
Pipe	B-861/B-363 Seamless	See Drawing	N/A
Tubing	B-338 2	See Drawing	N/A
Forgings/ Bar stock	B-381 F2 / SB348-2 Note 5 (2)	See Drawing	N/A
Gaskets	Note 3	N/A	N/A
Bolting	A-193 B8 / A-194 8	N/A	N/A

Miscellaneous Data

Orientation	Vertical	Support Type	Collar
Insulation Function	Not Applicable	Insulation Material	Not Applicable
Insulation Thickness (inch)	Not Applicable	Internal Finish	Welds Descaled as Laid
		External Finish	Welds Descaled as Laid

Remarks

* To be determined by the vendor.

Note 1: Steam coil design pressure = 180 psig, design temperature = 383°F
Cooling coil design pressure = 119 psig, design temperature = 174°F

Note 2: Vessel volumes are approximate and do not account for manufacturing tolerances, nozzles, and displacement of internals.

Note 3: Body flange gasket shall be Garlock Helicoflex HN 208A seal configuration with titanium jacket. (2)

Note 4: Contents of this document are Dangerous Waste Permit affecting.

BECHTEL	**MECHANICAL DATA SHEET: VESSEL**	PLANT ITEM No. 24590-HLW-MV-HDH-VSL-00002

Equipment Cyclic Data Sheet

Component Plant Item Number:	*HDH-VSL-00002*
Component Description	*Melter 1 Canister Decon Vessel*

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction	*SB-265 2*
Design Life	*40 Years*
Component Function and Life Cycle Description	*A cycle consists of the following:* • *A 10,000 lb canister will be loaded into the vessel and the lid will be closed* • *The vessel will fill to the overflow with one-molar nitric acid and Cerium +4 solution.* • *The heating coil will raise the temperature of the liquid from 68°F to 149°F.* • *Heating and cooling coils will maintain the temperature of the liquid at 149°F for 6 hours.* • *The nitric acid solution will be drained from the vessel* • *The upper and lower spray rings will rinse the canister with nitric acid and demineralized water* • *Flow to the upper spray ring will stop, the lid will open, and the canister will be slowly removed from the vessel while the lower spray ring continues to rinse the canister.*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*N/A*	*N/A*	*N/A*	
Operating Pressure	psig	*Atm*	*Atm*	*29,200*	
Operating Temperature	°F	*48*	*149*	*29,200*	
Contents Specific Gravity		*1.00*	*1.25*	*29,200*	
Contents Level	inch	*Empty*	*Full*	*29,200*	
Localized Features					
Vessel and Supports		*Empty / Full+Canister*		*29,200*	

Notes

***Cycle increase:** The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.*

***Note 5:** Bar SB348-2 is used for Spray Nozzles P/N 08D & 09D, Rollers and Roller Pins P/N 18C & 18D, Thermowells P/N 38A & 38C, Stabilizer bars P/N 19B, Lid Hold Downs P/N 28B & 31K.* △2

R10660668

MECHANICAL DATA SHEET: VESSEL

PLANT ITEM No. 24590-HLW-MV-HDH-VSL-00004

Project:	RPP-WTP	P&ID:	24590-HLW-M6-HDH-P20001
Project No:	24590	Process Data Sheet:	24590-HLW-MVD-HDH-00010 (1)
Project Site:	Hanford	Vessel Drawing	24590-HLW-MV-HDH-P0006, 24590-HLW-MV-HDH-P0007
Description:	Canister Decon Vessel 2		

Reference Data

ISSUED BY RPP-WTP PDC

Charge Vessels (Tag Numbers)	Not Required
Pulsejet Mixers / Agitators (Tag Numbers)	Not Required
RFDs/Pumps (Tag Numbers)	Not Required

Design Data

Quality Level		CM	Fabrication Specs	24590-WTP-3PS-MV00-TP001		
Seismic Category		SC-III	Design Code	Generally to ASME VIII Div 1		
Service/Contents		Nitric Acid, Water, Ceric Nitrate	Code Stamp	No		
Design Specific Gravity		1.25	NB Registration	No		
Maximum Operating Volume	gal	212 with Canister in Vessel	Weights (lbs)	Empty	Operating	Test
Total Volume	gal	630	Estimated	3400	21,200	21,200
Environmental Qualification (1)		N/A	Actual *			

Inside Diameter	inch	30			Wind Design		None
Length/Height (TL-TL)	inch	220 (OAL)			Snow Design		None
		Vessel Operating	Vessel Design	Coil/Jacket Design	Seismic Design		24590-WTP-3PS-MV00-TP002 24590-WTP-3PS-FB01-T0001
Internal Pressure	psig	Atm	15	Note 1	Seismic Base Moment *	ft-lb	
External Pressure	psig	Atm	Atm	Note 1	Postweld Heat Treat		None
Temperature	°F	149	225	Note 1	Corrosion Allowance	inch	0.04
Min. Design Metal Temp.	°F	40			Hydrostatic Test Pressure *	psig	

Note: 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 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.

ERIC B. ISERN STATE OF WASHINGTON 33449 REGISTERED PROFESSIONAL ENGINEER 12/6/05 EXPIRES 07/28/07

This Bound Document Contains a total of 3 Sheets.

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	REVIEWER	APPROVER
1	12/21/05	Issued for Permitting Use	G. Thompson	B. Makadia / L. Han	C. Slater	J. Julyk
0	3/24/04	Issued for Permitting Use	K. Brighman	B. Balakrishnan	C. Slater	M. Hoffmann

BECHTEL	MECHANICAL DATA SHEET: VESSEL	PLANT ITEM No. 24590-HLW-MV-HDH-VSL-00004

Materials of Construction

Component	Material	Minimum Thickness / Size	Containment
Lid Assembly	*B-265 2*	*See Drawing*	*N/A*
Shell	*B-265 2*	*See Drawing*	*N/A*
Bottom Head	*B-265 2*	*See Drawing*	*N/A*
Support	*B-265 2*	*See Drawing*	*N/A*
Shaft	*304SS Minimum*	*N/A*	*N/A*
Bearings	*304SS Minimum*	*N/A*	*N/A*
Pipe	*B-861/B-363 Seamless*	*See Drawing*	*N/A*
Tubing	*B-338 2*	*See Drawing*	*N/A*
Forgings/ Bar stock	*B-381 F2 / SB348-2 Note 5* ⚠1	*See Drawing*	*N/A*
Gaskets	*Note 3*	*N/A*	*N/A*
Bolting	*A-193 B8 / A-194 8*	*N/A*	*N/A*

Miscellaneous Data

Orientation	*Vertical*	Support Type	*Collar*
Insulation Function	*Not Applicable*	Insulation Material	*Not Applicable*
Insulation Thickness (inch)	*Not Applicable*	Internal Finish	*Welds Descaled as Laid*
		External Finish	*Welds Descaled as Laid*

Remarks

* To be determined by the vendor.

Note 1: ***Steam coil design pressure = 180 psig, design temperature = 383°F***
Cooling coil design pressure = 119 psig, design temperature = 174°F

Note 2: ***Vessel volumes are approximate and do not account for manufacturing tolerances, nozzles, and displacement of internals.***

Note 3: ***Body flange gasket shall be Garlock Helicoflex HN 208A seal configuration with titanium jacket.*** ⚠1

Note 4: ***Contents of this document are Dangerous Waste Permit affecting.***

BECHTEL	MECHANICAL DATA SHEET: VESSEL	PLANT ITEM No. 24590-HLW-MV-HDH-VSL-00004

Equipment Cyclic Data Sheet

Component Plant Item Number:	*HDH-VSL-00004*
Component Description	*Canister Decon Vessel 2*

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction	*SB-265 2*
Design Life	*40 Years*
Component Function and Life Cycle Description	*A cycle consists of the following:* • *A 18,000 lb canister will be loaded into the vessel and the lid will be closed* • *The vessel will fill to the overflow with one-molar nitric acid and Cerium +4 solution.* • *The heating coil will raise the temperature of the liquid from 68°F to 149°F.* • *Heating and cooling coils will maintain the temperature of the liquid at 149°F for 6 hours.* • *The nitric acid solution will be drained from the vessel* • *The upper and lower spray rings will rinse the canister with nitric acid and demineralized water* • *Flow to the upper spray ring will stop, the lid will open, and the canister will be slowly removed from the vessel while the lower spray ring continues to rinse the canister.*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*N/A*	*N/A*	*N/A*	
Operating Pressure	psig	*Atm*	*Atm*	*29,200*	
Operating Temperature	°F	*48*	*149*	*29,200*	
Contents Specific Gravity		*1.00*	*1.25*	*29,200*	
Contents Level	inch	*Empty*	*Full*	*29,200*	
Localized Features					
Vessel and Supports		*Empty / Full+Canister*		*29,200*	

Notes

Cycle Increase: The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.

Note 5: Bar SB348-2 is used for Spray Nozzles P/N 06D & 09D, Rollers and Roller Pins P/N 18C & 18D, Thermowells P/N 38A & 38C, Stabilizer bars P/N 19B, Lid Hold Downs P/N 28B & 31K. ⚠1

BECHTEL

MECHANICAL DATA SHEET: VESSEL

PLANT ITEM No. R10656188
24590-HLW-MV-HDH-VSL-00004

Project:	RPP-WTP	P&ID	24590-HLW-M6-HDH-20001
Project No:	24590	Process Data Sheet	24590-HLW-MVD-HDH-00010
Project Site:	Hanford	Vessel Drawing	24590-HLW-MV-HDH-00006, 24590-HLW-MV-HDH-00007
Description:	Canister Decon Vessel 2		

Reference Data

ISSUED BY RPP-WTP PDC

Charge Vessels (Tag Numbers)	Not Required
Pulsejet Mixers / Agitators (Tag Numbers)	Not Required
RFDs/Pumps (Tag Numbers)	Not Required

Design Data

Quality Level		CM	Fabrication Specs	24590-WTP-3PS-MV00-T0001		
Seismic Category		SC-III	Design Code	Generally to ASME VIII Div 1		
Service/Contents		Nitric Acid, Water, Ceric Nitrate	Code Stamp	No		
Design Specific Gravity		1.25	NB Registration	No		
Maximum Operating Volume	gal	212 with Canister in Vessel	Weights (lbs)	Empty	Operating	Test
Total Volume	gal	630	Estimated	3400	21,200	21,200
Environmental Qualification: N/A			Actual *			

Inside Diameter	inch	30			Wind Design	None	
Length/Height (TL-TL)	inch	220 (OAL)			Snow Design	None	
		Vessel Operating	Vessel Design	Coil/Jacket Design	Seismic Design	24590-WTP-3PS-MV00-T0002 24590-WTP-3PS-FB01-T0001	
Internal Pressure	psig	Atm	15	Note 1	Seismic Base Moment *	ft-lb	
External Pressure	psig	Atm	Atm	Note 1	Postweld Heat Treat	None	
Temperature	°F	149	225	Note 1	Corrosion Allowance	inch	0.04
Min. Design Metal Temp.	°F	40			Hydrostatic Test Pressure *	psig	

Materials of Construction

Component	Material	Minimum Thickness / Size	Containment
Lid Assembly	B-265 2	See Drawing	N/A
Shell	B-265 2	See Drawing	N/A
Bottom Head	B-265 2	See Drawing	N/A
Support	B-265 2	See Drawing	N/A
Shaft	304SS Minimum	N/A	N/A
Bearings	304SS Minimum	N/A	N/A
Pipe	B-861/B-363 Seamless	See Drawing	N/A
Tubing	B-338 2	See Drawing	N/A
Forgings/ Bar stock	B-381 F2 / SB348-2 Note 5	See Drawing	N/A
Gaskets	Note 3	N/A	N/A
Bolting	A-193 B8 / A-194 8	N/A	N/A

Miscellaneous Data

Orientation	Vertical	Support Type	Collar
Insulation Function	Not Applicable	Insulation Material	Not Applicable
Insulation Thickness (inch)	Not Applicable	Internal Finish	Welds Descaled as Laid
		External Finish	Welds Descaled as Laid

Remarks

* To be determined by the vendor.

Note 1: Steam coil design pressure = 180 psig, design temperature = 383°F
Cooling coil design pressure = 119 psig, design temperature = 174°F

Note 2: Vessel volumes are approximate and do not account for manufacturing tolerances, nozzles, and displacement of internals.

Note 3: Body flange gasket shall be Garlock Helicoflex HN 208A seal configuration with titanium jacket. (2)

Note 4: Contents of this document are Dangerous Waste Permit affecting.

	MECHANICAL DATA SHEET: VESSEL	PLANT ITEM No. 24590-HLW-MV-HDH-VSL-00004

Equipment Cyclic Data Sheet

Component Plant Item Number:	HDH-VSL-00004
Component Description	Canister Decon Vessel 2

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction	SB-265 2
Design Life	40 Years
Component Function and Life Cycle Description	A cycle consists of the following: • A 10,000 lb canister will be loaded into the vessel and the lid will be closed • The vessel will fill to the overflow with one-molar nitric acid and Cerium +4 solution. • The heating coil will raise the temperature of the liquid from 68°F to 149°F. • Heating and cooling coils will maintain the temperature of the liquid at 149°F for 6 hours. • The nitric acid solution will be drained from the vessel • The upper and lower spray rings will rinse the canister with nitric acid and demineralized water • Flow to the upper spray ring will stop, the lid will open, and the canister will be slowly removed from the vessel while the lower spray ring continues to rinse the canister.

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	N/A	N/A	N/A	
Operating Pressure	psig	Atm	Atm	29,200	
Operating Temperature	°F	48	149	29,200	
Contents Specific Gravity		1.00	1.25	29,200	
Contents Level	inch	Empty	Full	29,200	
Localized Features					
Vessel and Supports		Empty / Full+Canister		29,200	

Notes

Cycle Increase: The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.

Note 8: Bar SB348-2 is used for Spray Nozzles PN 08D & 09D, Rollers and Roller Pins PN 18C & 18D, Thermowells PN 38A & 38C, Stabilizer bars PN 19B, Lid Hold Downs PN 22B & 31K.

Approval

Rev	Description	System Engr	Vessel Engr	Checked	Reviewed	Approved	Date
0	Issue for Purchase	G. Penton	R. Simmons	T. Gallato C. Slater	B. Yarbrough	M. Hoffmann	10/29/03
1	Issued to incorporate 24590-WTP-SDDR-PROC-04-01079	R. Tomotomk	Paul Potani	Steve Crow	Jeff Pullen	M. Hoffmann	1/31/05
2	Revised per Note 3 on sheet 1 of 2.	[signature]	BVM	[signature]	[signature]	[signature]	11/28/05

DWG NO. WTP-M-21951 | SH 5 | REV 3

REVISION HISTORY

REV	DESCRIPTION	DATE	ENG	CHKR	DES AUTH	ENG MGR
0	ORIGINAL RELEASE	02/24/03	DAR	WOR	RAM	CHP
1	ENTIRE SHEET REVISED PER ECN-WTP-101	10/10/03	REE	SFB	RAM	CHP
2	ENTIRE SHEET REVISED PER ECN-WTP-116 & 117	02/02/04	REE	SFB	RAM	RWM
3	ENTIRE SHEET REVISED PER ECN-WTP-131 & 141	3-29-05	[signature]	[signature]	[signature] RAM	[signature]

Bechtel National, Inc. Job No. 24590

SUPPLIER DOCUMENT STATUS

1. [x] Work may proceed.
2. [ ] Revise and resubmit. Work may proceed subject to resolution of indicated comments.
3. [ ] Revise and resubmit. Work may not proceed.
4. [ ] Review not required. Work may proceed.

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations.

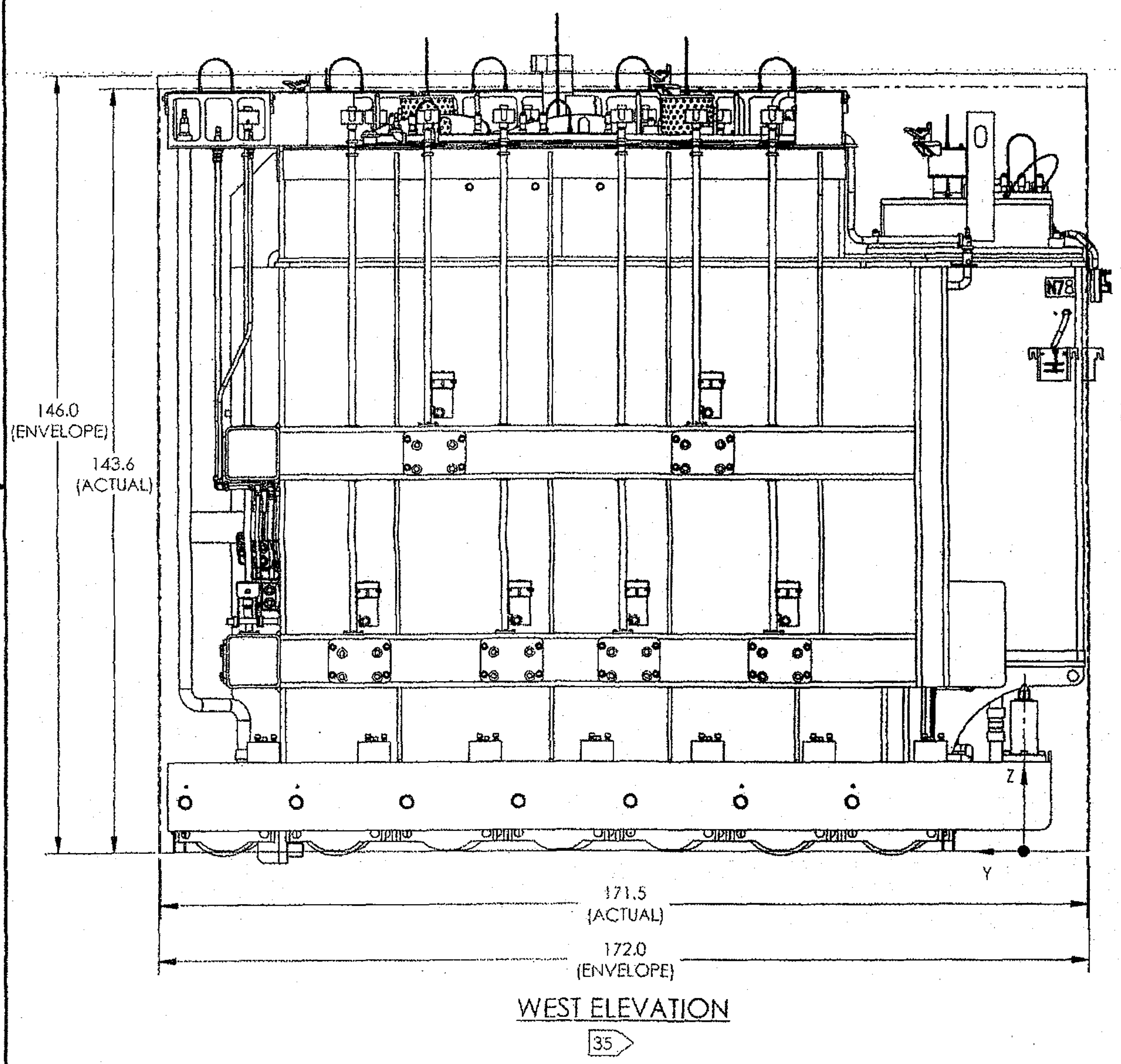
REVIEWED: MH / [initials]

G-321 Document Category 1.2
(From Supplement A to G-321-E (E) or G-321-V (V), as applicable, or "N/A" if SSRS is used)

Supersedes BNI Document No. N/A Rev. ____
(When applicable)

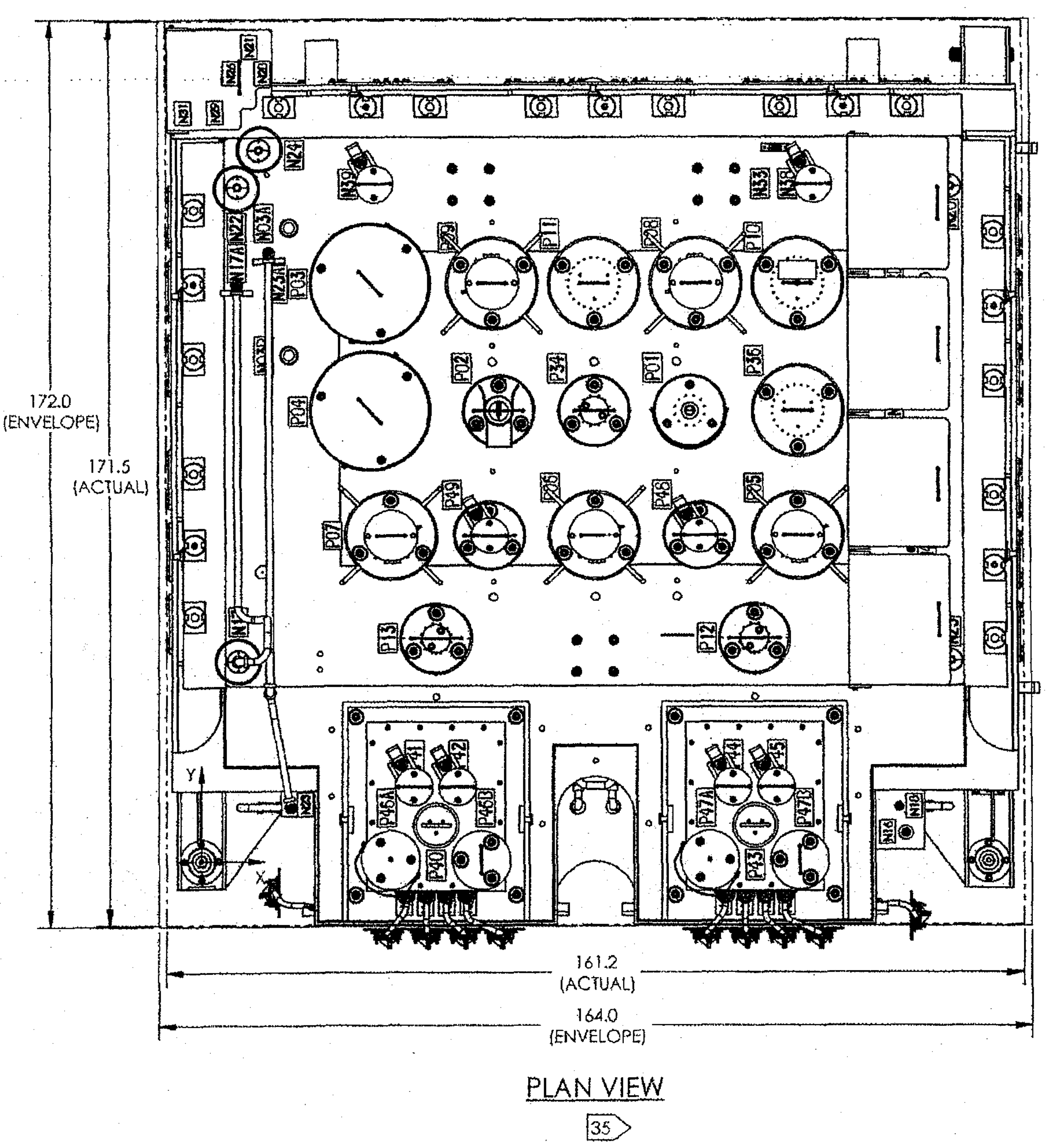
Accepted by Robert Vance [signature] 4/10/05
Print Name / Signature / Date

Released by N/A
(When applicable) Print Name / Signature / Date



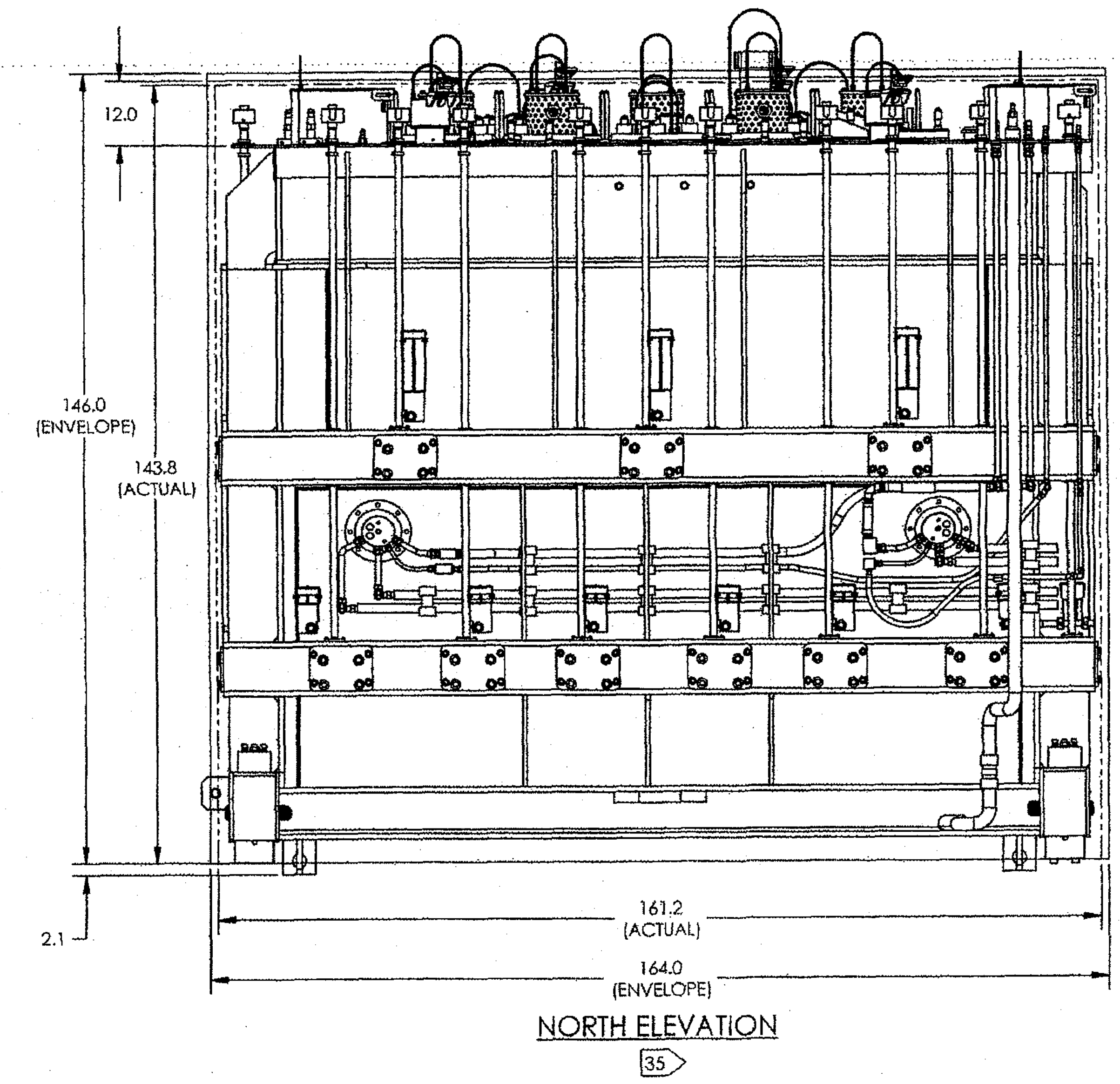
WEST ELEVATION

35



PLAN VIEW

35



NORTH ELEVATION

35

OVERPACK CONFIGURATION (WTP-M-21951-1)

HLW MELTER ENVELOPE

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 THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIAL AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

Duratek 10100 Old Columbia Road Columbia, MD 21046

TITLE: HLW MELTER ASSEMBLY

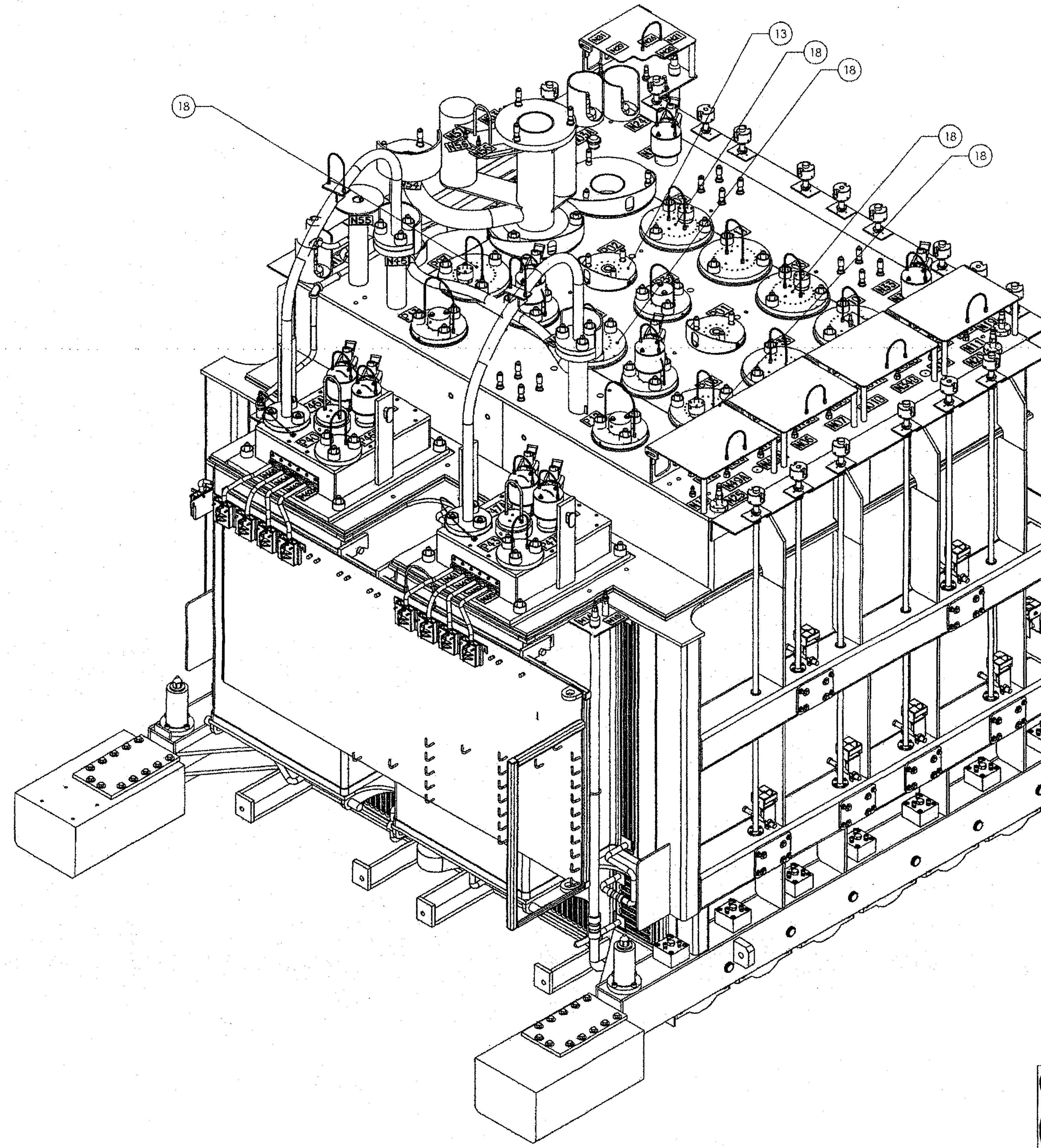
SIZE	CAGE CODE	DWG NO.	REV.
D	-	WTP-M-21951	3

SCALE 1:20 SHEET 5

R10538068

DWG NO. WTP-M-21951 SH 8 REV 3

REVISION HISTORY						
REV	DESCRIPTION	DATE	ENG	CHKR	DES AUTH	ENG MGR
0	ORIGINAL RELEASE	02/24/03	DAR	WOR	RAM	CHP
1	ENTIRE SHEET REVISED PER ECN-WTP-101	10/10/03	REE	SFB	RAM	CHP
2	ENTIRE SHEET REVISED PER ECN-WTP-116 & 117	02/02/04	REE	SFB	RAM	RWM
3	ENTIRE SHEET REVISED PER ECN-WTP-131 & 141	3-29-05	[illegible]	RAC	[illegible]	[illegible]



ISOMETRIC VIEW

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 THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIAL AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

Bechtel National, Inc. Job No. 24590

SUPPLIER DOCUMENT STATUS

1. [x] Work may proceed.
2. [ ] Revise and resubmit. Work may proceed subject to resolution of indicated comments.
3. [ ] Revise and resubmit. Work may not proceed.
4. [ ] Review not required. Work may proceed.

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations.

REVIEWED MH LC

G-321 Document Category 1.2
[From Supplement A to G-321-E (E) or G-321-V (V), as applicable, or "N/A" if SSRS is used]

Supersedes BNI Document No. N/A Rev. ____
[When applicable]

Accepted by ROBERT VANCE (Print Name) [signature] (Signature) 4/10/05 (Date)

Released by N/A (Print Name) ____ (Signature) ____ (Date)
[When applicable]

OPERATING CONFIGURATION (WTP-M-21951-3)

REMOVE LID PLUGS AND REMOTE NUTS. REPLACE WITH SHOWN LID COMPONENTS AND REINSTALL NUTS PER AP-WTP-21950.

Duratek 10100 Old Columbia Road Columbia, MD 21046

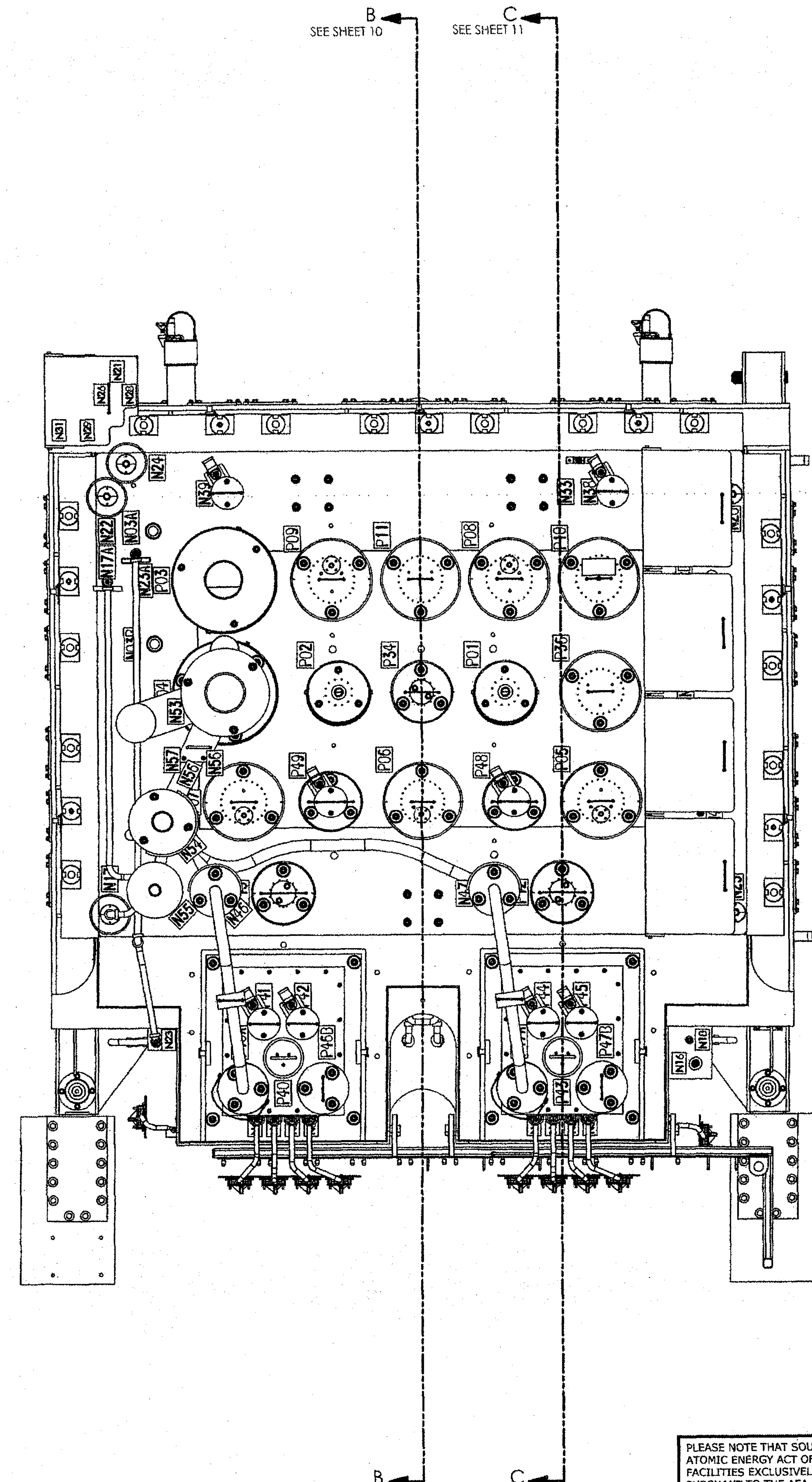
TITLE: HLW MELTER ASSEMBLY

SIZE	CAGE CODE	DWG NO.	REV.
D	-	WTP-M-21951	3
SCALE 1:16		SHEET 8	

DWG NO.	SH	REV
WTP-M-21951	9	3

REVISION HISTORY

REV	DESCRIPTION	DATE	ENG	CHKR	DES AUTH	ENG MGR
0	ORIGINAL RELEASE	02/24/03	DAR	WOR	RAM	CHP
1	ENTIRE SHEET REVISED PER ECN-WTP-101	10/10/03	REE	SFB	RAM	CHP
2	ENTIRE SHEET REVISED PER ECN-WTP-116 & 117	02/02/04	REE	SFB	RAM	RWM
3	ENTIRE SHEET REVISED PER ECN-WTP-131 & 141	3-29-05	[illegible]	RAC	[illegible]	[illegible]



PLAN VIEW

Bechtel National, Inc. Job No. 24590

SUPPLIER DOCUMENT STATUS

1. [✓] Work may proceed.
2. [ ] Revise and resubmit. Work may proceed subject to resolution of indicated comments.
3. [ ] Revise and resubmit. Work may not proceed.
4. [ ] Review not required. Work may proceed.

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations.

REVIEWED MH / LC

G-321 Document Category 1.2
[From Supplement A to G-321-E (E) or G-321-V (V), as applicable, or "N/A" if SSRS is used]

Supersedes BNI Document No. N/A Rev. ____
[When applicable]

Accepted by ROBERT VANCE (Print Name) [signature] (Signature) 4/10/05 (Date)

Released by N/A (Print Name) ____ (Signature) ____ (Date)
[When applicable]

OPERATING CONFIGURATION (WTP-M-21951-3)

Duratek
10100 Old Columbia Road
Columbia, MD 21046

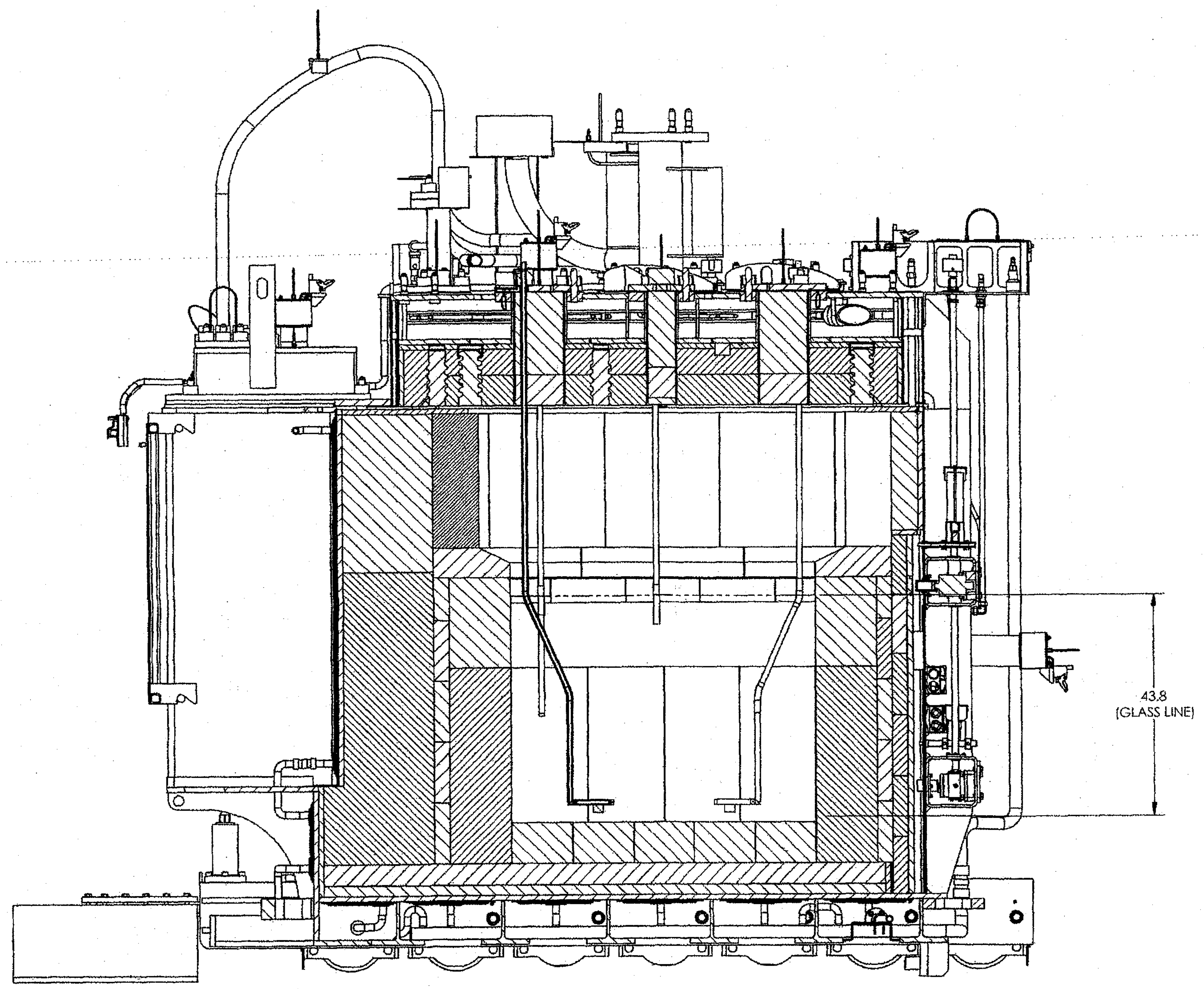
PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO ITS AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIAL AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

TITLE			
HLW MELTER ASSEMBLY			
SIZE: D	CAGE CODE: -	DWG NO.: WTP-M-21951	REV: 3
SCALE: 1:16		SHEET: 9	

DWG NO. WTP-M-21951 SH 10 REV 3

REVISION HISTORY

REV	DESCRIPTION	DATE	ENG	CHKR	DES AUTH	ENG MGR
0	ORIGINAL RELEASE	02/24/03	DAR	WOR	RAM	CHP
1	ENTIRE SHEET REVISED PER ECN-WTP-101	10/10/03	REE	SFB	RAM	CHP
2	ENTIRE SHEET REVISED PER ECN-WTP-116 & 117	02/02/04	REE	SFB	RAM	RWM
3	ENTIRE SHEET REVISED PER ECN-WTP-131 & 141	3-29-05	[illegible]	RAC	[illegible]	[illegible]



SECTION B-B
FROM SHEET 9

BECHTEL
Bechtel National, Inc. Job No. 24590
SUPPLIER DOCUMENT STATUS
1. [✓] Work may proceed.
2. [ ] Revise and resubmit. Work may proceed subject to resolution of indicated comments.
3. [ ] Revise and resubmit. Work may not proceed.
4. [ ] Review not required. Work may proceed.
Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations.
REVIEWED MH LC
G-321 Document Category 1.2
[From Supplement A to G-321-B (E) or G-321-V (V), as applicable, or "N/A" if SSRS is used]
Supersedes BNI Document No. N/A Rev.
[When applicable]
Accepted by ROBERT VANCE [signature] 4/10/05
Print Name Signature Date
Released by N/A
[When applicable] Print Name Signature Date

OPERATING CONFIGURATION (WTP-M-21951-3)

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 THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIAL AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

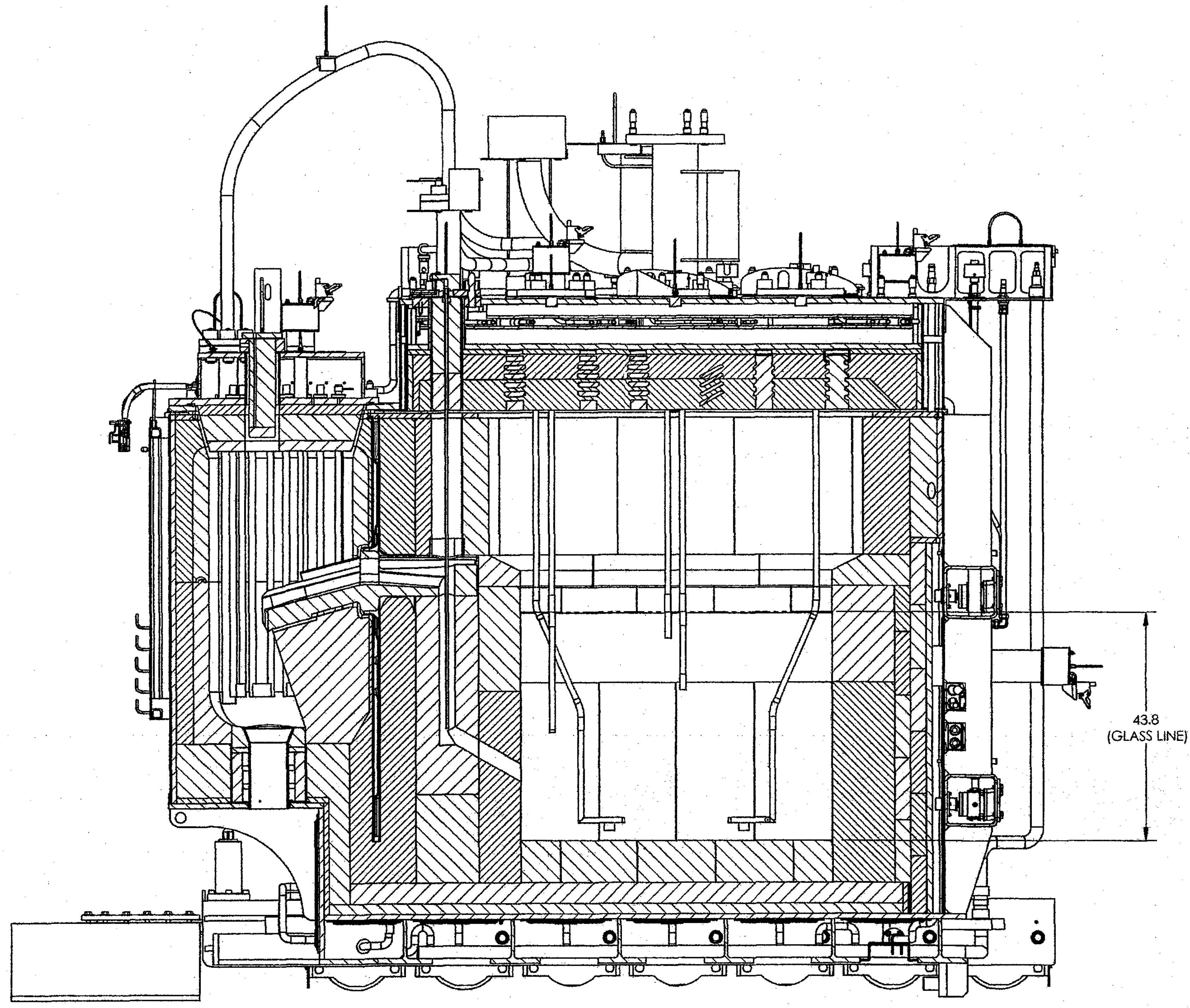
Duratek 10100 Old Columbia Road Columbia, MD 21046

TITLE: HLW MELTER ASSEMBLY

SIZE	CAGE CODE	DWG NO.	REV.
D	-	WTP-M-21951	3
SCALE 1:16		SHEET 10	

DWG NO. WTP-M-21951 | SH 11 | REV 3

REVISION HISTORY						
REV	DESCRIPTION	DATE	ENG	CHKR	DES AUTH	ENG MGR
0	ORIGINAL RELEASE	02/24/03	DAR	WOR	RAM	CHP
1	ENTIRE SHEET REVISED PER ECN-WTP-101	10/10/03	REE	SFB	RAM	CHP
2	ENTIRE SHEET REVISED PER ECN-WTP-116 & 117	02/02/04	REE	SFB	RAM	RWM
3	ENTIRE SHEET REVISED PER ECN-WTP-131 & 141	3-29-05	TB	RAC	TB for RAM	RWM



SECTION C-C
FROM SHEET 9

Bechtel National, Inc. Job No. 24590

SUPPLIER DOCUMENT STATUS

1. [x] Work may proceed.
2. [ ] Revise and resubmit. Work may proceed subject to resolution of indicated comments.
3. [ ] Revise and resubmit. Work may not proceed.
4. [ ] Review not required. Work may proceed.

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier and does not relieve supplier from full compliance with contractual obligations.

REVIEWED MH / LC

G-321 Document Category 1.2
[From Supplement A to G-321-E (E) or G-321-V (V), as applicable, or "N/A" if SSRS is used]

Supersedes BNI Document No. N/A Rev.
[When applicable]

Accepted by Robert Vance (Print Name) [signature] (Signature) 4/10/05 (Date)

Released by N/A (Print Name) (Signature) (Date)
[When applicable]

416 GPAS 7-03

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 THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIAL AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

OPERATING CONFIGURATION (WTP-M-21951-3)

Duratek — 10100 Old Columbia Road, Columbia, MD 21046

TITLE: HLW MELTER ASSEMBLY

SIZE D | CAGE CODE - | DWG NO. WTP-M-21951 | REV. 3

SCALE 1:16 | SHEET 11

THIS PAGE INTENTIONALLY
LEFT BANK

Drawings and Documents

Attachment 51 – Appendix 10.7
High Level Waste Building
Specifications

The following drawings have been incorporated into Appendix 10.7 and can be viewed at the Ecology Richland Office. **New drawings are in bold lettering.**

Drawing/Document Number	*Description*
24590-HLW-3PS-AE00-TP001, Rev 0	**Engineering Specification for HLW Melters**
24590-HLW-3PS-MBT0-TP001, Rev 2	Engineering Specification for Silver Mordenite Column Design and Fabrication
24590-HLW-3PS-MEE0-TP001, Rev 1	Engineering Specification for HEPA Filter Preheaters
24590-HLW-3PS-MQR0-TP002, Rev 1	Engineering Specification for HLW System HDH Canister Rinse Bogie
RESERVED	RESERVED

R10482123

ISSUED BY
RPP-WTP PDC

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

High Level Waste Melters

MARK A. SCOTT, STATE OF WASHINGTON, 19183, REGISTERED PROFESSIONAL ENGINEER — 2/3/05 — EXPIRES 04/01/05	LOUIS SCOTT GOFF, STATE OF WASHINGTON, 35745, REGISTERED PROFESSIONAL ENGINEER — 2/3/05 — EXPIRES 10/18/05	WALTER PAUL DROSJACK, STATE OF WASHINGTON, 41231, REGISTERED PROFESSIONAL ENGINEER — 2/1/05 — EXPIRES 6/6/05
STRUCTURAL	ELECTRICAL	MECHANICAL & OTHER

Content applicable to ALARA? ☒ Yes ☐ No

ADR No. Rev
N/A

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

Quality Designator
QL

DOE Contract No.
DE-AC27-01RV14136

0	1/31/05	Issued for permitting use.	R.P. Casassa	M. Hall	R. D. Peters	N/A	W. Eaton
REV	DATE	REASON FOR REVISION	BY	CHECK	REVIEW	QA	APEM/DEM

SPECIFICATION No. 24590-HLW-3PS-AE00-TP001 Rev 0

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

Appendices

1 General

1.1 Scope

A. This Specification provides performance requirements for the design of High Level Waste (HLW) vitrification melters for the River Protection Project - Waste Treatment Plant (RPP-WTP) at the Hanford, Washington Site of the Department of Energy (DOE). The performance requirements cover all phases of melter life, including assembly, transport, startup, commissioning, operation and maintenance, decommissioning, and disposal.
B. This Specification has been written for Contract No. 24590-101-TSA-W-000-0010 and is supported by Ref 2.2D. Controls and instrumentation requirements for melter design have been incorporated into Ref 2.2B.
C. The melters include, but are not limited to, the following major structures, systems, and components (SSCs): glass containment, glass and glass discharge heating, refractory cooling, instrumentation, offgas cooling and collection, waste and glass feed, glass frit addition for startup, glass discharge, and seismic restraint.
D. The subcontractor shall base the design on the information provided in this Specification, the referenced documents herein and the current contract documents.
E. See Ref 2.2D for melter design scope of work.
F. Additional research and technology testing by the subcontractor, to aid in the design, shall be in accordance with the contract documents.

1.2 Definitions

A. Base - Structural platform that supports the melter during transport and operation. Base includes structural steel and bracing, and cooling water panel structures. Base also includes plates that provide a portion of the gas barrier. The base has elements that restrain the melter during operation.
B. Contractor - Bechtel National, Inc.
C. Design Life - The baseline time, based on calculation, analysis, experience or testing, over which the SSC will safely maintain its original function.
D. Transportation System - Melter components that aid in the transport and positioning of the melter during transportation, installation, operation, decommissioning and disposal.
E. Lid - Structural cover over the top of the melter plenum space that supports lid plenum refractory and all components mounted through it. Lid also includes plates that provide a portion of the gas barrier.
F. Normal Operation - constitutes all regular and scheduled melter activities geared towards production of glass product at or near design throughput, i.e., feeding, pouring, idling, and scheduled SSC changeout.
G. Walls - Melter and discharge chamber exterior structural steel.
H. Overpack - Portable structural enclosure mounted on rail wheels that will be used for transporting new melters and disposing of failed or spent melters. Overpack will provide restraint, containment, contamination control, and radiation shielding during melter transport and disposal activities.
I. Subcontractor - Duratek, Inc.
J. Vendor - A manufacturer or supplier providing materials and/or services to the subcontractor.
K. Gas Barrier - Structural steel plate consisting of the walls and the internal surfaces of the lid and base. The gas barrier serves to support the offgas-related function of the shell, while providing controlled air in-leakage to the melter plenum.
L. Frit - Glass particulate of a size and geometry suitable for direct feed into the melter.

M. Shell - Structural elements of the melter that ensure confinement of bulk molten glass, should it migrate through the refractory. Also supports the offgas system by providing a confinement boundary to direct offgas into the melter offgas system. The shell is comprised of the base, walls, and lid.

1.3 Acronyms

Acronyms used in this Specification include:

CCTV	Closed Circuit Television
DOE	Department of Energy
ICD	Interface Control Document
HLW	High Level Waste
RPP-WTP	River Protection Project-Waste Treatment Plant
SC	Seismic Category
SSC	Systems, Structures, and Components
wg	Water Gage (pressure measurement)

2 Applicable Documents

2.1 Referenced Codes and Industry Standards

Unless otherwise noted, all codes and standards referenced herein, and in the documents referenced in Section 2.2, shall be to the latest editions, addenda, and supplements at the time of award.

A. Deleted
B. Deleted
C. American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
   1. IEEE Std 141, *Recommended Practice for Electric Power Distribution for Industrial Plants* (1986)
   2. IEEE Std 260.1, *American National Standard Letter Symbols for Units of Measurement* (1993)
   3. IEEE Std 315, *Graphic Symbols for Electrical and Electronics Diagrams* (reaffirmed 1993)
   4. IEEE Std 399, *Recommended Practice for Industrial and Commercial Power Systems Analysis* (1997)
   5. IEEE Std 1202, *Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies* (1991)
D. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
   1. ASME B31.3, Process Piping (1996)
   2. ASME Section III, Division I, Subsection NC, Rules for Construction of Nuclear Facility Components (2001)
   3. ASME Section VIII, Division I, Rules for Construction of Pressure Vessels (2001)
   4. ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities(1989)
   5. ASME NQA-2a, Part 2.7, Quality Assurance Requirements of Computer Software for Nuclear Facility Applications (1990)

6. ASME Section II, Material Specifications (2001)

E. Code of Federal Regulations (CFR) - 29 CFR 1910, Subpart S, *Occupational Safety and Health Administration, Electrical* (most current revision)
F. National Electrical Manufacturers Association (NEMA):
   1. NEMA WC, *Wire and Cable Standards* (1999)
   2. NEMA/ICEA (Insulated Cable Engineers Association), *Power Cable Ampacities* (1999)
G. National Fire Protection Association (NFPA)
   1. NFPA 70, *National Electrical Code* (1999)
   2. NFPA 497, *Recommended Practice for Classification of Hazardous Locations for Electrical Installations in Chemical Process Areas* (1997)
H. Underwriters Laboratories Inc (UL) - UL 508, *Standard for Safety Electric Industrial Control Equipment* (1999)
I. American Welding Society (AWS)
   1. AWS D1.1, *Structural Welding Code; Steel*
   2. AWS D1.6, *Structural Welding Code; Stainless Steel*
J. American National Standards Institute/American Institute of Steel Construction (ANSI/AISC)
   1. AISC N690, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities (1994)
K. American Institute of Steel Construction (AISC) -AISC M016-89, Manual of Steel Construction - Allowable Stress Design, Ninth Edition (as tailored in Appendix C of Ref. N)

2.2 Other Reference Documents/Drawings

A. Deleted
B. Document No. 24590-WTP-3PS-J000-T0001, Rev 1, *Engineering Specification for Melter Systems C&I Work Specification*
C. Deleted
D. Statement of Work for Subcontract No. 24590-CM-SRA-HM00-00001, *Modeling and Design of Melters*
E. Deleted
F. Deleted
G. Contractor Correspondence No. 025802, *Contract No. DE-AC27-01RV14136 - Letter Subcontract Number 24590-101-TSA-W000-0010, Comments to Duratek's 30 % Design Package Submittal*
H. Document No. 24590-HLW-S0C-S15T-00009, Rev 0C, *HLW Vitrification Building Seismic Analysis-In-Structure Response Spectra (ISRS)*
I. Document No. 24590-WTP-3PS-SS90-T0001, Rev. 1, *Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks*
J. Document No. 24590-WTP-DC-ST-04-001, Rev. 1, *Seismic Analysis and Design Criteria*
K. Drawing No. 24590-HLW-DD-S13T-00071, Rev. 2, *HLW Vitrification Building Structural Melter Seismic Restraint Embed Sections and Details*
L. Calculations No. 24590-HLW-DDC-S13T-00034, Rev. A, *Melter Seismic Restraint Embeds*
M. Document No. 24590-WTP-3PS-FB01-T0001, Rev. 1, *Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks*
N. Document No. 24590-WTP-SRD-ESH-01-001-02, Rev ~~2~~ 3 [handwritten: 3Z, initials, 2/1/05], *Safety Requirements Document, Volume II*

3 Design Requirements

The body of this specification identifies the functional design requirements for melter design. Appendices A and B, "Melter Services and Connections Interface Details" and "Melter Design Interface

Details" respectively, identify detailed design requirements and interfaces that have evolved from the functional design requirements for achieving the specified melter operating life and availability. The detailed design requirements and interfaces also provide a basis for designing the services and facilities that will support melter handling and operations.

3.1 General Functional Requirements

A. Other Functional Requirements - Other design requirements are defined in the melter design work performed in accordance with Contract No. 24590-101-TSA-W-000-0010 and submitted as the 30 percent design package, and contractor comments to the 30 percent design package (Ref. 2.2G). The package is referred to as the baseline design in this Specification. See also Ref 2.2D.

B. Containment System: The containment system will serve to support the credited safety functions of the melter shell, which are to ensure bulk confinement of radioactive materials during normal, abnormal and accident conditions, and to prevent exposures that may result in consequences to the co-located worker and facility worker above radiation exposure standards in the SRD. The containment system includes the melter shell and other elements: the refractory (and refractory thermocouples), cooling panels, jack bolts, and offgas ventilation.
   1. Coordinate with contractor to include design features for simplifying remote disassembly of a failed melter.
   2. The melter shell shall provide bulk confinement of glass in the event of refractory failure. The melter is not required to operate after a seismic event exceeding certain lateral acceleration limits, as defined in section 3.5; however, the shell shall maintain structural integrity and remain in place in accordance with the structural requirements outlined herein.
   3. Jack bolts: Design jack bolt system to prevent formation of significant gaps between refractory bricks. Bolt adjustment shall allow for:
      a. Remote operation in the melter cave.
      b. Support and adjustment of cooling panels and refractory during assembly, installation, startup, and operation.
   4. Melter Lid: Design shall include, but not be limited to, the following functions:
      a. Support all melter components mounted on and through it.
      b. Support refractory overhanging melter plenum, and thermal expansion of refractory during operation.
      c. Provide a continuous gas barrier in conjunction with wall and base gas barrier plates.
      d. Provide refractory cooling.
   5. Deleted.
   6. Melter Base: Base will perform the following functions:
      a. Support melter during transport, operation and maintenance, decommissioning, and disposal phases.
      b. Accommodate integrated transportation system.
      c. Provide contractor-coordinated interfaces with overpack and facility restraints.
      d. Provide flatness tolerances for refractory installation.
      e. Provide refractory cooling.
      f. Provide support for refractory during melter assembly, transport, installation, and operation.
      g. House melter services including drains and refractory water-cooling panels.
   7. Confinement of offgas is provided by the gas barrier portions of the shell, with engineered inbleeds. Inbleed openings shall be limited so that bulk flow of glass will be controlled should it leak from the refractory.

C. Heating System
   1. Heating system includes the electrodes (including extensions), startup heaters, discharge chamber heaters, and thermocouples.

2. After melter startup, glass shall be direct joule-heated.
3. Thermocouples shall provide continuous temperature monitoring while the melter is in service.

D. Feed System
1. Feed system includes temporary configuration for frit addition at startup, feed nozzles, associated feed lines (internal to melter only) for operation, and plenum thermocouples.
2. Subcontractor shall use best available information for locating feed nozzles over the glass pool to optimize processing rates.

E. Glass Pour System
1. Glass pour system includes glass pool level detectors, risers and airlift lances, troughs, dams, and discharge chamber structures.
2. Metallic Membrane (dam): Dam between the glass pool and discharge chamber shall prevent leakage of glass from the melt pool to the discharge chamber. Dam shall also limit leakage of air directly into the melter plenum through refractory seams over the melter lifetime.
3. Discharge Trough: Design trough to aid in maintaining glass temperature during pouring. Optimize trough slope and cross section for pouring and reduction of glass fiber formation.

F. Melter Disposal and Decommissioning: Coordinate with contractor to define general design requirements for melter disposal and decommissioning. Contractor will define specific disposal and decommissioning criteria after design is complete.

G. Melter Controls and Instrumentation: See Ref 2.2B for specific melter-related functional requirements for controls and instrumentation.

H. Transportation System: System will perform the following functions:
1. Support roller/wheel assemblies for melter transport on facility and overpack rails.
2. Guide and position melter on facility and overpack rails.
3. Interface with contractor-supplied drive systems that conform to subcontractor-defined melter movement criteria (see Appendix B).
4. Remain functional after an operational earthquake event as defined in Section 3.5A5: roller/wheel bearings shall remain functional and the rollers/wheels shall remain on the rails.
5. Allow for replacement by an identical melter after end-of-life or failure.

I. General Melter Component Design
1. Components requiring replacement during the design life of the melter shall be designed for ease of remote replacement and disposal. Where required, provide installed spare capacity.
2. Use of commercially available components and equipment without modifications will be optimized to the extent practical, except for components requiring optimization/value engineering studies per Ref 2.2D.
3. Subcontractor shall coordinate with contractor to determine applicability of modular design to minimize assembly and replacement times.
4. A power manipulator and an overhead maintenance crane will accommodate remote removal/replacement of modular components and equipment during startup and operation. Subcontractor shall coordinate with contractor to determine individual handling, routing, and access requirements so as not to exceed the operating parameters of the handling equipment.
5. Conductive individual components and equipment in contact with the molten glass shall be electrically isolated from the melter structure, base and lid, and from SSCs physically connecting the melter to the rest of the facility.
6. All components shall be designed to withstand thermal expansion during normal operations and function within established design parameters (e.g., interface locations and positioning features).
7. Deleted.

J. Agitation System
1. Agitation system includes bubblers and glass pool viewing system.
2. Arrangement and configuration of bubblers shall aid in optimizing melter throughput.

3. Each bubbler assembly, in coordination with the contractor, shall be designed for individual removal and replacement.

K. Restraint System
   1. Subcontractor shall design an anchor system, per the structural requirements below, to lock melter in place during operation, including pin, restraint, and interface to building embedments as shown in Ref. 2.2 K.
   2. In order to fully account for construction tolerances, interfacing dimensions shall be placed on hold for fabrication until after placement of the embedments in the field. As-built dimension will be provided by the project when available.

3.2 Performance Requirements

A. Design Life
   1. The facility is expected to operate for approximately 40 years.
   2. The melter, excluding consumable SSCs specified by the subcontractor, shall have a minimum 5-year design life.
   3. Refer to Appendix B for predicted subcontractor-defined design lives of selected SSCs to support target availability.
   4. Deleted.
   5. Subcontractor shall document bases for declaring the design lives of the melter and all associated SSCs.

B. Melter Throughput and Availability
   1. Baseline throughput shall be one and one half (1.5) metric tons of glass/day, per melter. The melter shall be designed to allow production rates of three (3.0) metric tons of glass/day with an increase in agitation/bubbling rate.
   2. Melter shall transform a slurry mixture of pretreated high level waste (HLW) and blended glass formers into a homogeneous glass melt. See Appendix B for waste and test feeds and glass composition data. Contractor will be responsible for controlling the feed chemistry composition within referenced boundary limits.
   3. Target baseline availability for the melter is 83%. Subcontractor shall interface with contractor to ensure that melter design supports goal.

3.3 Design Conditions

A. Site Data (Applicable to Melter Transport in Overpack)
   1. Elevation: 662 to 684 feet above mean sea level.
   2. Site Climatological Data:

Ambient Air Temperature	Minimum: - 23 °F, Maximum: 113 °F
Rate of Increase	Maximum: 26 °F per 20 min
Rate of Decrease	Maximum: 24 °F per hour
Relative Humidity	Maximum: 100 %, Minimum 5 %

B. Facility Data

1. Building layouts and equipment general arrangements are predicated on the melter and melter component dimensions shown in Appendix B. Subcontractor shall notify contractor of any changes to dimensions and/or equipment maintenance envelope requirements.
2. Melter Ventilation:
   a. Melter will be operated as part of a cascaded ventilation system.
   b. Melter cave will be a primary confinement zone, held at a nominal 1 to 1.4-in. wg negative pressure with respect to surrounding secondary confinement zones.
   c. Melter plenum pressure will be maintained at a nominal 5-in wg negative pressure with respect to the cave.
3. Indoor Temperatures: See Appendix B for melter cave temperature range.
4. Radiation Dosages: See Appendix B for radiation design interface requirements impacting melter design.
5. Melter Utility Services:
   a. Contractor is currently providing the following services to the melters: electrical power, cooling water, process water, demineralized water, purge air, instrument air, and argon.
   b. Pressure, flow, conditioning, and other control requirements will be adjusted by contractor to suit application at the delivery point.
   c. Subcontractor shall identify any other liquids or gases required over the melter lifetime.
   d. Subcontractor shall coordinate with contractor to define utilities that require normal service or backup services.
   e. Subcontractor shall identify critical melter services where stoppage would result in rapid failure of associated component or melter system (see Appendix B). Include estimates of time to failure.
   f. Subcontractor shall specify required service operating parameters at contract boundary, with contractor input on selected design operating criteria.
6. Deleted

3.4 Mechanical Requirements

See Appendix A for melter service and connection interface details and Appendix B for the balance of melter design interface details.

A. Discharge Chamber
   1. For baseline discharge chamber operation, glass discharge will alternate between the two chambers for every other canister. The switch between chambers will not occur until a canister has been filled.
   2. Each discharge chamber shall be designed for a throughput of three (3) metric tons per day.
B. Feed Nozzles
   1. Feed nozzles shall be designed for a throughput of three (3) metric tons per day, with all nozzles operating.
   2. Contractor will provide the following to each feed nozzle:
      a. A dedicated feed line and pump.
      b. Cooling water.
      c. Air and water purge.
   3. Subcontractor shall coordinate with contractor to design glass frit addition system, for use during melter startup. Subcontractor shall be responsible for design of frit discharge "nozzle" that will penetrate the melter lid.
C. Viewing Systems
   1. Design one (1) closed circuit television (CCTV) and associated system for viewing plenum area and cold cap.

2. CCTV will be used on an intermittent basis, as operation and maintenance requirements dictate. It will be removed from the melter when not in use. Design CCTV to be removable and replaceable with remote handling equipment.
3. Coordinate with contractor for design and incorporation of glass discharge viewing equipment, to be supplied by contractor.
4. Viewing ports shall be purged to prevent buildup of solids and other contaminants.
5. Cool CCTV ports as required.

D. Refractory Expansion Control System
1. Design jack bolts to actively control refractory expansion without operator intervention. Remote operation of, and access to, the bolts shall be maintained.
2. Coordinate with Contractor to provide a means of locally monitoring cooling panel and refractory movement with visual indicators.

E. Melter Cooling Water System
1. Provide water cooling using panels around the glass pool, plenum, and discharge chambers as required. Contractor will be responsible for water supply to the panels.
2. Cooling panels shall be designed in accordance with Ref 2.1D3.
3. Cooling panel design shall be such that internal pressure and/or temperature induced distortions will not place undue stress against the melter refractory.
4. Design cooling panels to be emptied at melter changeout or decommissioning.
5. Coordinate with contractor for overall cooling water system design, including instrumentation and controls, external to the melter.

F. Melter Offgas System
1. See Appendix A for sizes of primary and standby offgas pipes.
2. Each pipe shall accommodate anticipated melter in-leakage and purge streams. In-leakage streams include, but are not limited to, room air inflow from lid-mounted component removal/replacement operations, and inflow from the discharge chambers. Purges include gas inflows from the film coolers, feed nozzles, bubblers, and airlift lance.
3. Offgas pipe routing from the melter to the submerged bed scrubbers will be defined by the contractor.
4. Design and configuration of the primary offgas film cooler will reduce the offgas temperature and minimize solids deposition during the various modes of operation to support downstream offgas system operation. See Appendix B for additional requirements affecting film cooler design.
5. Film cooler design shall incorporate a means for internal cleaning. This operation may be assisted with remote handling equipment in the melter cave.
6. Provide redundant pressure measurement for the melter plenum.

G. Piping
1. All cooling water piping, feed piping and pour flanges shall be per Ref 2.1D1. Piping seismic design shall be in accordance with Ref 2.1D2, Appendices N and F. See Appendix A for piping fluid service categories. Subcontractor shall provide documentation for justification of service class selected where different than what is shown.
2. Joints: Use of all joints other than butt-welded shall be submitted for contractor review and approval.
3. Piping Nozzle Slopes: See Appendix B for slopes of selected utility and service lines.
4. Disconnects: Coordinate with contractor to define remote disconnect requirements at the melter-facility boundaries.
5. Drains: Provide low-point "floor" drains between the gas barrier and the refractory for the maximum credible leak from a complete break of one cooling water panel pipe. Coordinate with contractor to provide leak detection equipment at the drains. Design drains to prevent clogging from particle waste and to minimize inflow of air due to the melter operating at a vacuum.

H. Material Requirements

1. Subcontractor shall define all melter SSC material requirements in accordance with this Specification and applicable codes and standards. Where deviations are required, subcontractor shall notify contractor before proceeding with design.
2. Materials selected shall be able to withstand the corrosive environment caused by the melter feed, glass, and offgases for SSC lifetimes given in Section 3.2A2 and Appendix B. Combustible materials shall not be used without prior approval from contractor.
3. Subcontractor shall consider environmental, durability, corrosion and erosion factors during material selection. At a minimum, subcontractor shall evaluate the following characteristics:
   a. Surface finish
   b. Chemical resistance
   c. Radiation resistance
   d. Pressure effects (cyclical)
   e. Temperature effects
   f. Hardness (possibility of galling and fretting)
   g. Fatigue (cyclic stresses both with and without the presence of aggressive chemicals).
4. Corrosion monitoring capability during operations is not required.

I. Bubblers
1. Bubbler assemblies shall be isolated from the melter lid and lid jumpers to prevent electrical short-circuiting.
2. Coordinate with contractor to define air/gas supply requirements.

3.5 Structural Requirements

See Appendix A for melter service and connection details and Appendix B for the balance of melter design interface details.

A. General
1. In order to perform its credited safety function, the melter shell must maintain structural integrity and remain in place to preclude potential impacts to SC-I items during and after a seismic event. Thus the melter shell and restraints are SC-II, and shall be seismically qualified in accordance with Ref. 2.2.I.
   a. The "appropriate in-structure response spectra" cited by Ref. 2.2.I for dynamic analysis shall envelope the 3 % damped ISRS at building lines 10 & C and 11 & M from reference 2.2.H.
   b. Subcontractor shall submit a Seismic Qualification Report consistent with the requirements of Ref. 2.2.I.
2. Maintaining structural integrity as required above does not preclude limited yielding of the gas barrier portion of the melter shell during a seismic event, providing the following general and safety requirements are met:
   a. Permanent effects resulting from SC-II loading shall not prevent the melter from being removed from the facility and placed in its overpack.
   b. Permanent effects resulting from SC-II loading shall not allow for the bulk flow of molten glass.
   c. In order to maintain the integrity of the offgas system, which is an SC-III system, the shell shall maintain an appropriate factor of safety against yield when subjected to appropriately combined SC-III loadings.
3. During transport and normal operating conditions, the deflection under load shall be limited to allow for proper refractory performance.
4. Subcontractor shall design an anchor system, per SC-II, to lock melter in place, including pin, restraint, and interface to building embeds.

5. Subcontractor shall verify through analysis that the melter will remain capable of normal operation after a lateral seismic acceleration at the base of the melter of 0.061g in any horizontal direction.
6. For melter transport into the facility, subcontractor shall conduct analyses and provide documentation to ensure that refractory arrangement and integrity is maintained. Notify contractor if additional or temporary means of refractory restraint are advantageous.
7. The design of the electrodes and the melter dam shall address creep over the life of the component.

B. Melter Base
1. See Appendix B for additional structural related interface details.

C. Transportation System
1. Rollers/Wheels:
   a. Subcontractor shall consider worst potential load type combination in determining roller/wheel load capacity.
   b. Provide vertical adjustment capability (passive and/or active) to accommodate slight differences in transport rail elevation.
2. Fasteners, Anchors, and Positioning Devices: Coordinate with contractor to establish design and interface requirements for all phases of melter life.
3. See Appendix B for transportation system interface details.

D. Loadings
1. Dead Loads: Design shall consider the combined weight of all melter SSCs. Other static loads to be considered include:
   a. Temporary rigging equipment during transport.
   b. Weight corresponding to maximum glass volume during operations.
   c. Circulated cooling fluids during operations.
   d. Encasement of all voids with grout during decommissioning.
2. Live Loads: Subcontractor shall coordinate with contractor to develop loading requirements and limits related to transport, maintenance, decommissioning, and jumper attachment.
3. Seismic loads:
   a. For SC-II systems and components, seismic loads shall be determined in accordance with Ref 2.2.I.
   b. For SC-III systems and components, the seismic loading shall be determined in accordance with the Ref 2.2.M using the following parameters:
      i. Rp=3.0
      ii. hx=3.0
      iii. hr=68
   c. Alternately, SC-III seismic response may be determined by means of scaling the response from the SC-II analysis
      i. The scale factor shall be the ratio of the static base shear of the melter as determined by ref 2.2.M to the largest base shear value determined in the SC-II analysis
4. Pressure Gradients: The gas barrier walls shall be evaluated to withstand the operating pressure range of the offgas lines identified in Appendix A.
5. Other Loads:
   a. Thermal induced loads to be experienced during startup, normal operations, and idling.
   b. Piping reaction loads during normal operation.
   c. Impact wrench load. Maximum design load is 450 ft-lbs.
6. See Appendix B for melter static and live load detail requirements.
7. Load Combinations: .
   a. The melter is to be analyzed for the loads and combined loads appropriate to the seismic category (SC) of the component being considered as listed below.

i. SC-II elements: load combinations are based on the Structural Analysis and Design Criteria (Ref. 2.2.J) and ANSI/AISC N690 (Ref. 2.1.J.1)
ii. SC-III elements: load combinations are based on the Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks (Ref. 2.2.M)

b. Notations
   i. D = Dead Load
   ii. L = Live Load
   iii. E = Earthquake
   iv. Fμ = Inelastic Energy Absorption Factor
   v. To = Thermal Loads during Operating Conditions
   vi. Ro = Operating Pipe Reaction Load
   vii. S = Allowable Stress per Allowable Stress Design Method
c. SC-II load combinations
   i. Non-earthquake load combinations, all elements
      (a) S = D + L
      (b) S = D + L+ Ro + To
      (c) For primary plus secondary stresses, the allowable limits above are increased by a factor of 1.5
   ii. All elements except those in compression and shear, or for bolted connections
      (a) 1.6S = D + L +Ro + To + E / Fμ
   iii. For elements in compression and shear, and for bolted connections
      (b) 1.4S = D + L +Ro + To + E / Fμ
d. SC-III load combinations
   i. S = D + L
   ii. S = D + L+ Ro + To
   iii. For primary plus secondary stresses, the allowable limits above are increased by a factor of 1.5
   iv. S = 0.75 (D + L + Ro + To + E / 1.4)

8. Allowable Stresses
   a. Allowable stresses for plate and prismatic elements shall be determined using methods consistent with good structural engineering practice and the applicable Code, regardless of the method of analysis.
      i. SC-II allowable stresses are per Ref. 2.1.J.1
      ii. SC-III allowable stresses are per Ref. 2.1.K
9. Analysis: For 3D finite element analyses (FEA), in absence of code language governing allowable stresses, the following analysis approach shall be utilized:
   a. Criteria for stresses in SC-II elements
      i. Stress in elements loaded in tension, compression or bending shall be maximum principal stress criteria
      ii. Stress in elements loaded in shear shall be Tresca stress (maximum shear stress)
   b. Criteria for stresses in SC-III elements
      i. Stress in all elements, regardless of loading, may be Von Mises (maximum distortion energy) criteria
   c. Combined responses may be determined by superposition of responses from individual finite element models, provided appropriate explanation and justification is given.
10. Support Reactions
   a. Support reactions for all SC-II load cases and combinations shall be submitted in accordance with section 7.2 of reference 2.2 I.

b. SC-II seismic reactions at the interface of the melter base seismic pin and lug shall not exceed the following limits, per Ref. 2.2.L. Loads may act in all directions concurrently.
   i. 250 kip east-west
   ii. 250 kip north-south
   iii. 100 kip vertical

c. SC-II seismic reactions at each "tailhook" bracket shall not exceed 90 kips vertically, per Ref. 2.2.L. No other loads are permitted on the tailhooks.

E. Other
1. Buckling
   a. To ensure that elements in the load path maintain their structural integrity, appropriate methods of analysis shall be employed to analyze elements subject to buckling and other failure modes that are not predictable by FEA
      i. To preclude buckling due to shear loads, plate elements shall be stiffened as required in the Code
      ii. The allowable stress of elements subject to buckling due to compressive loads shall be reduced appropriately as required by the Code.
   b. Highly localized areas of stress determined by FEA to be above the allowable stress, are to be considered according to the Code commentary (Reference 2.1.J.1, section CQ1.5), providing that engineering judgments are documented and justified where used.
2. Structural welding shall be per Refs. 2.1.I.1 and 2.1.I.2
3. Material properties for structural analysis shall be per Ref. 2.1.D.6

3.6 Electrical Requirements

See Appendix A for melter service and connection details and Appendix B for the balance of melter design interface details.

A. General
1. The following code references apply to this section: Refs 2.1C1 through 2.1C5, 2.1E, 2.1F1, 2.1F2, 2.1G1, 2.1G2, and 2.1H.
2. Subcontractor shall specify the following:
   a. Minimum and maximum values of the following electrical parameters associated with the Joule heating process for HLW glass envelopes: AC/DC power, voltage, current, waveform, and frequency.
   b. Melter protective interlocks required on the power source to the melter electrodes.
   c. Electrode firing configuration.
   d. Instrumentation and control requirements for the power source to the electrodes, discharge heaters, and startup heaters.

B. Electrode Power
1. Electrodes and extension buses shall be capable of carrying the current at the voltage required for all modes of melter operation.
2. Minimize connection resistance if the extension bus and electrode are two separate components.
3. Connector for making external connections to the extension buses shall allow for expansion and contraction of the extension bus.
4. Magnetic Coupling: Extension buses shall not cause magnetic coupling with the materials through which they pass.
5. Electromagnetic Interference: To the extent practical, the configuration of the extension buses shall maximize magnetic field cancellation.

C. Discharge Heater Power

1. Discharge heaters shall be matched to the extent practical with respect to resistance, operating current, and voltage.
2. Each discharge heater assembly shall be designed with a plug-type connector integral to the heater assembly.
3. The discharge heaters shall be electrically isolated from each other and from the melter structure.

D. Startup Heater Power
1. Startup heaters shall be matched to the extent practical with respect to resistance, operating current, and voltage.
2. Design power connectors to each heater assembly, with coordination from Contractor.
3. The startup heaters shall be electrically isolated from each other and from the melter structure.

E. Cable
1. Refer to Ref 2.1F1 for general cable design standards.
2. Cables routed within the melter envelope shall be rated for the maximum ambient temperature encountered.
3. Cable insulation and jacket material shall be of the low flammability type, per Ref 2.1C5.
4. Cable insulation and jacket material shall be resistant to heat, moisture, impact, radiation, and ozone as required for the expected operating environment.
5. Cables shall be supported or routed in raceway within the melter structure.
6. Power cables of size # 2/0 and larger will be single conductor or triplexed.
7. Instrument cables shall be single-pair, triad-twisted and shielded, or multi-pair with shielded pair and overall shield and drain wire.
8. Control cables shall be multi-conductor and color coded in accordance with Ref 2.1F1, Standard Method. Coordinate with contractor to determine requirements for spare conductors that shall be included in multi-conductor control and instrumentation cables.
9. Instrument and thermocouple cables will be single pair twisted and shielded, or multi-pair cable with individual pair shielded and overall shield.
10. Minimum Conductor Sizes:
    a. #12 AWG for power circuits.
    b. #14 AWG for control circuits (120 VAC, 125 VDC) and instrument power circuits.
    c. #18 AWG for instrumentation - single pair cable.
    d. #20 AWG for instrumentation - multi pair cable.

    Note: Instrumentation conductors include low-level voltage, current, or digital electrical signal connections to sensing and actuating devices.
11. See Appendix A on conductors for normal and instrument power circuits, control circuits, and instrumentation (both single pair cable and multi pair cable). Instrumentation conductors include low level voltage, current, or digital electrical signal connections to sensing and actuating devices.
12. Cables shall be physically separated in accordance with the function and voltage class as follows:
    a. Low-voltage power AC and DC cables.
    b. High-level signal and control or discrete on/off control cables (120 VAC, 125 VDC).
    c. Controls with critical safety requirements as determined by contractor.
    d. Cables for general instrumentation (i.e., low-level analog and digital signals and data communication).

F. Deleted

G. Grounding
1. Metal sections of melter lid, base, structure, and containment system shall be electrically interconnected.
2. The HLW melters are grounded via contact between the facility rails and the wheels of the melter base.
3. Deleted

4. Deleted.

3.7 Controls and Instrumentation Requirements

A. Controls Requirements: For melter design requirements, related to control logic, sequence of operations, and control software and hardware, see Ref 2.2B. Controls system design is in contractor's scope of work unless stated otherwise in Ref 2.2B.
B. Instrumentation Requirements
   1. For melter design requirements related to instrumentation see Ref 2.2B.
   2. Appendix A contains instrumentation connection interface details related to specific melter SSCs.

3.8 Maintenance Requirements

A. General
   1. Design of all nonstructural SSCs shall be optimized for safe and effective remote maintenance. To the extent practical, the design will:
      a. Minimize downtime, and impacts to overall operation of the facility.
      b. Keep maintenance activities simple and straightforward, suitable for a power manipulator and an overhead maintenance crane.
      c. Minimize requirement for special tools and equipment for maintenance.
      d. Modularize SSCs for remote maintenance, access, and replacement.
      e. Demonstrate best possible access to controls, protective interlocks, and SSCs for maintenance.
      f. Minimize impact on interfacing SSCs while performing maintenance on targeted SSCs.
      g. Allow for the gathering of diagnostic information where possible to determine melter life.
      h. Incorporate features to aid in replacement of SSCs that do not meet the melter design life requirement of five years.
   2. Subcontractor shall perform failure modes and effects analyses on the critical SSCs identified in Ref 2.2D:
      a. Specify what critical SSCs need to be maintained and inspected, specify maintenance and inspection requirements, and provide data on predicted availability.
      b. Identify potential failures for critical SSCs, and recovery sequences.
      c. Identify and implement sufficient redundancy requirements to minimize impact on glass production.
   3. Subcontractor shall interface with contractor to ensure that access around melters is sufficient for inspection of all external melter surfaces, per Appendix B.
   4. Subcontractor shall identify all special tools and equipment for maintenance.
   5. All removable or replaceable components and equipment shall have lifting bails designed to interface with the overhead maintenance crane or power manipulator. See Appendix B for maintenance handling criteria.
   6. Subcontractor shall coordinate with contractor to optimize melter maintenance access, taking into account facility layout and maintenance support equipment and services outside of the subcontractor's scope of work.
B. Baseline Component Design Lives: See Appendix B for melter component design lives. Subcontractor shall advise contractor of changes, including component additions and deletions as well as improvements in baseline lifetimes.

4 Quality Assurance Requirements

4.1 General

A. Subcontractor and sub-tier vendors shall perform all design work in accordance with a contractor-approved quality assurance plan which meets the applicable requirements of Ref 2.1D4, and in accordance with Ref. 2.1D5.
B. Subcontractor shall be responsible for all sub-tier vendor quality assurance requirements during design.
C. See Ref 2.2D for quality assurance requirements pertaining to specific melter SSCs.
D. The contractor reserves the right to review design work in progress to assess the effectiveness of the subcontractor's quality system at any time during the design process. Assessments performed by the contractor shall in no way relieve the subcontractor of any contractual responsibilities.

5 Documentation and Submittals

5.1 General

A. See Ref 2.2D for submittal format, transmission, and review requirements.

5.2 Submittals

A. See Ref 2.2D for specific melter system submittal requirements not specified herein.

Appendix A

Melter Services and Connections Interface Details (4 pages total)

Appendix A - Melter Services and Connections Interface Details

ITEM IDENTIFIER	DESCRIPTION	CONNECTION NUMBER	LINE SIZE, INCH	OPS MODE	SERVICE TYPE	NOMINAL FLOW / AMPS	NOMINAL PRESSURE / VOLTS AT POINT OF USE	NOMINAL TEMPERATURE, F	DESIGN LIMIT FLOW / AMPS (NOTE 59)	DESIGN LIMIT PRESSURE / VOLTS (NOTE 59)	DESIGN LIMIT TEMPERATURE, F	CRITICAL SERVICE	FLUID SERVICE CATEGORY (NOTE 59)	CONNECTION TYPE	NOTES
por18	AIR SUPPLY - AIR LIFT/RISER PURGE GAS (TYPICAL OF 2)	N12, N13	3/8	INTERMITTENT	IA-2	3 SCFM	3 PSIG	113	N/A	<15 PSIG	240	NO	D	STAUBLI	14, 53, 24
agl13	AIR SUPPLY - BUBBLER (TYPICAL OF 5)	N05, 6, 7, 8, 9	1/2	CONTINUOUS	IA-2	3 SCFM	10 PSIG	113	N/A	<15 PSIG	240	YES	D	STAUBLI	14, 15, 24
agl08	AIR SUPPLY - BUBBLER OR STARTUP HEATER, SPARE	N11	1/2	SPARE	IA-2	3 SCFM	10 PSIG	113	N/A	<15 PSIG	240	NO	D	STAUBLI	29
htm18	AIR SUPPLY - ELECTRODE COOLING (TYPICAL OF 2)	N/A	1	CONTINUOUS	IA-2	90 SCFM	N/A	113	N/A	25 PSIG	113	NO	D	STAUBLI	
htm19	AIR SUPPLY - ELECTRODE EXTENSION COOLING (TYPICAL OF 2)	N/A	1	CONTINUOUS	IA-2	10 SCFM	N/A	113	N/A	25 PSIG	113	YES	D	STAUBLI	
ogp12	AIR SUPPLY - FUTURE STANDBY FILM COOLER	N03B	2	SPARE	IA-1	N/A	N/A	113	N/A	<15 PSIG	240	YES	D	SPECIAL	
ogp13	AIR SUPPLY - ITS PLENUM PRESSURE TAP	N10A	1/2	CONTINUOUS	IA-1	0.2 SCFH	5 PSIG	113	N/A	5 PSIG	240	YES	D	STAUBLI	
ogs03	AIR SUPPLY - LINE PURGE, STANDBY OFFGAS	N/A	2	CONTINUOUS	IA-1	30 - 160 SCFM	5 PSIG	113	N/A	<15 PSIG	240	NO	D	SPECIAL	
ogp09	AIR SUPPLY - PLENUM (STAND BY OFF GAS) VACUUM MEASUREMENT	N56	3/8	CONTINUOUS	IA-2	0.2 SCFH	0 PSIG	113	N/A	<15 PSIG	240	NO	D	STAUBLI	34
vew01	AIR SUPPLY - PLENUM CCTV COOLING (IF INSTALLED)	N30	1/2	CONTINUOUS (IF CCTV INSTALLED)	IA-1	15 SCFM	10 PSIG	113	N/A	<15 PSIG	240	YES	D	STAUBLI	28
ogp03	AIR SUPPLY - FILM COOLER	N03A	2	CONTINUOUS	IA-1	300 SCFM	0 PSIG	113	N/A	<15 PSIG	240	NO	D	SPECIAL	36
lkd01	AIR SUPPLY - SHELL LEAK DETECTOR (REDUNDANT PLENUM VACUUM)	N33	3/8	CONTINUOUS	IA-1	0.2 SCFH	1	113	N/A	<15 PSIG	240	NO	D	STAUBLI	
por19	ARGON SUPPLY - AIR LIFT/RISER PURGE GAS (TYPICAL OF 2)	N12, N13	3/8	CONTINUOUS	IA-2	0.2 SCFH	0 PSIG	113	N/A	<15 PSIG	240	YES	D	STAUBLI	14
lvl01	ARGON SUPPLY - LEVEL DETECTOR, DENSITY LEG	N34B	3/8	CONTINUOUS	Ar	1 SCFH	2 PSIG	113	N/A	<15 PSIG	240	YES	D	STAUBLI	
lvl02	ARGON SUPPLY - LEVEL DETECTOR, LEVEL LEG	N34A	3/8	CONTINUOUS	Ar	1 SCFH	3 PSIG	113	N/A	<15 PSIG	240	YES	D	STAUBLI	
drn01	DRAIN - MELTER SHELL	N32	1	RARE (ONLY IF LEAK OCCURS)	N/A	N/A	0 PSIG	113	N/A	N/A	113	NO	N/A	N/A	40
fed16	FEED SUPPLY - FEED NOZZLE (TYPICAL OF 2)	P01, P02	3/4	CONTINUOUS	N/A	1 GPM	35 PSIG	113	N/A	166 PSIG	360	NO	D	STAUBLI	64
fed07	FRIT ADDITION FUNNEL	P02	3	STARTUP ONLY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	3-BOLT FLANGE	8, 30
htd21	POWER - DISCHARGE CHAMBER HEATER (TYPICAL OF 8 FOR EAST & WEST, PAIRED CONNECTIONS)		N/A	CONTINUOUS	ELECTRICAL	30-50 A	0 - 202 V	N/A	50 A	600 V	600	NO	N/A	MULTI-CONTACT	

ITEM IDENTIFIER	DESCRIPTION	CONNECTION NUMBER	LINE SIZE, INCH	OPS MODE	SERVICE TYPE	NOMINAL FLOW / AMPS	NOMINAL PRESSURE / VOLTS AT POINT OF USE	NOMINAL TEMPERATURE, F	DESIGN LIMIT FLOW / AMPS (NOTE 59)	DESIGN LIMIT PRESSURE / VOLTS (NOTE 59)	DESIGN LIMIT TEMPERATURE, F	CRITICAL SERVICE	FLUID SERVICE CATEGORY (NOTE 59)	CONNECTION TYPE	NOTES
htd22	POWER - DISCHARGE CHAMBER HEATER, AUXILIARY, TYPICAL OF 2		N/A	RARE	ELECTRICAL	20 A	208 V	N/A	35 A	600 V	500	NO	N/A	MULTI-CONTACT	11
hts06	POWER - STARTUP HEATER (TYPICAL OF 5)	P05, 6, 7, 8, 9	N/A	STARTUP ONLY	ELECTRICAL	115 A	320 V	N/A	150 A	600 V	113	NO	N/A	NONE	6, 29
ogp11	OFFGAS - MAIN PORT	P03	8	CONTINUOUS	N/A	N/A	-5 IN W G.	400 - 1000	N/A	-100 IN. W G	1000	NO	M	3-BOLT FLANGE	37
ogs02	OFFGAS - STANDBY PORT	P04	8	RARE	N/A	N/A	-5 IN W G.	400 -1000	N/A	-100 IN. W G	1000	NO	M	3-BOLT FLANGE	37
ogp10	POWER - FILM COOLER CLEANER	N58	N/A	RARE	ELECTRICAL	5 A	480 VAC	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
vew02	POWER - CCTV, PLENUM	N59	N/A	CONTINUOUS (IF CCTV INSTALLED)	ELECTRICAL	3 A	120 VAC	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
htm20	POWER - ELECTRODE (TYPICAL OF 2)	N/A	N/A	CONTINUOUS	ELECTRICAL	1500 - 8000 A	75 - 320 VAC	N/A	8300	350 VAC	N/A	YES	N/A	SPECIAL	
vew05	SIGNAL - CCTV, PLENUM	N60	N/A	CONTINUOUS (IF CCTV INSTALLED)	ELECTRICAL	N/A	1 V	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
ogr01	SIGNAL - FILM COOLER CLEANER LIMIT SWITCH, DOWN	N59	N/A	RARE	SIGNAL	2 A	120 VAC	N/A	N/A	10 PSIG	N/A	NO	N/A	LEMO	
ogr02	SIGNAL - FILM COOLER CLEANER LIMIT SWITCH, UP	N58	N/A	RARE	SIGNAL	2 A	120 VAC	N/A	N/A	25 PSIG	N/A	NO	N/A	LEMO	
ogs07	SPARE SERVICE - CONNECTION TO STANDBY OFFGAS	N57	3/8	RARE	IA-2	N/A	-5 IN W G.	113	N/A	N/A	150	NO	D	STAUBLI	
agi14	SPARE SERVICE - PORT (TYPICAL OF 4)	N/A	1/2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	150	NO	N/A	STAUBLI	
tmp49	TC - EAST DISCHARGE CHAMBER, THERMOWELL #1 (TYPICAL OF 2 VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMOCOUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
tmp50	TC - EAST DISCHARGE CHAMBER, THERMOWELL #2 (TYPICAL OF 2 VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMOCOUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
tmp45	TC - EAST ELECTRODE, (3 FOR ELECTRODE, 2 FOR COOLING AIR EXHAUST ALL VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMOCOUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
tmp53	TC - EAST REFRACTORY THERMOWELL (TYPICAL OF 5 VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMOCOUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
tmp47	TC - GLASS POOL & PLENUM, EAST THERMOWELL (TYPICAL OF 5 VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMOCOUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
tmp48	TC - GLASS POOL & PLENUM, WEST THERMOWELL (TYPICAL OF 5 VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMOCOUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	

ITEM IDENTIFIER	DESCRIPTION	CONNEC-TION NUMBER	LINE SIZE, INCH	OPS MODE	SERVICE TYPE	NOMINAL FLOW / AMPS	NOMINAL PRESSURE / VOLTS AT POINT OF USE	NOMINAL TEMPER-ATURE, F	DESIGN LIMIT FLOW / AMPS (NOTE 59)	DESIGN LIMIT PRESSURE / VOLTS (NOTE 59)	DESIGN LIMIT TEMPER-ATURE, F	CRITICAL SERVICE	FLUID SERVICE CATEGORY (NOTE 59)	CONNEC-TION TYPE	NOTES
tmp51	TC - WEST DISCHARGE CHAMBER, THERMOWELL #1 (TYPICAL OF 2 VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMO-COUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
tmp52	TC - WEST DISCHARGE CHAMBER, THERMOWELL #2 (TYPICAL OF 2 VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMO-COUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
tmp46	TC - WEST ELECTRODE (3 FOR ELECTRODE, 2 FOR COOLING AIR EXHAUST, ALL VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMO-COUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
tmp54	TC - WEST REFRACTORY THERMOWELL (TYPICAL OF 5 VIA COMMON CONNECTION)	N/A	N/A	CONTINUOUS	THERMO-COUPLE SIGNAL	N/A	N/A	N/A	N/A	N/A	N/A	NO	N/A	LEMO	
por06	VENT - EAST DISCHARGE CHAMBER	N47A	2	CONTINUOUS	N/A	17 SCFM	N/A	907	17 SCFM	-5 PSIG	1000	NO	N/A	3 BOLT FLANGE	33
por14	VENT - WEST DISCHARGE CHAMBER	N46A	2	CONTINUOUS	N/A	17 SCFM	N/A	907	17 SCFM	-5 PSIG	1000	NO	N/A	3 BOLT FLANGE	33
clg32	WATER RETURN - COOLING PANEL TOTAL BASED ON 95 F SUPPLY	N/A	N/A	N/A	CW	45 GPM	N/A	120	45 GPM	150 PSIG	366	YES	NS		
clg01	WATER RETURN - COOLING BASE	N21	1	CONTINUOUS	CW	10 GPM	50 PSIG	120	10 GPM	150 PSIG	366	YES	NS		
clg24	WATER RETURN - COOLING, EAST WALL	N25	1	CONTINUOUS	CW	10 GPM	50 PSIG	120	10 GPM	150 PSIG	366	YES	NS		
clg26	WATER RETURN - COOLING, NORTH WALL	N24	1	CONTINUOUS	CW	10 GPM	50 PSIG	120	10 GPM	150 PSIG	366	YES	NS		
clg28	WATER RETURN - COOLING, SOUTH WALL	N23	1	CONTINUOUS	CW	5 GPM	50 PSIG	120	5 GPM	150 PSIG	366	YES	NS		
clg30	WATER RETURN - COOLING, WEST WALL	N22	1	CONTINUOUS	CW	10 GPM	50 PSIG	120	10 GPM	150 PSIG	366	YES	NS		
clg02	WATER SUPPLY - COOLING, BASE	N16	1	CONTINUOUS	CW	10 GPM	50 PSIG	95	10 GPM	150 PSIG	366	YES	NS	STAUBLI	
clg25	WATER SUPPLY - COOLING, EAST WALL	N20	1	CONTINUOUS	CW	10 GPM	50 PSIG	95	10 GPM	150 PSIG	366	YES	NS	STAUBLI	
clg27	WATER SUPPLY - COOLING, NORTH WALL	N19	1	CONTINUOUS	CW	10 GPM	50 PSIG	95	10 GPM	150 PSIG	366	YES	NS	STAUBLI	
clg29	WATER SUPPLY - COOLING, SOUTH WALL	N18	1	CONTINUOUS	CW	5 GPM	50 PSIG	95	5 GPM	150 PSIG	366	YES	NS	STAUBLI	
clg31	WATER SUPPLY - COOLING, WEST WALL	N17	1	CONTINUOUS	CW	10 GPM	50 PSIG	95	10 GPM	150 PSIG	366	YES	NS	STAUBLI	
fed14	WATER SUPPLY - FEED NOZZLE FLUSH TYPICAL OF 2	N/A	N/A	INTERMITTENT	DW	2 GPM	35 PSIG	95	2 GPM	150 PSIG	366	NO	N/A	N/A	

ITEM IDENTIFIER	DESCRIPTION	CONNECTION NUMBER	LINE SIZE, INCH	OPS MODE	SERVICE TYPE	NOMINAL FLOW / AMPS	NOMINAL PRESSURE / VOLTS AT POINT OF USE	NOMINAL TEMPERATURE, F	DESIGN LIMIT FLOW / AMPS (NOTE 59)	DESIGN LIMIT PRESSURE / VOLTS (NOTE 59)	DESIGN LIMIT TEMPERATURE, F	CRITICAL SERVICE	FLUID SERVICE CATEGORY (NOTE 59)	CONNECTION TYPE	NOTES
ogp04	WATER SUPPLY - FILM COOLER WASH (INJECTED VIA FILM COOLER AIR LINE)	N/A	N/A	INTERMITTENT	DIW	1 GPM	25 PSIG	95	1 GPM	135 PSIG	366	NO	N/A	N/A	
fed06	WATER SUPPLY -PREFEED PLENUM COOLING WATER, EAST FEED	N01B	3/4	INTERMITTENT	DIW	1 GPM	25 PSIG	95	1 GPM	135 PSIG	366	NO	N/A	STAUBLI	
fed09	WATER SUPPLY -PREFEED PLENUM COOLING WATER, WEST FEED	N02B	3/5	INTERMITTENT	DIW	1 GPM	25 PSIG	95	1 GPM	135 PSIG	366	NO	N/A	STAUBLI	
ogs01	WATER SUPPLY - STANDBY OFFGAS PIPE SPRAY, SAME CONNECTION AS ogs03	N/A	N/A	INTERMITTENT	DIW	1 GPM	25 PSIG	95	1 GPM	135 PSIG	366	NO	NS	STAUBLI	

SERVICE TYPE

- Ar — WELDING GRADE ARGON
- CW — COOLING WATER, DEMINERALIZED, FILTERED TO <2 MICRON, NO CORROSION INHIBITORS, CL < 40 PPM, SULFATE <100 PPM, TDS <340 PPM, TOTAL SUSPENDED SOLIDS, <300 PPM, TOTAL HARDNESS < 170 PPM
- IA-1 — INSTRUMENT AIR PER ANSI/ISA-S7.0 01-1996
- IA-2 — INSTRUMENT AIR WITH EXTRA FILTRATION FOR PARTICULATE, WATER, AND HYDROCARBONS
- DIW — DEMINERALIZED WATER

1 COOLING WATER SUPPLY TEMPERATURE IS TO BE GREATER THAN MELTER GALLERY AIR TEMP TO PREVENT CONDENSATION

6 INSTALLED DURING MELTER STARTUP

11 DISCHARGE CHAMBER AUX HEATERS NOT NORMALLY CONNECTED. HEATER TO BE USED FOR POUR FLANGE GLASS BLOCKAGE RECOVERY

14 AIR LIFT DISCHARGES ARE OPERATED INTERMITTENTLY ONE AT A TIME. ARGON IS PURGED THROUGH THE AIR LIFT AT 0.2 SCFH WHEN GLASS IS NOT BEING DISCHARGED

24 N/A = NOT APPLICABLE

28 COOLING AIR WILL BE EXHAUSTED INTO MELTER CAVE

29 BUBBLER AND STARTUP HEATERS FIT THE SAME LID NOZZLES

30 FRIT ADDITION AND FEED NOZZLES FIT SAME LID NOZZLES

34 LEVEL DETECTOR REFERENCE LEG AND MELTER PLENUM PRESSURE COMBINED MEASUREMENT FROM STANDBY OFGFGAS PORT

35 MAY INCLUDE WATER FLUSH FOR FILM COOLER

37 TEMP MAY BE HIGHER IF FILM COOLER AND AIR INJECTION STOPS DURING PRESSURE TRIP

40 SEAL POT OR TRAP REQUIRED

50 ONCE PER 4 HOURS THE FEED LINES ARE FLUSHED. THIS OCCURS FOR EACH OF THE 6 ADS PUMPS/FEEDLINES, OR 1.5 GPH PER MELTER. APPROX ONCE PER MONTH, FLUSH EACH FEED NOZZLE FOR APPROX 30 MIN.

53 AIR FLOWS DURING POURS ONLY, APPROX. 30 MIN EVERY 3 HR. ARGON USED AS A CONTINUOUS PURGE, EVEN DURING POURS (ABOUT 1 SCFH)

54 WATER USED TO COOL PLENUM AFTER IDLE FLOW FROM ONLY 1 NOZZLE IS SUFFICIENT, DURATION APPROX 30 MIN.

59 UNLESS OTHERWISE NOTED, THE OPERATING DESIGN LIMITS MUST BE BASED ON PROCESS VALUES DEFINED BY RPP-WTP ENGINEERING. WHERE PROCESS VALUES DIFFER FROM THE B31.1 PIPING/TUBING SERVICE CLASS, THE SERVICE CLASS IS GOVERNING.

64 PROCESS VALUES ARE BASED ON PILOT MELTER DATA AND DESIGN DEVELOPMENT. ACTUAL MELTER OPERATING/DESIGN CRITERIA MAY VARY DEPENDING ON FINAL SYSTEM DESIGN BY RPP-WTP

Appendix B

Melter Design Interface Details (10 pages total)

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
agi07	bubbler	component weight	290.31 lb.	HSH	
agi08	bubbler	intermediate in-facility storage criteria	consumable template has storage positions for 8 consumables with 11 in dia. bases	HSH	note 5
agi02	bubbler	operating life	MTTF - 2 mos	HSH	
agi03	bubbler	remote handling requirements	3 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting ball for 5 ton and 17 ton crane hook	HSH	
vew09	cctv - for melter plenum	component weight	250 lb. max	HSH	
vew07	cctv - for melter plenum	dimensions - envelope	16.75" dia. X 34.31" tall	HSH	
vew14	cctv - for melter plenum	intermediate in-facility storage criteria	consumable template has storage positions for 8 consumables with 11 in dia. bases	HSH	note 5
vew02	cctv - for melter plenum	operating life	MTTF - 12 mos	HSH	
vew05	cctv - for melter plenum	remote handling requirements	2 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting ball for 5 ton and 17 ton crane hook	HSH	
enc49	cooling panel expansion indicators	adjustment interface/connection	adjustments to indicators not necessary	HSH	
enc46	cooling panel expansion indicators	quantity	21 total - 6 on east wall, 9 on north wall, 6 on west wall	HSH	
enc48	cooling panel expansion indicators	viewing criteria	need to view a 4" diameter wheel at a steep viewing angle. Approximately 60-90 degrees	HSH	jumper placement by project may affect view
enc17	datum point - facility reference	coordinates of melter datum in plant coordinate system	melter 1: N. 3806' - 7 1/4" E. 10149' - 1" Elev. 2' - 11" melter 2: N. 3806' - 7 1/4" E. 10042' - 1" Elev. 2' - 11"	30	note 5.
enc18	datum point - facility reference	description of physical location	located 7.75 inches to south of pour spouts center line on west rail center line at elev. 2'-11"	30	
enc38	datum point - facility reference	dimensional tolerance for locating datum point in melter cave	to be determined by project after completion of melter design	HSH	note 5
enc21	datum point - melter reference	description of physical location (x,y,z location from which all melter dimensions originate from)	point on top center of west rail, on centerline of seismic restraint pin. See enc18 and res04	30	
enc41	datum point - melter reference	fabrication/ assembly dimensional tolerances	+/- 0.031" (0.0156" for the hole on the end truck and 0.0156" for the holes(s) in the restraint	30	
por24	discharge chamber lid	component weight	1642 lb.	HSH	
por23	discharge chamber lid	dimensions - envelope	33.125" x 40.0" plan, 19.125" high from bottom of refractory to top of cover, 34.25" high from bottom of refractory to top of lifting lugs	HSH	
por06	discharge chamber lid	operating life	MTTF - 30 mos	HSH	
por05	discharge chamber lid	remote handling requirements	5 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting ball for 5 ton and 17 ton crane hook; alignment device will protect heater elements from damage during installation (see maintenance tools)	HSH	

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
enc26	drain - for annulus spaces	drain configuration	elbow directed downward with "flapper valve" on end, drains onto pour cave cover	HMP	
enc36	drain - for annulus spaces	leak detection configuration for drain	shell leak detector level probe will be located with its tip roughly in elbow of drain. If leak develops, water will build up to about 5" wc, then any additional water will drip out of flapper valve.	HMP	
enc51	drain - for annulus spaces	physical location	lower northwest corner of melter	HMP	
enc52	drain - for annulus spaces - leak detection equipment	operating life	MTTF - life of melter	HSH	
env32	facility rails	configuration	rectangular, 2.5" wide, flat, top of rail elevation 2'-11", east/west rail stops 11-3/4"/11-3/4" north of building grid K	HMH	
env33	facility rails	load limits - horizontal	Design anchorage of rail for 10% of vertical load on wheel	HMH	conforms to wheel vendor design recommendations and Crane Manufacturers Association of America (CMAA)
env67	facility rails	load limits - vertical	Assume 2 times wheel rating in env52 for occasional overload	HMH	
env38	facility rails	material/finish/coating/heat treating	17-4PH stainless, condition H900, yield stress = 183ksi, RMS 63 to 125, no coating.	HMH	
env39	facility rails	maximum rail gap	8 inches	HMH	Subcontractor comfortable crossing any rail gap smaller than 20.5 inches (wheel spacing), less 2 inches (load distribution per CMAA 70, 3.3.2.3), less any rail tapers used. A 7.5 inch rail gap between the HLW melter overpack and the HLW vitrification facility rails will be acceptable.
env40	facility rails	size/configuration	2.5" wide, must be flat, no more than a 1/32" chamfer (or radius) on edges, at least 1" tall for rail flange clearance. Top of rail elevation 2'-11", rails stop 11-3/4" north of building grid K.	HMH	
env41	facility rails	tolerances - horizontal lateral /parallel	horizontal lateral deviation +/- 0.04" over a 8 foot rail span, parallelism of rails in horizontal plane +/- 0.04" for each 16 foot span (non-cumulative)	HMH	
env34	facility rails	vertical/levelness tolerance	0.060"	HSH/HMH	Requirement driven by facility rail flatness tolerance
fed14	feed nozzle	component weight	108 lb.	HSH	
fed11	feed nozzle	dimensions - envelope	13" dia. flange X 23.88" long	HSH	
fed21	feed nozzle	intermediate in-facility storage criteria	consumable template has storage positions for 8 consumables with 11 in dia. bases	HSH	note 5. Feed nozzle to be stored in Consumable Template
fed03	feed nozzle	operating life	MTTF - life of melter	HSH	

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
fed07	feed nozzle	remote handling requirements	5 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting bail for 5 ton and 17 ton crane hook	HSH	
fed19	feed nozzle - glass frit addition	component weight	132 lb.	HSH	
fed16	feed nozzle - glass frit addition	configuration	project design requirement. Will be configured to interface with subcontractor port design.	HSH	shall interface with consumable bucket with gate valve on bottom to accept bulk charge of frit w/o metering
fed20	feed nozzle - glass frit addition	intermediate in-facility storage criteria	consumable template has storage positions for 8 consumables with 11 in dia. bases	HSH	note 5. Storage location will be determined by project operations
fed05	feed nozzle - glass frit addition	remote handling requirements	4 inch across flats for captive fasteners, 1 1/4 inch ACME thread, nut retainer, standard lifting bail for 5 ton and 17 ton crane hook	HSH	
ogs13	film cooler	component weight	251 lb.	HSH	
ogs11	film cooler	dimensions - envelope	22" dia. flange x 23.5" long, from bottom to top of flange	HSH	
ogs36	film cooler	intermediate in-facility storage criteria	consumable template has storage positions for 8 consumables with 11 in dia. bases	HSH	note 5
ogs03	film cooler	operating life	MTTF - 36 mos	HSH	
ogs05	film cooler	remote handling requirements	2 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting bail for 5 ton and 17 ton crane hook	HSH	
ogs17	film cooler cleaner	component weight	1000 lb. max	HSH	
ogs16	film cooler cleaner	dimensions - envelope	to be verified after melter design is complete	HSH	
ogs37	film cooler cleaner	intermediate in-facility storage criteria	consumable template has storage positions for 8 consumables with 11 in dia. bases	HSH	note 5. On hold
ogs06	film cooler cleaner	operating life	MTTF - 12 mos	HSH	
ogs08	film cooler cleaner	remote handling requirements	3 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting bail for 5 ton and 17 ton crane hook	HSH	
plv05	glass pool level detector	component weight	102 lb.	HSH	
plv07	glass pool level detector	dimensions - envelope	76.2" long to bottom of flange, 87.22" long to top of fixed lifting bail, 13" dia flange, total width is 13.94"	HSH	
plv09	glass pool level detector	intermediate in-facility storage criteria	consumable template has storage positions for 8 consumables with 11 in dia. bases	HSH	note 5
plv02	glass pool level detector	operating life	MTTF - 9 mos	HSH	
plv04	glass pool level detector	remote handling requirements	4 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting bail for 5 ton and 17 ton crane hook	HSH	
por28	glass riser airlift lance	component weight	81 lb.	HSH	
por27	glass riser airlift lance	dimensions - envelope	87.75" long to top of plug, 95.71" long to top of fixed lifting bail, 13" dia flange	HSH	

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
por31	glass riser airlift lance	intermediate in-facility storage criteria	consumable template has storage positions for 8 consumables with 11 in dia. bases	HSH	note 5
por10	glass riser airlift lance	operating life	MTTF - life of melter	HSH	
por12	glass riser airlift lance	remote handling requirements	6 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting bail for 5 ton and 17 ton crane hook	HSH	
enc45	jackbolt	adjustment interface/connection	PaR 3000 with parallel grip hand interfaces directly with adjuster. Max torque 185 in-lb.	HSH	
enc27	jackbolt	monitoring plan during startup and for general maintenance	final plan to be determined. May only need periodic (monthly basis) monitoring using in-cave cctv's	HSH	
enc44	jackbolt	quantity	21 total - 6 on east wall, 9 on north wall, 6 on west wall	HSH	
enc28	jackbolt	viewing criteria	direct visual with in-cave camera	HSH	Direct visibility or visibility with melter cave CCTV
enc03	melter - castable refractory	allowable sit times before bakeout	12 months+	BOF	Subcontractor design objective
enc54	melter - general	bolt torque limit for use of remote impact wrench	450 ft-lb. max	HSH	
env08	melter - general	clearance criteria for maintenance and equipment access	limited or no access at sides or under jumpers to east. Items on east side requiring visual monitoring to be angled to north or south.	HSH	Cable attachment points front and rear. Accessible with 300-750 ft-lb. variable torque impact wrench at jackbolt sites and jumper sites
env61	melter - general	clearance criteria for services under melter	no services or obstructions to exist between top of rails up to bottom of melter base (cross beams), except for tailhooks.	HSH	
env55	melter - general	component/consumable lifting design criteria	lifting bales/devices designed to 3 times yield	HSH	
enc10	melter - general	design for remote breakdown of melter in event of catastrophic failure	lid designed to be removed for decontamination and for access to pool for glass removal using remote operated in-cave equipment. Actual process for lid removal to be defined by project after melter design is complete.	HSH	Open issue for alternate molten glass removal; drawings cited do not include cradle concept
enc31	melter - general	dimensions - envelope	172" N-S x 164" E-W x 146" high (installed component height from top of rail). 157" high to top of extended lifting bails, 134" high to top of melter shell.	HMH	
env13	melter - general	electrical grounding connections - location and connection details	use off-gas jumper, standby off-gas jumper, and two feed jumpers, requires that the submerged bed scrubber and feed tank be grounded.	GRE	
env14	melter - general	guard rails and safety barriers - configuration and loads for startup	guard rails and safety barriers are not a project requirement	HSH	note 5
enc16	melter - general	lifting bail design for consumables/ replaceable equipment	listed separately for each component - see remote handling criteria	HSH	
env05	melter - general	maintenance tool needs	discharge heater assembly handling stands, spreader bar and installation alignment/ guide tool; cover plates; melter wheel power package; electrode thermocouple installation and guide tool; commissioning glass pool sampler	HSH	

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
env68	melter - general	Radiation dose rate - external	sides: 39.6 rem/hr, front/back: 65.3 rem/hr, bottom: 12.5 rem/hr, top (no decon): 84.0 rem/hr, top (w/ decon) 4.50 rem/hr	HSH	Combined dose for 0" shielding. For other cases, see reference p. 33 of 36.
enc39	melter - general	thermal movement (maximum) of any nozzle, from centroid of melter	0.156"	HSH	
enc42	melter - general	tolerances - fabrication/assembly dimensional tolerances for flexible connections from melter datum point	+/- 0.078" (includes melter datum point location tolerance, +/- 0.032" for positioning lid wrt melter datum, 0.015" for position tolerance for each hole from machining)	HMH/HMP	specific tolerances defined on Subcontractor melter assembly drawings
enc43	melter - general	tolerances - fabrication/assembly dimensional tolerances for hard connections from melter datum point	+/- 0.078" (includes melter datum point location tolerance, +/- 0.032" for positioning lid wrt melter datum, 0.015" for position tolerance for each hole from machining)	HMH/HMP	specific tolerances defined on Subcontractor melter assembly drawings
enc15	melter - general	use of common ports between operating modes	bubblers and startup heaters are the only consumables that utilize a common port	HMP	
enc01	melter - general	weight - empty and operating	176,695 lb. without glass, 199,029 lb. with glass	HMH	tolerances not included
env58	melter - lid	handling cradle configuration	handling cradle will be attached to melter lid for flipping and shipping. Lifting/ transportation devices to bolt to cradle.	BOF	
env62	melter - lid	handling cradle requirements for assembly/transport	accommodates flipping of melter lid 180 degrees; does not interfere with castable refractory installation; protects lid studs, lid and refractory during bake-out and transportation; supports discharge chamber top surface to prevent buckling of lid side walls	BOF	
env63	melter - lid	handling cradle requirements for decommissioning	imported into cave via overpack; interfaces with in-cave embeds; is handled in cave with 12' lifting beam and remote tooling (impact wrench, etc.); able to be decontaminated; designed for high-cycle vibration from jackhammer during refractory breakout	HSH	
env57	melter - lid	handling criteria	melter lid must be safely flipped during assembly, transportation, and decommissioning (see env62 and env63 for specific requirements)	BOF	
env59	melter - lid	lifting/flipping loads	total lifted weight not to exceed 17 tons (capacity of in-cave crane)	HSH	
ogs18	melter - operation	annular space in-leakage air quality	unfiltered cave air	HOP	
gls01	melter - operation	glass composition - forming chemicals by waste envelope	reference composition for envelope D tank AZ101 is glass 98-31	HMP	
gls07	melter - operation	glass electrical conductivity	0.1 – 0.7 S/cm @ 1100 – 1200°C	HMP	
gls13	melter - operation	glass frit composition	Al_2O_3 - 13.57%, CaO - 0.40%, K_2O - 2.01%, MgO - 2.11%, P_2O_5 - 3.42%, ZnO - 3.12%, B_2O_3 - 17.29%, Fe_2O_3 - 0.70%, Li_2O - 2.51%, Na_2O - 15.88%, SiO_2 - 38.99%; Viscosity ~ 50 poise @ 1125°C, Conductivity ~0.35 S/cm @ 1125C, Liquidus < 900°C	HMP	<u>Composition subject to change based on long term idling requirements during commissioning.</u>
por26	melter - operation	glass pool level range during operation	43" - 43.8"	HMP	
gls09	melter - operation	glass pool liquidus temperature, range	<950°C	HMP	
htg13	melter - operation	glass pool temperature range	1100 - 1200° C w/ setpoint at 1150° C	HMP	

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
gls11	melter - operation	glass viscosity @ operating temp, range	10 to 150 Poise at 1100°C	HMP	
vnt04	melter - operation	heat loss through melter shell to cave, feed mode	78 kW	C5V	
vnt05	melter - operation	heat loss through melter shell to cave, idle mode	85kW	C5V	
env60	melter - operation	maximum/minimum ambient temperatures in melter cave	113F / 59F	C5V	
ogs24	melter - operation	offgas temperature downstream of film cooler - during feed - normal and design ranges	207 - 249 C	HOP	
ogs25	melter - operation	offgas temperature downstream of film cooler - during idle - normal and design ranges	313 C	HOP	
ogs20	melter - operation	offgas temperature in plenum - during feed - normal and design ranges	400 - 550 C	HOP	
ogs21	melter - operation	offgas temperature in plenum - during idle normal and design ranges	1000 C	HOP	
wst06	melter - operation	waste feed characteristics - normal waste	per simulated waste used in pilot melter tests. will depend on actual composition of tank waste delivered to project. Tank AZ101 with 98-31 glass adequately defines waste composition for melter design purposes	HMP	
wst07	melter - operation	waste feed characteristics - range of feed variation	will depend on actual composition of tank waste delivered to project. Tank AZ101 with 98-31 glass adequately defines waste composition for melter design purposes	HMP	
fed12	melter - operation	waste feed distribution through feed nozzles with respect to operating modes	two nozzles are required for proper plenum pool cold cap distribution, regardless of operating mode	HMP	
env54	melter - seismic	in-structure seismic response spectra	Ref. 2.2.H, Plots 106, 107, 108 @ 0' elevation, Joint J-12-1, Node 5423	30	"Seismic Qualification of Seismic Category I/II Equipment and Tanks"
env66	melter - seismic	remote handling requirements for seismic restraints	hex head bolt, 2" across flats for engaging seismic pin with remote impact wrench.	HSH	pins are provided with each melter
res03	melter - seismic	restraint loads	west pin 180,317 lb. east/west, 109,012 lb. north/south, 210,708 lb. resultant. East pin 0 lb. east/west, 109,012 lb. north/south, 109,012 lb. resultant applied at 1'-5 1/2" above top of embedded plate (elev. 4'-2"). Vertical load at each tailhook restraint: 58,870 lb. upward	HSH	
res04	melter - seismic	restraint location	pins: 7.75" South of Col. Line K, on centerlines of rails; Tailhooks: pin centerlines 8.25" inboard of rail centerlines at elev. 2'-11.395" (0.395" above rail), south face mounts at 136.23" north of melter datum. North face of facility pin receiver plate to be 135.5" north of melter datum.	HSH	
res05	melter - seismic	restraint quantity	four restraints, including two "tailhooks" for overturning	HSH	

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
env56	melter - seismic	seismic restraint bracket envelope	pins: east embed horiz mounting surface - 1'-8" x 4'-6" at elev. 2'-8 1/2"; West horiz - 1'-8" x 4'-6" at elev. 2'-8 1/2", vertical surface 1'-6" high x 4'-6" at 7'-2" from melter centerline.North edge of east/west embed at 10 3/4" / 4 1/4" south of building grid K. Tailhook: 6" wide bracket with pin hangs below melter 2.605" below top of rail just inside of wheels. Tailhook receiver dimension: 7.5" wide bracket w/ 3"dia. hole and 3.75" edge distance (including at clipped corners). Mat'l: 1.5" thk. 304L SS.	HSH	
env69	melter - seismic	seismic restraint embedment tolerances for manufacture	East embed: top of plate at flat to within 0.015"; West embed: top of plate east of vertical plate flat to within 0.015"; perpendicularity and flatness of east face if vertical plate: +/- 1/16" of 90 degree plane. Excluded from above areas of horizontal and vertical surfaces: A 45 degree dianonal 3/8" fillet plane at the intersection corner of the two plates. Fillet weld build-up shall not penetrate this plane. Plate length dimensions not listed above +/- 1/8".	CS&A	tolerances are needed to ensure that no additional modification of seismic lug assemblies is required in field.
env 70	melter - seismic	seismic restraint embedment tolerances for placement in field	East embed: location of north and west edges of plate +/- 1/8". Top of plate elevation +0", -1/8" and level within 1/16"; West embed: location of north and east edges of plate +/- 1/8". Top of plate at lug base area (east of vertical plate): elevation +0", -1/8" and level within 1/16", location of east foace of vertical plate +1/8", -0" of indicated distance from melter centerline and parallel to melter centerline within 1/16"	CS&A	
res06	melter - seismic	seismic restraint installation requirements	Restraint lug base north edge to be installed 5.5" south of melter datum; center of tongue to align with rail centerline. Hole in lug is marked with melter moved into position, then removed from base for machining hole. Lug base is welded in place and lug is realigned horizontally using shims on sides; belleville spring washers are used to lock in final vertical position. Lug base welds are bevel welds along pour cave walls and at top edge of west base, fillets elsewhere.	HSH	one-time set up required for first melter in cave will not apply to subsequent melters
res02	melter - seismic	seismic restraint interface configuration	Subcontractor designed pin attachment (WTP-M-21730) welds to embed in melter cave. Tailhook for uplift on north end: 2.5" dia. 3" long pins facing south and fitting into 3" dia. receiving holes. See env56	HSH	
env51	melter - transport	guidance system - criteria for locating and setting melter in facility	guidance and location tolerances of flanged wheels on west rail and seismic pins	HMH	
env28	melter - transport	loads and moments transferred to melter	Towing lug on north side of melter designed for 0.23 times melter weight	HMH	load is to drag full melter with some, but not all wheels seized up.

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
env65	melter - transport	loads and moments transferred to melter	Towing lug on south side of melter designed for 0.5 times melter weight	HSH	load is to drag full melter from overpack with all of the wheels seized. Must overcome static friction of wheels on overpack rails. Lubrication will be applied to overpack rails prior to insertion of spent melter.
env19	melter - transport	max acceleration/deceleration x/y/z during transport (new melter only)	0.1 g	HMH	
env27	melter - transport	remote handling requirements for cave import	use PaR installed "shepherds hook" with capacity to drag melter from overpack.	HSH	
env31	melter - transport	stop/deceleration mechanism for melter import (into cave)	proximity switch/stop switch mounted on in-cave wall	HSH	
clg02	piping - cooling water	slope of cooling water piping	no slope required for operational purposes	PCW	must have the ability to blow out dry with air
enc40	piping - offgas nozzle	thermal movement	0.076"	HMP	
ogs38	piping - standby offgas	operating life	MTTF - life of melter	HSH	
prm05	plenum pressure sensor	component weight	170 lb., about the same as a blank plug	HSH	
prm07	plenum pressure sensor	dimensions - envelope	26" dia. x 64" tall	HSH	
prm09	plenum pressure sensor	intermediate in-facility storage criteria	consumable template has storage positions for 16 consumables with 7 in dia. bases	HSH	note 5
prm02	plenum pressure sensor	operating life	MTTF - life of melter	HSH	
prm04	plenum pressure sensor	remote handling requirements	7 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting ball for 5 ton and 17 ton crane hook	HSH	
enc53	plugs - lid spares	operating life	MTTF - life of melter	HSH	
htg18	startup heater	component weight	1074 lb. for 5 heaters, 215 lb. each	HSH	
htg14	startup heater	dimensions - envelope	16.75" dia. flange x 64.0" to top of cable enclosure	HSH	
htg19	startup heater	intermediate in-facility storage criteria	consumable bucket and template to be devised by project	HSH	note 5
htg02	startup heater	operating life	MTTF - 3 mos	HSH	operating life is for heater elements. Rest of heater should last life of melter
htg04	startup heater	remote handling requirements	6 inch across flats for captive fasteners, 1-1/4 inch ACME thread, nut retainer, standard lifting ball for 5 ton and 17 ton crane hook	HSH	
htg21	thermocouple - discharge chamber	component weight	16 lb.	HSH	
htg24	thermocouple - discharge chamber	intermediate in-facility storage criteria	consumable template has storage positions for 16 consumables with 7 in dia. bases	HSH	note 5
tmp29	thermocouple - discharge chamber	operating life	MTTF - 12 mos	HSH	

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
htg25	thermocouple - discharge chamber	remote handling requirements	use standard lifting bail for 5 ton and 17 ton crane hook	HSH	
htg22	thermocouple - discharge chamber thermowell	dimensions - envelope	5.25" dia plug x 58.19" from bottom of thermocouple to top of lifting bail	HSH	
tmp31	thermocouple - electrode extensions	component weight	16 lb.	HSH	
tmp32	thermocouple - electrode extensions	dimensions - envelope	5.25" dia plug x 61.69" from bottom of thermocouple to top of lifting bail	HSH	
tmp33	thermocouple - electrode extensions	intermediate in-facility storage criteria	consumable template has storage positions for 16 consumables with 7 in dia. bases	HSH	note 5
tmp34	thermocouple - electrode extensions	operating life	MTTF - 12 mos	HSH	
tmp35	thermocouple - electrode extensions	remote handling requirements	horizontal insertion	HSH	
tmp17	thermocouple - plenum/pool	component weight	16 lb.	HSH	
tmp26	thermocouple - plenum/pool	intermediate in-facility storage criteria	consumable template has storage positions for 16 consumables with 7 in dia. bases	HSH	note 5
tmp37	thermocouple - plenum/pool	operating life	MTTF - 9 mos	HSH	
tmp06	thermocouple - plenum/pool	remote handling requirements	use standard lifting bail for 5 ton and 17 ton crane hook	HSH	
tmp19	thermocouple - refractory	component weight	16 lb.	HSH	
tmp27	thermocouple - refractory	intermediate in-facility storage criteria	consumable template has storage positions for 16 consumables with 7 in dia. bases	HSH	note 5
tmp07	thermocouple - refractory	operating life	MTTF - greater than 12 mos	HSH	
tmp09	thermocouple - refractory	remote handling requirements	use standard lifting bail for 5 ton and 17 ton crane hook	HSH	
tmp30	thermowell - discharge chamber	operating life	MTTF - 12 mos	HSH	
tmp39	thermowell - plenum/pool	component weight	99 lb.	HSH	
tmp15	thermowell - plenum/pool	dimensions - envelope	13" dia flange x 94.52" long from bottom to top of fixed lifting bail	HSH	
tmp38	thermowell - plenum/pool	operating life	MTTF - 9 mos	HSH	
tmp18	thermowell - refractory	dimensions - envelope	7.0" dia x 113.84" long	HSH	

Tag	Component (2, 3)	Interface Detail (2, 3)	Interface Criteria	System/ Area Locators	Comments
vnt07	vent insert - discharge chamber	operating life	MTTF - 30 mos	HSH	
vnt08	vent line - discharge chamber	operating life	MTTF - 30 mos	HSH	
env42	wheels	friction coefficient between melter and facility melter rails	0.23	HMH	estimated value
env11	wheels	remote handling requirements	no remote adjustments required	HSH	
env47	wheels	type/materials	Demag Model DRS315, cast iron	HMH	
env52	wheels	wheel load capacity	48,500 lb. for Demag Model DRS315.	HMH	
env43	wheels	wheel load distribution - over all wheels	Max - 26,800 lb.	HMH	
env44	wheels	wheel location and spacing	outside, 148" rail span (c-c), east/west side: south wheel centerline 22.5"/24.5" from seismic pin respectively	HMH	
env45	wheels	wheel quantity	7 wheels per side, spaced approximately 20.55" center-to-center	HMH	

Notes

1 Column Descriptions
"Tag" - Detail identifier. Not to be reused.
"Component" - Description of specific melter SSC for which the interface detail is associated, use as a sorting column.
"Interface Detail" - Description of interface/design detail in question. Use "Component" column for complete detail description.
"Interface Criteria" - Interface/design data, based on requirements in the specification.
"System/Area Locators" - developed in accordance with project procedures, identifies impacted discipline.
"Comments" - For providing status and/or additional clarification.

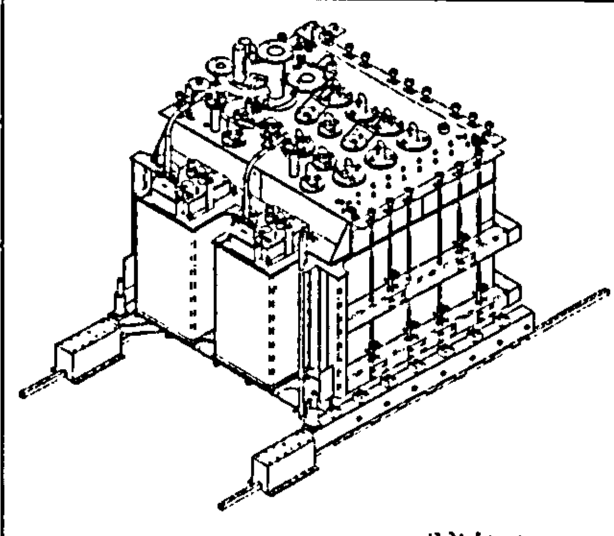
2 Write key words first, followed by secondary description if necessary.
3 Use these columns together to fully define interface detail.
4 N/A - not applicable
5 Interproject interface detail, not a subcontractor/project interface detail.

RPP-WTP	DATA SHEET HIGH LEVEL WASTE MELTER 1	Data Sheet Number	24590-HLW-M0D-HMP-P0001
		Plant Item Number	24590-HLW-ME-HMP-MLTR-00001
		This bound document contains a total of 1 sheet	

System: HMP
Project: RPP-WTP
Project No: 24590
Site: Hanford
Function: Convert blended HLW slurry and glass formers into glass and deliver glass to canisters

Reference Documents:
24590-HLW-3PS-AE00-TP001, Engineering Specification for High Level Waste Melters
deleted
deleted
deleted
deleted

WALTER PAUL DROSTE · STATE OF WASHINGTON · PROFESSIONAL ENGINEER
EXPIRES 6/6/07
4/27/06



ISSUED BY
RPP-WTP PDC

	Units			Units	
MECHANICAL					
Melter Design Life	years	5	Melter Base Rail Center to Center Distance	inches	148.00
Maximum Outside Dimensions (L x W x H)	inches	172 x 184 x 146	Maximum Assembled Weight, Empty	pounds	174,000
Plant Elevation, top of rail	ft-in	2 - 11	Maximum Assembled Weight with Glass	pounds	198 000
PROCESS					
Design Glass Production	MT/D	3.0	Thermal load to cave from melter (idle and feed modes)	kW	35 max
Glass Tank Volume	ft^3	144	Melter Cooling Water	GPM	50 (nominal)
Glass Tank Surface Dimensions (L x W)	inches	60 x 86	Melter Cooling Water	Delta T (°F)	15 (nominal)
Max Operating Glass Depth	inches	44			
Design Glass Operating Temperature (max)	°F	2200			
ELECTRICAL					
Electrodes, kW		600 maximum			
Start-up Heaters, kW		183 total maximum			
Discharge Chamber, kW		56 max per chamber			
CONTROLS AND INSTRUMENTATION					
deleted					
deleted					
MAJOR COMPONENTS - Materials					
Melter Shell and Base		A500, A36, 304L, C276	Cooling Panels		C276, 316L
Melter and Discharge Chamber Lids		304L, Alloy 690	Discharge Chamber Trough and Dam		Alloy 690
Electrodes		Alloy 690	Film Cooler		Alloy 690

REPLACEABLE COMPONENTS

	Number	Design Life (months)		Number	Design Life (months)
Feed Nozzle	2	60	Discharge Chamber Lid Assembly	2	30
Film Cooler	1	60	Discharge Chamber Vent Line	2	60
Air Lift Lance	2	60	Discharge Chamber Vent Insert	2	60
Level Probe	1	12	Discharge Chamber Thermowell	4	60
Plenum/Glass Pool Thermocouple	2	4	Discharge Chamber Thermocouple	4	12
Plenum/Glass Pool Thermowell	2	8	Electrode Thermocouple Assembly	3	12
Refractory Thermocouple Assy	2	12	Plenum View Camera	1	12
Bubblers	6	2	Start-up Heaters	6	3

NOTES

Note 1: Contents of this document are Dangerous Waste Permit affecting.

Note 2: 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 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.

Date	Rev	Reason for Revision	Prepared	Checked	Approved
4/27/06	1	Revised to correct typographical error	Mark Hall		
1/31/2006	0	Issued for Permitting Use	Mark Hall	Lawrence Curtis	

R10673689

RPP-WTP	DATA SHEET HIGH LEVEL WASTE MELTER 2	Data Sheet Number	24590-HLW-M0D-HMP-P0002
		Plant Item Number	24590-HLW-ME-HMP-MLTR-00002
		This bound document contains a total of 1 sheet	

System: HMP

Project: RPP-WTP

Project No: 24590

Site: Hanford

Function: Convert blended HLW slurry and glass formers into glass and deliver glass to canisters

Reference Documents:

24590-HLW-3PS-AE00-TP001, Engineering Specification for High Level Waste Melters

deleted

deleted

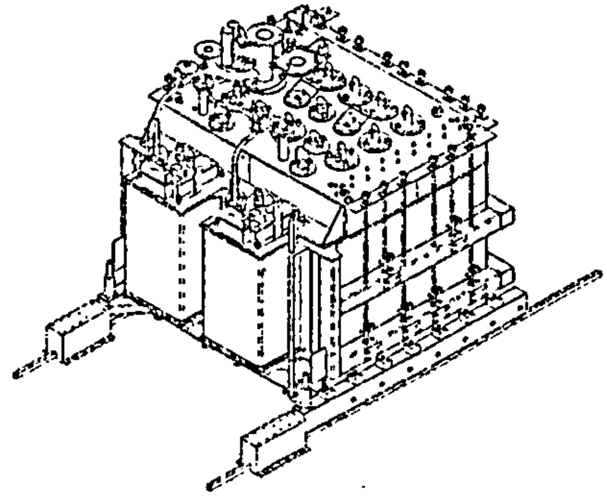
deleted

deleted

WALTER PAUL DROSJACK
STATE OF WASHINGTON
41231
REGISTERED
PROFESSIONAL ENGINEER

1/31/05

EXPIRES 6/6/05



MECHANICAL

	Units			Units	
Melter Design Life	years	5	Melter Base, Rail Center to Center Distance	inches	148 00
Maximum Outside Dimensions (L x W x H)	inches	172 x 164 x 146	Maximum Assembled Weight, Empty	pounds	174 000
Front Elevation, top of rail	ft-in	2 - 11	Maximum Assembled Weight with Glass	pounds	198 000

PROCESS

Design Glass Production	MT/D	3 0	Thermal load to cave from melter (idle and feed modes)	kW	35 max
Glass Tank Volume	ft^3	144	Melter Cooling Water	GPM	50 (nominal)
Glass Tank Surface Dimensions (L x W)	inches	60 x 96	Melter Cooling Water	Delta T (°F)	15 (nominal)
Max Operating Glass Depth	inches	44			
Design Glass Operating Temperature (max)	°F	2200			

ELECTRICAL

Electrodes, kW	600 maximum
Start-up Heaters, kW	183 total maximum
Discharge Chamber, kW	56 max per chamber

CONTROLS AND INSTRUMENTATION

deleted

deleted

MAJOR COMPONENTS - Materials

Melter Shell and Base	A500 A36, 304L, C276	Cooling Panels	C276, 316L
Melter and Discharge Chamber Lids	304L, Alloy 690	Discharge Chamber Trough and Dam	Alloy 690
Electrodes	Alloy 690	Film Cooler	Alloy 690

REPLACEABLE COMPONENTS

	Number	Design Life (months)		Number	Design Life (months)
Feed Nozzle	2	60	Discharge Chamber Lid Assembly	2	30
Film Cooler	1	60	Discharge Chamber Vent Line	2	60
Air Lift Lance	2	60	Discharge Chamber Vent Insert	2	60
Level Probe	1	12	Discharge Chamber Thermowell	4	60
Plenum/Glass Pool Thermocouple	2	4	Discharge Chamber Thermocouple	4	12
Plenum/Glass Pool Thermowell	2	9	Electrode Thermocouple Assembly	3	12
Refractory Thermocouple Assy	2	12	Plenum View Camera	1	12
Bubblers	8	2	Start-up Heaters	6	3

NOTES

Note 1: Contents of this document are Dangerous Waste Permit affecting

Note 2: 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 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

1/31/05	6	Issued for Permitting Use	Mark Hall	Lawrence Lutz	William Elam
Date	Rev	Reason for Revision	Prepared	Checked	Approved

ISSUED BY
RPP-WTP PDC

R10482355

THIS PAGE INTENTIONALLY
LEFT BANK

Drawings and Documents

Attachment 51 – Appendix 10.9
High Level Waste Building
Material Selection Documentation

The following drawings have been incorporated into Appendix 10.9 and can be viewed at the Ecology Richland Office. See Appendix 7.9 for material selection documentation common to the Pretreatment, LAW, HLW, and Laboratory buildings. **New drawings are in bold lettering.**

Drawing/Document	*Description*
~~24590-HLW-N1D-HDH-P0003, Rev 0~~	~~Material Selection Data Sheet for HDH-VSL-00002/4~~
24590-HLW-N1D-HDH-P0003, Rev 1	**Material Selection Data Sheet for HDH-VSL-00002/4**
24590-HLW-N1D-HDH-P0005, Rev 1	Material Selection Data Sheet for HDH-VSL-00003
24590-HLW-N1D-HDH-P0007, Rev 1	Material Selection Data Sheet for HDH-VSL-00001
24590-HLW-N1D-HMP-P0001, Rev 0	**Material Selection Data Sheet for HLW HMP-MLTR-00001 & 2**
24590-HLW-N1D-HOP-P0002, Rev 0	Selection Data Sheet for HOP-WESP-00001/2
24590-HLW-N1D-HOP-P0003, Rev 0	Material Selection Data Sheet for HOP-ADBR-00001A/1B / 2A/2B
24590-HLW-N1D-HOP-P0004, Rev 1	Material Selection Data Sheet for HOP-SCO-00001/4
24590-HLW-N1D-HOP-P0005, Rev 1	Material Selection Data Sheet for HOP-SCR-00001/2
24590-HLW-N1D-HOP-P0006, Rev 1	Material Selection Data Sheet for HOP-ABS-00002/3
24590-HLW-N1D-HOP-P0009, Rev 2	Material Selection Data Sheet for HOP-VSL-00903/4
24590-HLW-N1D-HSH-P0001, Rev 0	Material Selection Data Sheet for HSH-TK--00001/2
24590-HLW-N1D-RLD-P0001, Rev 0	Material Selection Data Sheet for RLD-VSL-00007

PLANT ITEM MATERIAL SELECTION DATA SHEET

HDH-VSL-00002 & HDH-VSL-00004 (HLW)
Canister Decon Vessels

ISSUED BY
RPP-WTP PDC

R10592511

- Design Temperature (°F) (max/min): 225/40
- Design Pressure (psig) (internal/external): 15/atm
- Location: out cell

Contents of this document are Dangerous Waste Permit affecting

Operating conditions are as stated on attached sheets 6 and 7

Operating Modes Considered:

- The tank is filled with the acidic decontamination solution at normal operating temperature.

Materials Considered:

Material (UNS No.)	Relative Cost	Acceptable Material	Unacceptable Material
Carbon Steel	0.23		X
304L (S30403)	1.00		X
316L (S31603)	1.18		X
6% Mo (N08367/N08926)	7.64		X
Alloy 22 (N06022)	11.4		X
Ti-2 (R50400)	10.1	X	

Recommended Material: UNS R50400

Recommended Corrosion Allowance: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)

Process & Operations Limitations:

None identified

STEVEN WAKEMAN VAIL
STATE OF WASHINGTON
39250
REGISTERED
PROFESSIONAL ENGINEER
12/1/05
EXPIRES: 12/07/07

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 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.

This bound document contains a total of 7 sheets.

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	APPROVER
1	12/1/05	Issued for Permitting Use	[signature]	[signature]	[signature]
0	3/15/04	Issued for Permitting Use	DLA	JRD	APR

PLANT ITEM MATERIAL SELECTION DATA SHEET

Corrosion Considerations:

Canister decontamination vessels hold the filled canister and the ceric nitrate solution during decontamination. Heating and cooling coils are used to maintain the decontamination solution at 149 °F. After the decontamination solution is drained from the vessel, spray rings rinse the canister with nitric aid and demineralized water.

a General Corrosion
Corrosion rates of 304 stainless steel in Ce-IV/nitric acid solutions depend on temperature, nitric acid concentration, and cerium concentration, but are typically about 350 mpy. Thus, the neat solution is good for decontamination of stainless steel but cannot be stored in stainless steel containers.

There are no published data on the dissolution rate of Ti-2 by $Ce(NO_3)_4/HNO_3$ solutions. However, Craig (1989) states that Ti is very resistant to nitric acid except that in the 20-70% concentration range (maximum at 45%), the corrosion rate is relatively high. The use of about 12% acid minimizes this. Corrosion is inhibited by Ti^{+4}, Cr^{+6}, and Fe^{+3} ions as well as by other oxidizing ions. Ce^{+4} is not mentioned. However, it is expected to behave similarly.

Zirconium, according to Craig (1989), can crack in concentrated nitric acid, such as might be present in condensed vapors. Consequently, it is not more appealing than Ti.

West Valley Nuclear Services has not examined their Ti-2 vessel for corrosion. However, they do not believe it has been a problem. The reason Ti was selected was that it was recommended by Battelle-Northwest (PNNL). PNNL recomenended it because electrodes used in several earlier studies were Ti and had not visibly degraded.

Conclusion:
Ti appears to be an acceptable alloy although there are no published data, or known unpublished data, on the topic. Based on an examination of the chemical and electrochemical behaviors of Ti alloys and Ce^{+4} solutions, no problem appears to exist.

b Pitting Corrosion
No data are available. Ti is resistant to pitting in chloride solutions although the effects of a highly oxidizing medium, such as Ce^{+4}, with chloride are unknown. However, in this system, there should be no chloride except for that brought over with any ^{137}Cs contamination. According to Meigs (2000), this should amount only to 0.13 Ci of ^{137}Cs, equivalent to about 1.5 mg of Cs and therefore 0.4 mg of chloride. With approximately 800 L of solution, the chloride is expected to be about 0.5 ppb.

Pitting of the canister is not expected to be a concern because of the low chloride concentration, the high nitrate concentration, and the high general corrosion rate.

Conclusion:
Pitting of the canister is not considered a problem as long as the 304L meets specifications. Pitting of the Decontamination Vessel is not a concern.

c End Grain Corrosion
No published data, but not expected to be a concern.

Conclusion:
Not likely in this system.

d Stress Corrosion Cracking
Cracking of the canister is not a concern at the stated conditions because there is too much nitrate, too little chloride, and the uniform corrosion rate is too high. Work by Mackey (2000) showed post-decontamination cracking of the canister is not a concern.

No reports of cracking of Ti in this environment are known.

Conclusion:
Ti-2 is acceptable.

PLANT ITEM MATERIAL SELECTION DATA SHEET

e Crevice Corrosion
See Pitting.

Conclusion:
See Pitting.

f Corrosion at Welds
West Valley reports no problems. Proper welding techniques will be required (H_2, O_2, or N_2 shall not be present in the welding cover gas).

Conclusion:
Weld corrosion is not considered a problem.

g Microbiologically Induced Corrosion (MIC)
The proposed operating conditions are not conducive to microbial growth.

Conclusion:
MIC is not considered a problem.

h Fatigue/Corrosion Fatigue
Corrosion fatigue is not expected to be a problem except possibly in the coils and their entry point into the vessel – these lines will be used alternately for heating and cooling the acid and will undergo severe stresses. Design and material will accommodate this.

Conclusions
Proper design and material choice mitigates this concern.

i Vapor Phase Corrosion
West Valley has encountered no problems.

Conclusion:
Not expected to be a concern.

j Erosion
Velocities are expected to be low. Erosion allowance of 0.004 inch for components with low solids content (< 2 wt%) at low velocities is based on 24590-WTP-RPT-M-04-0008.

Conclusion:
Not expected to be a concern.

k Galling of Moving Surfaces
Not applicable.

Conclusion:
Not applicable.

l Fretting/Wear
No contacting surfaces expected.

Conclusion:
Not applicable.

m Galvanic Corrosion
The canister is expected to be anodic relative to the vessel. The canister is purposely being corroded and so this state is acceptable. It is unknown whether hydrogen will be generated at the Ti surface. Because of the strong oxidizing nature of the solution, hydrogen, if present, is not expected to survive long enough to diffuse into the Ti.

Conclusion:
The hydrogen generation rate at the Ti-2 surface is not expected to be a concern.

PLANT ITEM MATERIAL SELECTION DATA SHEET

n Cavitation
None expected.

Conclusion:
Not believed to be of concern.

o Creep
The temperatures are too low to be a concern.

Conclusion:
Not applicable.

p Inadvertent Addition of Nitric Acid
Vessels normally contain nitric acid and operate at a low pH.

Conclusion:
Not applicable.

PLANT ITEM MATERIAL SELECTION DATA SHEET

References:
1. 24590-WTP-RPT-M-04-0008, Rev. 2, *Evaluation Of Stainless Steel Wear Rates In WTP Waste Streams At Low Velocities*
2. 24590-WTP-RPT-PR-04-0001, Rev. B, *WTP Process Corrosion Data*
3. Craig, BD, Editor, 1989, *Handbook of Corrosion Data*, ASM International, Metals Park, OH 44073
4. Mackey, DB, Personal communication to JR Divine, 24 March, 2000
5. Meigs, R, Personal communication: to D E Larson, 22 March 2000, amount of soluble Cs on the canister.

Bibliography:
1. Bray, LA, 1988, *Development of a Chemical Process Using Nitric Acid-Cerium (IV) for Decontamination of High-Level Waste Canisters*, Battelle, Pacific Northwest Laboratory, Richland, WA 99352
2. Bray, LA, MR Elmore, KJ Carson, RJ Elovich, GM Richardson, and LD Anderson, 1992, *Decontamination Testing of Radioactive-Contaminated Stainless Steel Coupons Using a Ce(IV) Solution*, Battelle, Pacific Northwest Laboratory, Richland, WA 99352
3. Bray, LA and JR Divine Telecon, March 2000

PLANT ITEM MATERIAL SELECTION DATA SHEET

PROCESS CORROSION DATA SHEET

Component(s) (Name/ID #) Canister decon vessel (HDH-VSL-00002, HDH-VSL-00004)

Facility HLW

In Black Cell? No

Chemicals	Unit[1]	Contract Maximum		Non-Routine		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/l	1.19E-03	1.92E-03			
Chloride	g/l					
Fluoride	g/l					
Iron	g/l	7.39E-01	7.37E-01			
Nitrate	g/l	2.42E+02	2.42E+02			
Nitrite	g/l					
Phosphate	g/l					
Sulfate	g/l					
Mercury	g/l					
Carbonate	g/l					
Undissolved solids	wt %	6.45E-02	6.46E-02			
Other (Pb)	g/l	2.23E-04	1.99E-04			
Other(Cerium)	g/l	6.81E+01	6.81E+01			
pH	N/A					Note 3
Temperature	°F					Note 2

List of Organic Species:

References

System Description: 24590-HLW-3YD-HDH-00001, Rev 0
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normal Input Stream #: HDH01, HDH02, HDH03, NAR21A/B
Off Normal Input Stream # (e.g., overflow from other vessels):
P&ID: 24590-HLW-M6-HDH-00001, Rev 1
PFD: 24590-HLW-M5-V17T-00006, Rev 4
Technical Reports:

Notes:

1. Concentrations less than 1x 10^{-4} g/l do not need to be reported; list values to two significant digits max.
2. Tmin 40 °F, Tnorm 140 °F, Tmax 225 °F (24590-HLW-MVD-HDH-00006, Rev 1)
3. Approximately pH 6 to 6.8 (24590-HLW-M4C-HDH-00001, Rev A).

Assumptions

PLANT ITEM MATERIAL SELECTION DATA SHEET

5.2.4 Canister Decontamination Vessel (HDH-VSL-00002, HDH-VSL-00004)

Routine Operations

The canister decontamination vessel is used to hold the filled canister and ceric nitrate solution during the decontamination process. High-pressure steam at 343 °F is supplied to raise the solution temperature from 68 °F to 149 °F and is held at 149 °F for 6 hours during the decontamination process. Heating and cooling coils maintain the temperature of the liquid at 149 °F. The nitric acid solution is drained from the vessel. Spray rings will rinse the canister with nitric acid and demineralized water. The canister is then removed from the vessel.

Non-Routine Operations that Could Affect Corrosion/Erosion

None identified.

R10637293

24590-HLW-N1D-HMP-P0001
Rev. 0

PLANT ITEM MATERIAL SELECTION DATA SHEET

HMP-MLTR-00001 & 2 (HLW)
HLW Melter 1 & 2 Gas Barrier and Cooling Panels

- Design Temperature (°F) (gas barrier/cooling panels): 411/366
- Design Pressure (gas barrier/cooling panels): -100" wc/150 psig

ISSUED BY
RPP-WTP PDC

Contents of this documents are Dangerous Waste Permit affecting

Operating conditions are as stated on sheet 4

Materials Considered:

Material (UNS No.)	Acceptable Material	Unacceptable Material
Carbon Steel		X
304L (S30403)		X
316L (S31603)	X*	
6% Mo (N08367/N08926)		X
Alloy 276 (N10276)	X	
Alloy 22 (N06022)		X
Alloy 690 (N06690)	X	
Ti-2 (R50400)		X

Recommended Material: Containment: Alloy 690 and Alloy 276
Cooling panels within the gas barrier: Alloy 276

*316L is suitable for cooling panels located outside of the gas barrier only

Recommended Corrosion Allowance: 0.00 inch

Process & Operations Limitations:

- None

10/28/05

EXPIRES: 12/07/05

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 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.

This bound document contains a total of 4 sheets

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	APPROVER
0	10/28/05	Issue for Permitting Use			

PLANT ITEM MATERIAL SELECTION DATA SHEET

Corrosion Considerations:

The HLW melter is "encapsulated" in a mostly Hastelloy® C-276 outer shell with a lid of Inconel® 690, though some air in-leakage is permitted. Within the outer shell are cooling pads constructed of Hastelloy® C-276 (24590-101-TSA-W000-0010-418-01). There is no stainless steel or carbon steel within the gas barrier.

The operating temperatures for HLW components range from approximately 130 °F to 135 °F at the cooling pads to about 411 °F at the lid The gas compositions for the HOP system are used as a conservative limit. Because the offgas from the melter contains about 27% water, condensation is feasible at these temperatures. The presence of NOx and SOx is expected to result in a condensate at the cooling panels with a pH ≤1.5; some chloride will be present along with fluoride.

a General Corrosion
At the lid temperature of 411 °F, the corrosion is expected to be less than that of the offgas line which is Inconel® 690 and operates at about 1200 °F.

At the cooling panels, the lower temperature and the relatively high chromium content of the alloys is expected to keep the general corrosion rate much less than 1 mpy.

Conclusion:
No significant corrosion is expected. Therefore, no massive loss of containment is expected.

b Pitting Corrosion
At the relatively low pH, estimated at approximately 1.5 in the condensed solution, the halide concentration, which is low in the gas phase, is expected to be relatively low. Nevertheless, there is some concern about the pitting of Inconel® 690 which has no molybdenum; the pitting rate is expected to be small (Special Metals 2002). The Hastelloy® C-276 is expected to be immune from pitting at these temperatures and conditions (Haynes Int'l 1987).

Conclusion:
There is some concern about the pitting of the Inconel® 690. There are no data available to give rates but it is expected that the liner will not have significant penetration in the five years of melter life.

c End Grain Corrosion
Acid concentrations are not sufficiently high to be a concern.

Conclusion:
Not a concern.

d Stress Corrosion Cracking
The high nickel content of the alloys is expected to minimize the probability of cracking.

Conclusion:
Not a significant concern.

e Crevice Corrosion
The concerns are similar to those noted in the pitting section. The main concern is whether there are crevices where condensate can collect.

Conclusion:
Same as the pitting conclusions.

f Corrosion at Welds
Corrosion at welds is not considered a problem in the proposed environment.

Conclusion:
Weld corrosion is not considered a problem under that anticipated operating conditions.

g Microbiologically Induced Corrosion (MIC)
Not a concern for the conditions and materials. .

Conclusion:
Not a concern.

h Fatigue/Corrosion Fatigue
Thermal cycles should not be more than a few per day. Therefore, corrosion fatigue is not a concern.

Conclusions
Not a concern.

PLANT ITEM MATERIAL SELECTION DATA SHEET

I Vapor Phase Corrosion
Not a concern, as noted in the general corrosion section.

Conclusion:
Not a concern.

J Erosion
There is no fluid flow.

Conclusion:
Not a concern.

k Galling of Moving Surfaces
No moving surfaces are expected.

Conclusion:
Galling is not a concern.

l Fretting/Wear
No contacting surfaces expected.

Conclusion:
No fretting concern.

m Galvanic Corrosion
There is not a significant potential difference between the alloys.

Conclusion
Not a concern

n Cavitation
There is no fluid flow.

Conclusion:
Not a concern.

o Creep
The temperatures are too low to have an effect.

Conclusion:
Not a concern.

P Inadvertent Addition of Nitric Acid
There is no practical method of adding nitric acid.

Conclusion:
Not a concern.

PLANT ITEM MATERIAL SELECTION DATA SHEET

References

1. 24590-101-TSA-W000-0010-418-01, *HLW Melter Materials Selection Report.*
2. CCN 120764, e-mail from M Hall to JR Divine, 24 March 2005, "Melter Materials and Operating Conditions."
3. Hastelloy® alloy C-276, 1987, Haynes International, Inc.
4. Inconel alloy 690, 2002, Publication Number SMC-079, Special Metals Corporation

Bibliography

1. Agarwal, DC, *Nickel and Nickel alloys*, In: Revie, WW, 2000. *Uhlig's Corrosion Handbook*, 2nd Edition, Wiley-Interscience, New York, NY 10158
2. Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073
3. Imrich, KJ, *Metallurgical Evaluation of an Inconel 690 Insert from a Radioactive Waste Glass Melter Pour Spout*, Westinghouse Savannah River Company, 1998.
4. Wright, IG, *High-Temperature Oxidation*, In: Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073

PLANT ITEM MATERIAL SELECTION DATA SHEET

OPERATING CONDITIONS

Materials Selection Data

Component (Name/ID) HMP-MLTR-00001&2 (note 1)
System HMP (HLW Melter Process System)

Chemicals	Unit	Normal Conditions	Maximum Flow Conditions
Oxygen	%	15	14.9
Chlorine	ppmv	trace	trace
Fluorine	ppmv	trace	trace
NO_x	ppmv	1230	6650
Sulfur Dioxide (SO_2)	ppmv	11	9
Ammonia (NH_3)	ppmv	181	436
Carbon Monoxide (CO)	ppmv	80	156
Carbon Dioxide	%	0.7	1.3
Particulate	ppmv	410	361
Hydrochloric Acid (HCl)	ppmv	3.5	26
Hydrofluoric Acid (HF)	ppmv	30	294
Water (H_2O)	%	27.7	27.2
Pressure	mbar	972	971
Temperature (Note 2)	°F		

Note 1: The compositions for the HOP system are used as a conservative limit.

Note 2: Cooling panel temperatures are expected to be the maximum average cooling water temperature. Operating temperature range for HLW panels is 130F to 135F. HLW maximum gas barrier temperature is 411°F at the lid (CCN120764).

THIS PAGE INTENTIONALLY
LEFT BANK

Drawings and Documents

Attachment 51 – Appendix 10.11
High Level Waste Building
IQRPE Reports

The following drawings have been incorporated into Appendix 10.11 and can be viewed at the Ecology Richland Office. **New drawings are in bold lettering.**

Drawing/Documents	*Description*
24590-101-SC-HXYG-0074-03-00003, Rev 00A	IQRPE Integrity Assessment Report for HOP-ABS-00002/3
24590-CM-HC4-HXYG-00138-01-00021, Rev 00B	IQRPE Integrity Assessment Report for HOP Miscellaneous Unit Sub-systems
24590-CM-HC4-HXYG-00138-01-08, Rev 00B	IQRPE Integrity Assessment Report for Below Grade Secondary Containment
24590-CM-HC4-HXYG-00138-01-11, Rev 00B	IQRPE Integrity Assessment Report for El. 0 Secondary Containment
24590-CM-HC4-HXYG-00138-01-15, Rev 00B	IQRPE Integrity Assessment Report for HLW Portion of Below Grade Transfer Lines, Secondary Containment, Ancillary Equipment, and Corrosion Assessment, Rev. 1
24590-CM-HC4-HXYG-00138-01-17, Rev 00A	IQRPE Integrity Assessment Report for HOP-VSL-00903/4
24590-CM-HC4-HXYG-00138-02-08, Rev 00B	IQRPE Integrity Assessment Report for El. -21 HOP Ancillary Equipment
24590-CM-HC4-HXYG-00138-02-00010, Rev 00A	IQRPE Integrity Assessment Reports PVV System Ancillary Equipment
24590-CM-HC4-HXYG-00138-02-00024, Rev 00A	IQRPE Integrity Assessment Report for HDH-VSL-00001/2/3/4

24590-CM-HC4-HXYG-00138-02-00025, Rev 00B	IQRPE Integrity Assessment Report for El. 0 to 58 HOP Ancillary Equipment
24590-CM-HC4-HXYG-00138-02-00026, Rev 00A	IQRPE Integrity Assessment Report for El. 0 HOP Miscellaneous Unit Subsystems
24590-CM-HC4-HXYG-00138-02-00030, Rev 00A	IQRPE Integrity Assessment Report for El. 0 HFP Ancillary Equipment
24590-CM-HC4-HXYG-00138-02-00042, Rev 00A	IQRPE Integrity Assessment Report for El. 37 Secondary Containment
24590-CM-HC4-HXYG-00138-02-00043, Rev 00A	IQRPE Integrity Assessment Report for RLD-VSL-00002/7/8
24590-CM-HC4-HXYG-00138-02-00044, Rev 00A	IQRPE Integrity Assessment Report for El. 21 RLD Ancillary Equipment
24590-CM-HC4-HXYG-00138-02-00048, Rev 00A	IQRPE Integrity Assessment Report for PJV Ancillary Equipment
24590-CM-HC4-HXYG-00138-02-00049, Rev 00A	IQRPE Integrity Assessment Report for PJV-HEPA-00004A/4B/5A/5B and PJV-HTR-00002
24590-CM-HC4-HXYG-00138-02-00050, Rev 00A	IQRPE Integrity Assessment Report for HSH-TK-00001/2
24590-CM-HXYG-00138-02-00055 Rev. 00A	IQRPE Integrity Assessment Report for HDH Ancillary Equipment
24590-CM-HC4-HXYG-00211 AVEVA-IA-084, Rev 0	**IQRPE Integrity Assessment Report for Melter Process HMP System Miscellaneous Treatment Unit**
24590-CM-HC4-HXYG-00211 AVEVA-IA-082, Rev 0	**IQRPE Integrity Assessment Report for Melter Process HMP System Miscellaneous Treatment Unit Subsystem Equipment Ancillary Equipment**
RESERVED	RESERVED

R10875258

AREVA

CCN: 139504

AREVA-06-045

Ms. Anne Weldon
Subcontracts
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99352

May 9, 2006

Dear Ms. Weldon:

BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00211 - STRUCTURAL INTEGRITY ASSESSMENT OF HIGH LEVEL WASTE (HLW) MELTER PROCESS SYSTEM (HMP) MISCELLANEOUS TREATMENT UNITS (MTUs) (AREVA-IA-084, REV. 0)

The integrity assessment of the subject Miscellaneous Treatment Units (MTUs) has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that the MTUs are adequately designed and have sufficient structural strength, compatibility with the waste(s) to be processed/stored/treated, and corrosion protection to ensure that they will not collapse, rupture, or fail.

If you have any questions, please feel free to contact me at (509) 376-8020

Sincerely,

M. D. Rickenbach, Director
Engineering & Services
AREVA NC Inc.
Richland

llm

Enclosure

cc: D. C. Pfluger M.1.I104 w/enclosure (2)

COGEMA, INC.
2425 Stevens Center Place, Second Floor, Richland, Washington 99354 • P.O Box 840, Richland, Washington 99352
Tel.. 509 372 8256 • Fax: 509 372 3160 • www.areva.com

IQRPE REVIEW
OF
THE HIGH LEVEL WASTE (HLW) MELTER PROCESS SYSTEM (HMP) MISCELLANEOUS TREATMENT UNITS (MTUs)

"I, Fred Porter, have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the High Level Waste (HLW) Melter Process System (HMP) Miscellaneous Treatment Units (MTUs) as required by the Washington Administrative Code, *Dangerous Waste Regulations*, Section WAC-173-303-640(3) (a) through (g) applicable components."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design fully satisfies the requirements of the WAC.

The attached review is ten (10) pages numbered one (1) through ten (10).

FRED E. PORTER
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER
EXPIRES: 12-08-2007

Signature: [signature]

Date: 5-09-2006

STRUCTURAL INTEGRITY ASSESSMENT OF THE HIGH LEVEL WASTE (HLW) MELTER PROCESS SYSTEM (HMP) MISCELLANEOUS TREATMENT UNITS (MTUs)

Scope	Scope of this Integrity Assessment.	The HLW Melter Process System (HMP) is comprised of two HLW melters, each with the same design. Also included in the HMP are the pour spouts that are attached to the discharge chambers (2) of each melter. Melter 1 is located in HLW building cave H-0117 and Melter 2 is in cave H-0106, as shown on HLW Vitrification Building General Arrangement Plan at EL. 0'-0". This Integrity Assessment reviews the HLW Melter Process System (HMP) melter design and compatibility with ancillary process systems interfacing with the melters as shown on: Process Flow Diagram Drawings 24590-HLW-M5-V17T-P0002, -P20002; P&ID drawings 24590-HLW-M6-HMP-P0001, -P0002, -P0003, -P0004, -P0006, -P0007, -P0008, -P0013, -P0014, -P20001, -P20002, -P20003, -P20004, -P20006, -P20007, -P20008, -P20013, -P20014; and as defined in the System Description for HLW Melter Process System (HMP).
Summary of Assessment		For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design controls and requirements to ensure the design fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations* for Tank Systems.

References	Drawings and System Description.	Drawings: 24590-HLW-P1-P01T-00002, Rev. 5, HLW Vitrification Building General Arrangement Plan at EL. 0'-0"; 24590-HLW-M5-VI7T-P0002, Rev. 1, Process Flow Diagram HLW Vitrification Melter 1 (Systems HMP and HOP); 24590-HLW-M5-V17T-P20002, Rev.1, Process Flow Diagram HLW Vitrificatiion Melter 2 (Systems HMP and HOP); 24590-HLW-M6-HMP-P0001, Rev. 1, P&ID - HLW Melter 1 System Feed and Agitation; 24590-HLW-M6-HMP-P0002, Rev. 1, P&ID - HLW Melter 1 System Film Cooler and Offgas Connection; 24590-HLW-M6-HMP-P0003, Rev. 0, P&ID - HLW Melter Process System HLW Melter 1 Cooling System; 24590-HLW-M6-HMP-P0004, Rev. 0, P&ID - HLW Melter 1 Electrode Air Cooling and Joule Heating; 24590-HLW-M6-HMP-P0006, Rev. 1, P&ID - HLW Melter 1 System East Discharge Heaters and Airlift; 24590-HLW-M6-HMP-P0007, Rev. 1, P&ID - HLW Melter 1 System West Discharge Heaters and Airlift; 24590-HLW-M6-HMP-P0008, Rev. 1, P&ID - HLW Melter Process System Melter 1 Glass Pour & Monitoring Instrumentation; 24590-HLW-M6-HMP-P0013, Rev. 1, P&ID - HLW Melter 1 System Pressure, Density and Level Detection; 24590-HLW-M6-HMP-P0014, Rev. 0, P&ID - HLW Melter Process System HLW Melter 1 Cooling System; 24590-HLW-M6-HMP-P20001, Rev. 1, P&ID - HLW Melter 2 System Feed and Agitation; 24590-HLW-M6-HMP-P20002, Rev. 1, P&ID - HLW Melter 2 System Film Cooler and Offgas Connection; 24590-HLW-M6-HMP-P20003, Rev. 0, P&ID - HLW Melter Process System HLW Melter 2 Cooling System; 24590-HLW-M6-HMP-P20004, Rev. 0, P&ID - HLW Melter 2 Electrode Air Cooling and Joule Heating; 24590-HLW-M6-HMP-P20006, Rev. 1, P&ID - HLW Melter 2 System East Discharge Heaters and Airlift; 24590-HLW-M6-HMP-P20007, Rev. 1, P&ID - HLW Melter 2 System West Discharge Heaters and Airlift; 24590-HLW-M6-HMP-P20008, Rev. 1, P&ID - HLW Melter Process System Melter 2 Glass Pour & Monitoring Instrumentation; 24590-HLW-M6-HMP-P20013, Rev. 1, P&ID - HLW Melter 2 System Pressure, Density and Level Detection; 24590-HLW-M6-HMP-P20014, Rev. 0, P&ID - HLW Melter Process System HLW Melter 2 Cooling System. System Description: 24590-HLW-3YD-HMP-00001, Rev. 1, System Description for HLW Melter Process System (HMP).

Design	Melter design standards are appropriate and adequate for the equipment's intended use.	24590-HLW-3PS-AE00-T0001, Rev. 3, Engineering Specification for High Level Waste Melters; 24590-WTP-DC-ST-01-001, Rev. 11, Structural Design Criteria; 24590-WTP-SED-ENS-03-002-04, Rev 0H, Safety Envelope Document; HLW Facility Specific Information (SED); ASME B31.3, Chemical Plant and Petroleum Refinery Piping (1996); ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NC, Appendices N and F, Rules for Construction of Nuclear Power Plant Components (2001); ASME Boiler and Pressure Vessel Code, Section VIII, (2001).	Melters 1 and 2 are vendor supplied equipment. The melters are designed to meet performance requirements specified in the Engineering Specification for High Level Waste Melters for all phases of melter life, including assembly, transport, startup, commissioning and maintenance. Structural design of the melters is in accordance with the Structural Design Criteria Document for seismic category SC-II structures, systems and components (SSCs) referenced in the Engineering Specification Document. The melters are not required to operate after a seismic event. However, the category SC-II shell and restraints containing the molten glass pool will maintain structural integrity and remain in place to preclude potential impacts to SC-I items referenced in the Safety Envelope Document. Provisions to avoid stress problems associated with thermal growth of the melter as it expands in relation to ancillary equipment has been considered in the design. Melter cooling water piping, feed piping, offgas piping and pour flanges are designed in accordance with ASME B31.3. Piping seismic design is in accordance with ASME B&PV Code Section III, appendices N and F. Melter cooling water system panels located on the external surface of the ceramic refractory containing the glass pool are designed in accordance with ASME B&PV Code Section VIII.

Design	Melter design compatibility with ancillary systems.	Drawings and System Description listed above under References; ASME B31.3, Chemical Plant and Petroleum Refinery Piping (1966); ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NC, Appendices N and F, Rules for Construction of Nuclear Power Plant Components (2001); 24590-WTP-3PS-J000-T0001, Rev. 1, Melter Systems C&I Work Specification; 24590-HLW-3YD-HOP-00001, Rev. 1, System Description for HLW Melter Offgas Treatment Process and Process Vessel Vent Extraction (HOP and PVV Systems).	Melters are supplied as packaged units with provisions for interface connections with ancillary systems listed in the System Description Document and shown on the P&ID drawings. Ancillary process systems interfacing with melters include: HLW Melter Feed Process System (HFP), HLW Melter Offgas Treatment Process System (HOP), and HLW Canister Pour Handling System (HPH). The melter design provides nozzles for jumpers from connecting ancillary piping systems. Melter piping and nozzle design is compatible with ASME B31.3 and ASME B&PV Code Section III design requirements of ancillary piping systems. Melter offgas is routed to the HLW Melter Offgas Treatment Process System (HOP) as defined in the System Description for HLW Melter Offgas Treatment Document. The ancillary HOP system scrubbers and coolers reduce melter offgas temperature and minimize solids disposition in the downstream offgas system. Controls and Instrumentation for specific melter-related functional requirements are specified in the Melter Systems C&I Work Specification. Purge air is supplied to the melter for continuous bubbler and air lift lance operation in the glass pool and for intermittent uses in the plenum.

Design	Melter design is adequate to maintain operating requirements during design life.	24590-HLW-3PS-AE00-T0001, Rev 3, Engineering Specification for High Level Waste Melters; 24590-WTP-DB-ENG-01-001, Rev. 1F, Basis of Design; 24590-WTP-SRD-ESH-01-001-02, Rev.31, Safety Requirements Document, Volume II.	The Basis of Design Document for the HLW facility specifies the facility is expected to operate for 40 years. The Engineering Specification for High Level Waste Melters specifies the melter, excluding consumable SSCs, shall have a minimum 5 year design life. The melter design life is applicable to all non-maintainable melter components, which includes refractory, electrodes, discharge dam and trough, cooling panels, and all structural and containment steelwork. Melter consumable components are designed to be removed and replaced remotely. Components requiring replacement during the design life of the melter are designed for ease of remote replacement and disposal. Where required, installed spare capacity is provided. Melters are designed and installed to allow for replacement after end-of-life or failure. The melter design and installation permits appropriate periodic inspection and testing in accordance with Safety Requirements Document, Volume II (SRD).
Design	Melter is adequately designed. For structural and seismic loads.	24590-HLW-3PS-AE00-T0001, Rev. 3, Engineering Specification for High Level Waste Melters; 24590-WTP-DC-ST-01-001, Rev. 11, Structural Design Criteria; 24590-WTP-RPT-ST-01-002, Rev. 3, Seismic Analysis and Design Approach.	Seismic design for the melters is in accordance with the Seismic Analysis and Design Approach document for SC-II structures, systems, and components as referenced in the Engineering Specification for High Level Waste Melters. Melter structural design is in accordance with Structural Design Criteria Document for seismic category II structures.

Connections	Melter Seams and connections are adequately designed.	24590-HLW-3PS-AE00-T0001, Rev. 3, Engineering Specification for High Level Waste Melters; ASME B31.3, Chemical Plant and Petroleum Refinery Piping (1996); ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NC, Appendices N and F, Rules for Construction of Nuclear Facility Components (2001).	The Engineering Specification for High Level Waste Melters requires in-cell piping that is non-maintainable to be fully welded. The melter nozzle connections at the interface with ancillary piping system Jumpers are maintainable and are not welded connections. Melter piping and nozzle interface connections are compatible with ancillary piping design codes ASME B31.3 and ASME B&PV, Section III. The melter design provides in-leakage through engineered openings in some lid components. There is also incidental air in-leakage into the melter plenum. Air in-leakage to the melter plenum comes directly from the HLW cave. Each melter is connected to a dedicated offgas system that maintains a slight vacuum in the melter plenum.
Frost Heave	The Melter Process System will withstand the effects of frost heave.	24590-WTP-DC-ST-01-001, Rev.11, Structural Design Criteria.	The Structural Design Criteria requires that all structural foundations shall extend into the surrounding soil below the frost line to preclude frost heave. The frost depth line is 30 in. below grade. The HLW building foundation is at elevation -21"-0"and is not subject to frost heave. The HLW Melter Process System is located in caves within the HLW building at elevation 0'-0".

Waste Characteristics	Characteristics of the waste to be stored or treated have been identified.	Drawings and System Description listed above under References; 24590-HLW-3PS-AE00-T0001, Rev. 3, Engineering Specification for High Level Waste Melters; 24590-WTP-DB-ENG-01-001, Rev. 1F, Basis of Design.	The Basis of Design describes the characteristics of the waste to be treated and waste product to be stored. The HMP System Description provides a melter process overview listing the range of physical properties of HLW molten glass which is further defined in the Engineering Specification for High Level Waste Melters. The System Description Document describes facility interfaces, waste characteristics and production flow rates. Process systems that interface with the HLW Melter Process System (HMP) are shown on the P&ID drawings. The constituents of the HLW concentrate undergo chemical reactions, convert to their respective oxides, and dissolve in the molten glass.

Waste Handling Functions	Melters are designed to handle wastes with the characteristics defined above.	Drawings and System Description listed above under References; 24590-HLW-3YD-HOP-00001, Rev. 1, System Description for HLW Melter Offgas Treatment Process and Process Vessel Vent Extraction (HOP and PVV Systems).	The System Description Document defines the functions of the HMP system as the following; receive HLW concentrate and additives, vitrify HLW concentrate and additives, contain glass pool, deliver glass, confine hazardous emissions and report system conditions. The melters are designed to produce molten glass formed from HLW concentrate and glass former additives with the characteristics defined above. The glass pool is contained using heat-resisting ceramic bricks called refractory, backed up with an exterior metal structure with cooling panels. The panels provide cooling to freeze the glass within the refractory brick seams. The melters deliver molten glass to stainless steel canisters. The molten material is then allowed to cool, forming a borosilicate glass waste form. Immobilized High Level Waste (IHLW) is the resulting product (glass plus canister). The system works with the HLW Melter Offgas Treatment System (HOP) to direct melter emissions to offgas treatment processes. The functions of the ancillary systems servicing the HMP System are defined in the System Description Document and shown on the P&ID drawings.
Compatibility	The selection of materials adequately addresses the operating environment.	24590-HLW-3PS-AE00-T0001, Rev. 3, Engineering Specification for High Level Waste Melters; 24590-HLW-N1D-HMP-P0001, Rev. 0, Plant Item Material Selection Data Sheet.	The Engineering Specification for High Level Waste Melters specifies each melter, excluding consumable components, shall have a minimum 5 year design life. Materials of construction provided in accordance with the Engineering Specification Document and Plant Item Material Selection Data Sheets are able to withstand the radioactive, thermal, and corrosive environment caused by the melter feed, molten glass, and offgasses. The selection of materials and structural design of melters fabricated in accordance with the Engineering Specification Document are compatible with the melter operating environment for the required design life.

Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the miscellaneous treatment units.	24590-HLW-3PS-AE00-T0001, Rev. 3, Engineering Specification for High Level Waste Melters.	The Engineering Specification for High Level Waste Melters specifies materials selected to withstand the corrosive melter operating environment for the service life of melter SSC's. Corrosion monitoring capability during operations is not required. The Engineering Specification for High Level Waste Melters considers environmental, durability, corrosion and erosion factors during materials selection. Factors evaluated include: surface finish, chemical resistance, radiation resistance, pressure effects (cyclical), temperature effects, hardness and fatigue.
Strength	Pressure controls are designed to ensure pressure relief if normal operating pressures in the melters are exceeded.	Drawings and System Description listed above under References; 24590-WTP-SED-ENS-03-002-04, Rev. 0H, Safety Envelope Document; HLW Facility Specific In formation (SED).	The System Description Document states the system shall provide instrumentation to detect rises in pressure in the melter plenum and provide an actuating signal to the associated interlocks that follow when the melter plenum pressure reaches a predetermined value. The melter plenum pressure interlocks will stop feed to the melter and film cooler injection air on receiving an actuation signal from the melter pressure instrumentation. Redundant pressure measurement shown on the P&ID drawings is provided for the melter plenum in accordance with requirements of the Safety Envelope Document.
Strength	Maximum flows and any unusual operating stresses are identified	Drawings and System Description listed above under References; 24590-101-TSA-W000-0010-407-577, Rev, NA, HLW Melter FMEA Report.	The System Description Document section, Action on Faults and Mal-Operation, discusses selected failure modes and recovery responses for the HLW Melter Process System. A component- by- component detailed analysis can be found in the HLW Melter Failure Modes and Effects Analysis (FMEA) Document.

Secondary Containment	Containment and confinement requirements for high level wastes.	Drawings and System Description listed above under References; ASME Boiler and Pressure Vessel Code, Section VIII, (2001); 24590-WTP-SRD-ESH-01-001-02, Rev.31, Safety Requirements Document, Volume II.	High level wastes containment and confinement requirements in terms of configuration, interfaces, instrumentation, control and reliability is provided as defined in the HMP System Description Document. Confinement reliability factors for HMP structures, systems and components are in accordance with Safety Requirements Document, Volume II, for QL-2 requirements. The HMP melters use a refractory package to contain the molten glass. The refractory package consists of glass pool refractory and plenum refractory. The refractory package is designed to serve as a mechanical, thermal, and electrical barrier between the molten glass inside the shell and the external metal shell. The refractory package is contained within a metal structure with cooling panel assemblies on three sides and the bottom of the melter, which provide bulk containment and melter cooling. The metal containment shell / cooling water panels are designed and fabricated in accordance with ASME B&PV Section VIII. The caves that house the melter installations have protective liners and provide secondary containment for the HMP melter process system. Ventilation systems and offgas systems are provided to control radiological and chemical material releases and the generation of flammable and explosive gases during normal and accident conditions. Each melter is connected to a dedicated offgas system through to the stack, as shown on the P&ID drawings. Instrumentation is provided to detect and control rises in offgas pressure in the melter plenum.

Master Distribution Schedule for WTP Project Subcontract Management Group

SUBMITTAL TRANSMITTAL: ☐ First Submittal ☐ Re-Submittal ☐ QVRP Package
☐ No Review Required ☐ No Review Required Re-Submittal ☐ Submittal Supplement

CORRESPONDENCE: ☒ With Attachment ☐ W/O Attachment (letter only)
☐ Fax as Original (Letter Only) ☐ Fax as Original (With Attachment)

☐ Pre-Award/Award Package ☐ Executed Change Order Package
☐ Executed Amendment Package ☐ Back Charge

Subcontract Number:	24590-CM-HC4-HXYG-00211
Subcontract Title:	Tank Integrity Design Assessments by IQRPE
Subcontractor Name:	AREVA NC, Inc.
Subcontract Administrator:	Arne Weldon

PDC Document Number	Rev	Document Title	Rev
139505	0	AREVA -AI-082, Rev. 1	

INCOMING DISTRIBUTION

Name	MSIN/ E-mail	Original	Copy	Copy of cover sheet / transmittal only	Primary File Index	Alternate File Index	Assigned Action or Remarks
PDC	MS9-A	X		B.8			Please rush for permitting
Dan Pfluger	MS5-I		x				
Barbara Dubiel	MS4-D2		x				

OUTGOING DISTRIBUTION FOR RETURNED STATUSED STICKER SUBMITTALS

Name	MSIN/ E-mail	Original	Copy	Copy of cover sheet / transmittal only	Primary File Index	File Index Alternate	Assigned Action or Remarks
PDC	MS9-A	X					

R10675259

AREVA

CCN: 139505

AREVA-06-044

Ms. Anne Weldon
Subcontracts
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99352

May 9, 2006

Dear Ms. Weldon:

BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00211 - STRUCTURAL INTEGRITY ASSESSMENT OF HIGH LEVEL WASTE (HLW) MELTER PROCESS SYSTEM (HMP) MISCELLANEOUS TREATMENT UNITS (MTUs) SUBSYSTEM EQUIPMENT ANCILLARY EQUIPMENT (COGEMA-IA-082, REV. 1)

The integrity assessment of the subject ancillary equipment has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that the ancillary equipment are adequately designed and have sufficient structural strength, compatibility with the waste(s) to be processed/stored/treated, and corrosion protection to ensure that they will not collapse, rupture, or fail.

If you have any questions, please contact Tarlok Hundal at (509) 373-4438, or via facsimile at (509) 372-0504.

Sincerely,

M. D. Rickenbach, Director
Engineering & Services
AREVA NC Inc.
Richland

llm

Enclosure

cc: D. C. Pfluger M.1.I104 w/ enclosure(2)

STRUCTURAL INTEGRITY ASSESSMENT OF THE HIGH LEVEL WASTE (HLW) MELTER PROCESS SYSTEM (HMP) MISCELLANEOUS TREATMENT UNITS (MTUs) SUBSYSTEM EQUIPMENT ANCILLARY EQUIPMENT

IQRPE REVIEW
OF
THE HIGH LEVEL WASTE (HLW) MELTER PROCESS SYSTEM (HMP) MISCELLANEOUS TREATMENT UNITS (MTUs) SUBSYSTEM EQUIPMENT ANCILLARY EQUIPMENT

"I, Tarlok Hundal have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the High Level Waste (HLW) Melter Process System (HMP) Miscellaneous Treatment Units (MTUs) Subsystem Equipment Ancillary Equipment as required by the Washington Administrative Code, *Dangerous Waste Regulations*, Section WAC-173-303-640(3) (a) through (g) applicable components."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design fully satisfies the requirements of the WAC.

The attached review is nine (9) pages numbered one (1) through nine (9).

TARLOK SINGH HUNDAL
STATE OF WASHINGTON
20213
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES: 02/15/08

Signature

5/9/06
Date

Scope	Scope of this Integrity Assessment	This Integrity Assessment addresses the MTUs ancillary equipment associated with the HLW Melter Process System (HMP) two Melters (HMP-MLTR-00001 and -00002) located in Rooms H-0117 and H-0106, respectively, at Elevation 3'-0" of the HLW facility. The MTUs ancillary equipment associated with these two Melters are shown on the P&ID drawings 24590-HLW-M6-HMP-P0001, -P0002, -P0003, -P0004,-P0006, -P0007, -P0008, -P0013, -P0014, -P20001, -P20002, -P20003, -P20004, -P20006, -P20007, -P20008, -P20013, and -P20014.
Summary of Assessment		For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design requirements and controls to ensure that the design fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations* for Tank Systems.

References	Drawings and System Description	**Drawings:** 24590-HLW-P1-P01T-00001, Rev. 6, HLW Vitrification Building General Arrangement (Permit) Plan at El.(-)21'- 0"; 24590-HLW-P1-P01T-00002, Rev. 5, HLW Vitrification Building General Arrangement (Permit) Plan at El. 0'- 0"; 24590-HLW-P1-P01T-00005, Rev. 4, HLW Vitrification Building General Arrangement (Permit) Plan at El. 58'- 0"; 24590-HLW-P1-P01T-00009, Rev. 10, HLW Vitrification Building General Arrangement (Permit) Sections D-D, E-E & F-F; 24590-HLW-P1-P01T-00010, Rev. 10, HLW Vitrification Building General Arrangement (Permit) Section G-G & H-H; 24590-HLW-M6-HMP-P0001, Rev. 1, P&ID -HLW Melter 1 System Feed and Agitation; 24590-HLW-M6-HMP-P0002, Rev. 1, P&ID -HLW Melter 1 System Film Cooler and Offgas Connection; 24590-HLW-M6-HMP-P0003, Rev. 0, P&ID -Melter Process System HLW Melter 1 Cooling System; 24590-HLW-M6-HMP-P0004, Rev. 0, P&ID -HLW Melter 1 Electrode Air Cooling and Joule Heating; 24590-HLW-M6-HMP-P0006, Rev. 1, P&ID -HLW Melter 1 System East Discharge Heaters and Airlift; 24590-HLW-M6-HMP-P0007, Rev. 1, P&ID -HLW Melter 1 System West Discharge Heaters and Airlift; 24590-HLW-M6-HMP-P0008, Rev. 1, P&ID -HLW Melter Process System Melter 1 Gas Pour & Monitoring Instrumentation; 24590-HLW-M6-HMP-P0013, Rev. 1, P&ID -HLW Melter 1 System Pressure, Density and Level Detection; 24590-HLW-M6-HMP-P0014, Rev. 0, P&ID -Melter Process System HLW Melter 1 Cooling System; 24590-HLW-M6-HMP-P20001, Rev. 1, P&ID -HLW Melter 2 System Feed and Agitation; 24590-HLW-M6-HMP-P20002, Rev. 1, P&ID -HLW Melter 2 System Film Cooler and Offgas Connection; 24590-HLW-M6-HMP-P20003, Rev. 0, P&ID -Melter Process System HLW Melter 2 Cooling System; 24590-HLW-M6-HMP-P20004, Rev. 0, P&ID -HLW Melter 2 Electrode Air Cooling and Joule Heating; 24590-HLW-M6-HMP-P20006, Rev. 1, P&ID -HLW Melter 2 System East Discharge Heaters and Airlift; 24590-HLW-M6-HMP-P20007, Rev. 1, P&ID -HLW Melter 2 System West Discharge Heaters and Airlift; 24590-HLW-M6-HMP-P20008, Rev. 1, P&ID -HLW Melter Process System Melter 2 Gas Pour & Monitoring Instrumentation; 24590-HLW-M6-HMP-P20013, Rev. 1, P&ID -HLW Melter 2 System Pressure, Density and Level Detection; 24590-HLW-M6-HMP-P20014, Rev. 0, P&ID -Melter Process System HLW Melter 2 Cooling System; 24590-HLW-M5-V17T-P0002, Rev. 1, Process Flow Diagram HLW Vitrification Melter 1 (Systems HMP and HOP); 24590-HLW-M5-V17T-P20002, Rev. 1, Process Flow Diagram HLW Vitrification Melter 2 (Systems HMP and HOP). 24590-HLW-P3-HMP-GL02011001, Rev. 0, HLW Vitrification Isometric (Line No. HMP-GL-02011-S11B-0.5); 24590-HLW-P3-HMP-GL02011002, Rev. 0, HLW Vitrification Isometric (Line No. HMP-GL-02011-S11B-0.5); 24590-HLW-P3-HMP-GL02011003, Rev. 0, HLW Vitrification Isometric (Line No. HMP-GL-02011-S10A-0.5); 24590-HLW-P3-HMP-GA02041001, Rev. 0, HLW Vitrification Isometric (Line No. HMP-GA-02041-S11B-0.5); 24590-HLW-P3-HMP-GA02041002, Rev. 0, HLW Vitrification Isometric (Line No. HMP-GA-02041-S11B-0.5); 24590-HLW-P3-HMP-GA02041003, Rev. 0, HLW Vitrification Isometric (Line No. HMP-GA-02041-S10A-0.5); 24590-HLW-P3-HMP-GA02050001, Rev. 0, HLW Vitrification Isometric (Line No. HMP-GA-02050-S11B-0.5). 24590-HLW-HMP-H30500, Rev. 0, Pipe Support Drawing; 24590-HLW-HMP-H30501, Rev. 0, Pipe Support Drawing; 24590-HLW-HMP-H30502, Rev. 0, Pipe Support Drawing; 24590-HLW-HMP-H30503, Rev. 0, Pipe Support Drawing; 24590-HLW-HMP-H30504, Rev. 0, Pipe Support Drawing. **System Description:** 24590-HLW-3YD-HMP-00001, Rev. 1, System Description for HLW Melter Process System (HMP).

Information Assessed		Source of Information	Assessment
Design	Ancillary equipment design standards are appropriate and adequate for the equipment's intended use.	Drawings and System Description listed above under References; 24590-WTP-DC-PS-01-001, Rev. 4, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria;" ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-3DP-G04T-00905, Rev. 7, Determination of Quality Levels.	The Pipe Stress Design Criteria identifies ASME B31.3 as the design code for piping systems of the WTP. The Process System Description document states that the HMP system does not have any important to safety function. Drawings show that the ancillary equipment is of QL-1, QL-2 or commercial quality grade and is Seismic Category SC-I, SC-II, SC-III, or SC-IV. Determination of Quality Levels document and Pipe Stress Design Criteria document provide detailed discussion of quality grades and seismic categories, respectively. The codes and standards used are acceptable and adequate for the design of the ancillary piping for the intended service.
Design	If the ancillary equipment to be used is not built to a design standard, the design calculations demonstrate sound engineering principles of construction.	Drawings and listed above under References; 24590-WTP-DC-PS-01-001, Rev. 4, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-HLW-PHC-HMP-00100, Rev. D, RPP-WTP Pipe Support Calculation for HMP System (non-analyzed piping); 24590-WTP-3DP-G04T-00906, Rev. 4, Isometric Drawings and Associated Calculations; 24590-WTP-3DP-G04B-00037, Rev. 10, Engineering Calculations.	The ancillary equipment is built to design standards. The Pipe Stress Design Criteria specifies that piping is to be designed in accordance with ASME B31.3 Code. The review of the sample isometric and pipe support drawings listed in the References, Pipe Support Calculation, and of the design process and controls described in Isometric Drawings and Associated Calculations, and Engineering Calculations documents provides adequate assurance that HMP ancillary equipment are properly designed, installed, and verified to meet the requirements of the applicable design criteria established for the project. The review of the aforementioned documents demonstrates that sound design engineering principles are used for the design and construction.

Information Assessed		Source of Information	Assessment
Design	Ancillary equipment has adequate strength at the end of its design life to withstand the operating pressure, operating temperature, thermal expansion, and seismic loads. Equipment is protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.	24590-WTP-DC-PS-01-001, Rev. 4, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria;" ASME Boiler and Pressure Vessel Code, Section III, Division 1, Rules for Construction of Nuclear Power Plant Components, American Society of Mechanical Engineers, 1995; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; Uniform Building Code (UBC), 1997; 24590-WTP-PER-M-02-002, Rev. 1, Materials for Ancillary Equipment.	The Pipe Stress Design Criteria requires the use of the ASME B31.3 Code for process piping design. ASME B31.3 requires explicit consideration of operating pressure, operating temperature, thermal expansion/contraction, settlement, vibration, and corrosion allowance in the design of piping. For the seismic design of Seismic Category (SC-I/II/III/IV) ancillary equipment, applicable ASME Section III, Subsection NC and Appendix F and Appendix N, or Uniform Building Code (UBC) are used to supplement the requirements of ASME B31.3. Details of the seismic design methods are discussed in the Pipe Stress Design Criteria document. These are appropriate and adequate codes and standards to assure that the ancillary equipment has adequate strength at the end of its design life to withstand all anticipated loads.

Information Assessed		Source of Information	Assessment
Supports	Ancillary equipment supports are adequately designed.	Drawings listed above under References; 24590-WTP-DC-PS-01-002, Rev. 3, Pipe Support Design Criteria; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; ASME Boiler and Pressure Vessel Code, Section III, Division 1, Rules for Construction of Nuclear Power Plant Components, American Society of Mechanical Engineers, 1995; Uniform Building Code (UBC), 1997; 24590-WTP-PER-PS-02-001, Rev. 4, Ancillary Equipment Pipe Support Design; 24590-WTP-PL-PS-01-001, Rev. 1, Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs (PCFAPPS); 24590-HLW-PHC-HMP-00100, Rev. D, RPP-WTP Pipe Support Calculation for HMP System (non-analyzed piping); 24590-WTP-3DP-G04T-00906, Rev. 4, Isometric Drawings and Associated Calculations; 24590-WTP-3DP-G04B-00037, Rev. 10, Engineering Calculations.	The Pipe Support Design Criteria document considers all loadings identified in ASME B31.3 and utilizes ASME B&PV Code, Section III, Division 1, Subsection NF and Appendix F or UBC, to supplement the requirements of ASME B31.3 for seismic design of Seismic Category (SC-I/II/III/IV) pipe supports. Bounding load cases are passed to the pipe support designers from the results of the ancillary equipment piping stress analyses. Details of the seismic design methodology are discussed in the Pipe Support Design Criteria document. Examples of typical ancillary equipment supports are shown in the Ancillary Equipment Pipe Support Design document. Analysis is by manual calculation or approved computer programs that have been verified and validated. These are appropriate codes and standards for design of ancillary equipment supports for the HMP system. Ancillary equipment supports are to be designed to allow a minimum of heat to be transferred to the building structures. The temperature of the building structures is not to exceed 150°F for concrete and 200°F for steel. The review of the sample isometric drawings, pipe support drawings, Pipe Support Calculations, and that of the design process and controls described in Isometric Drawings and Associated Calculations, and Engineering Calculation documents provides sufficient assurance that HMP ancillary equipment supports are adequately designed, installed, and verified to meet the requirements of the applicable design criteria established for the project.
	The system will withstand the effects of frost heave.	Drawings listed above under References; 24590-WTP-DC-ST-01-001, Rev. 11, Structural Design Criteria.	The Structural Design Criteria requires that all outdoor equipment structural foundations shall extend into the surrounding soil below the 30" frost line to preclude frost heave. The HMP ancillary equipment system considered in this assessment is located inside the HLW facility. The HLW facility structural foundations are well below the grade elevation, therefore, the HMP system is not subjected to any frost heave effects.

Information Assessed		Source of Information	Assessment
Connections	Seams and connections are adequately designed.	24590-WTP-DC-PS-01-001, Rev. 4, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria;" ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; ASME B16.5, Piping Flanges and Flanged Fittings, American Society of Mechanical Engineers; ASME Boiler and Pressure Vessel Code (B&PV), Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers.	The Pipe Stress Design Criteria specifies the ASME B31.3 Process Piping design code for the piping systems. Welding is to be performed in accordance with the requirements of ASME B31.3 and the ASME B&PV Code, Section IX. ASME B16.5 is specified for flange designs. These are appropriate codes and standards for design and fabrication of the HMP System ancillary equipment.
Waste Characteristics	Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, temperature)	System Description listed above under References; 24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems; 24590-WTP-PER-PR-03-002, Rev. 2, Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems.	The Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit System and System Description documents indicate that flammable or explosive concentrations of hydrogen are not expected in the HLW facility systems ancillary equipment. Similarly, the Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems document provides a summary of the HLW facility ancillary equipment design features that provide for confinement and treatment of chronically toxic vapors and emissions during normal operations, abnormal operations, and during and after a Design Basis seismic event.
	Ancillary equipment is designed to handle the wastes with the characteristics defined above and any treatment reagents.	24590-WTP-PER-M-02-002, Rev. 1, Materials for Ancillary Equipment.	The Materials for Ancillary Equipment document specifies that ancillary equipment materials that contact the waste are to be equal to or better than those of the upstream source vessels. Selection of proper material for the HMP piping and equipment ensures that the ancillary equipment is appropriately designed to handle the waste.

Information Assessed		Source of Information	Assessment
Compatibility	The pH range of the waste, waste temperature and the corrosion behavior of the structural materials are adequately addressed. Ancillary equipment material and protective coatings ensure the ancillary equipment structure is adequately protected from the corrosive effects of the waste stream and external environments. The protection is sufficient to ensure the equipment will not leak or fail for the design life of the system.	24590-WTP-DB-ENG-01-001, Rev. 1F, Basis of Design; 24590-WTP-PER-M-02-002, Rev. 1, Materials for Ancillary Equipment; 24590-WTP-3PS-NN00-T0001, Rev. 1, Engineering Specification for Thermal Insulation for Mechanical Systems; ASTM Annual Book of ASTM Standards, American Society of Testing and Materials.	The Basis of Design document identifies a service design life of 40 years for the ancillary equipment. Detailed materials selection (corrosion) evaluations are conducted for each vessel in the HLW facility during process design to assure a 40-year service life. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment in contact with the waste will be equal to or better than the material and corrosion allowance of the waste source vessel. The Thermal Insulation specification requires that all insulating materials used on the outside of ancillary equipment be pre-approved for use on austenitic stainless steel in accordance with applicable ASTM standards and tests to preclude external corrosion of ancillary equipment. Therefore, the ancillary equipment will provide the expected design service life.
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the ancillary equipment.	System Description listed above under References; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-DC-PS-01-001, Rev. 4, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria;" 24590-WTP-DB-ENG-01-001, Rev. 1F, Basis of Design; 24590-WTP-PER-M-02-002, Rev. 1, Materials for Ancillary Equipment; 24590-WTP-PER-PL-02-001, Rev. 6, Piping Material Class Description.	ASME B31.3 is the design code for the WTP piping. Consideration of corrosion, including corrosion allowance, is a mandatory requirement of ASME B31.3 and is appropriately supplemented in the Pipe Stress Design Criteria document. A required service life of 40 years is identified in the Basis of Design for ancillary equipment. Detailed materials selection (corrosion) evaluations are conducted for each vessel in the HLW facility during process design to ensure a 40-year service life. The Materials for Ancillary Equipment document requires that downstream ancillary equipment is to be constructed of equal or better materials, and with the same corrosion allowance as the source vessel. Corrosion/Erosion allowances are listed for the ancillary equipment (each piping class and associated valves, fittings, etc.) in the Piping Material Class Description document.

Information Assessed		Source of Information	Assessment
Pressure Controls	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessels are exceeded.	24590-WTP-DC-PS-01-001, Rev. 4, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria;" ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers.	The Pipe Stress Design Criteria document specifies ASME B31.3 as the design code for the WTP piping. ASME B31.3 requires provision be made to safely contain or relieve any pressure to which the piping may be subjected. ASME B31.3 piping not protected by a pressure relieving device, or that can be isolated from a pressure reliving device must be designed for at least the highest pressure that can be developed.
	Maximum flows and any unusual operating stresses are identified	Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 4, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria;" ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-3PS-P000-T0001, Rev. 5, Engineering Specification for Piping Material Classes General Description and Summary; 24590-WTP-PER-PL-02-001, Rev. 6, Piping Material Class Description; 24590-WTP-3DP-G04T-00906, Rev. 4, Isometric Drawings and Associated Calculations; 24590-WTP-3DP-G04B-00037, Rev. 10, Engineering Calculations.	The expected flow paths for the ancillary equipment are identified on the P&ID drawings. The Pipe Stress Design Criteria specifies the ASME B31.3 code for piping design. This code requires piping to be designed to the highest pressure that can be developed in a piping system assuring that maximum operating stresses remain within code allowables. Piping material classes are shown on the P&ID drawings, embedded in the item numbers for each ancillary equipment component. Each ancillary equipment is designed for the highest anticipated temperature and pressure values which are also within the bounding maximum design temperature and pressure values listed for each piping material class in the Piping Material Class General Description document. ASME B31.3 and the associated standards are appropriate and adequate for the design of the ancillary equipment. Furthermore, the fabrication or isometric drawings released for construction by Bechtel National, Inc. (BNI), and the design process and controls described in the Isometric Drawings and Associated Calculations, and Engineering Calculations documents provides adequate assurance that subject ancillary equipment are properly designed, installed, and verified to meet the requirements identified in the applicable design criteria established for the project.

Information Assessed		Source of Information	Assessment
Secondary Containment	Ancillary equipment is designed with secondary containment that is constructed of materials compatible with the waste and of sufficient strength to prevent failure (pressure gradients, waste, climatic conditions, daily operations), provided with a leak-detection system, and designed to drain and remove liquids.	Drawings listed above under References; 24590-HLW-PER-M-02-001, Rev. 3, HLW Facility Sump Data.	The ancillary equipment considered in this assessment is located in C5/R5 areas (Room H-0117 and H-0106) within the HLW building. These HLW rooms are secondary containment concrete structures provided with stainless steel liner plates and sumps (HSH-SUMP-00003/7), as shown on the general arrangement drawings and in Sump Data document, which are outside the scope of this integrity assessment. The assessment of the secondary containment structures is conducted in a separate document.

Master Distribution Schedule for WTP Project Subcontract Management Group

SUBMITTAL TRANSMITTAL: ☐ First Submittal ☐ Re-Submittal ☐ QVRP Package
☐ No Review Required ☐ No Review Required Re-Submittal ☐ Submittal Supplement

CORRESPONDENCE: ☒ With Attachment ☐ W/O Attachment (letter only)
☐ Fax as Original (Letter Only) ☐ Fax as Original (With Attachment)

☐ Pre-Award/Award Package ☐ Executed Change Order Package
☐ Executed Amendment Package ☐ Back Charge

Subcontract Number:	24590-CM-HC4-HXYG-00211
Subcontract Title:	Tank Integrity Design Assessments by IQRPE
Subcontractor Name:	AREVA NC, Inc.
Subcontract Administrator:	Anne Weldon

PDC Document Number	Rev	Document Title	Rev
139504	0	AREVA -AI-084, Rev. 0	

INCOMING DISTRIBUTION

Name	MSIN/ E-mail	Original	Copy	Copy of cover sheet / transmittal only	Primary File Index	Alternate File Index	Assigned Action or Remarks
PDC	MS9-A	X		B.8			Please rush for permitting
Dan Pfluger	MS5-I		x				
Barbara Dubiel	MS4-D2		x				

OUTGOING DISTRIBUTION FOR RETURNED STATUSED STICKER SUBMITTALS

Name	MSIN/ E-mail	Original	Copy	Copy of cover sheet / transmittal only	Primary File Index	File Index Alternate	Assigned Action or Remarks
PDC	MS9-A	X					

THIS PAGE INTENTIONALLY
LEFT BANK

Drawings and Documents

Attachment 51 – Appendix 11.9
Laboratory Building
Material Selection Documentation

The following drawings have been incorporated into Appendix 11.9 and can be viewed at the Ecology Richland Office. See Appendix 7.9 for material selection documentation common to the Pretreatment, LAW, HLW, and Laboratory buildings. **New drawings are in bold lettering.**

Drawing/Document Number	*Description*
~~24590-LAB-N1D-RLD-P0002, Rev 0~~	~~Material Selection Data Sheet for RLD-VSL-00164~~
24590-LAB-N1D-RLD-P0002, Rev 1	**Material Selection Data Sheet for RLD-VSL-00164**
~~24590-LAB-N1D-RLD-P0003, Rev 0~~	~~Material Selection Data Sheet for RLD-VSL-00165~~
24590-LAB-N1D-RLD-P0003, Rev 1	**Material Selection Data Sheet for RLD-VSL-00165**
RESERVED	RESERVED

24590-LAB-N1D-RLD-P0002
Rev. 1

R10672006

PLANT ITEM MATERIAL SELECTION DATA SHEET

ISSUED BY
RPP-WTP PDC

RLD-VSL-00164 (LAB)
Lab Area Sink Drain Collection Vessel (RLD C3 Vessel)

- Design Temperature (°F)(max/min): 240/-20
- Design Pressure (psig) (max/min): 15/7
- Location: Lab

Operating conditions as stated on attached Material Selection Data Sheet

Options Considered:

- Vessel contains contaminated liquid effluent at normal operating temperatures less than 92°F.
- Mixing will be provided by pumps and eductors. Solid accumulation at bottom of vessel is anticipated. Wash rings are available for flushing.
- Dilute acid is available for cleaning vessel internals.

Materials Considered:

Material (UNS No.)	Relative Cost	Acceptable Material	Unacceptable Material
Carbon Steel	0.23		X
304L (S30403)	1.00		X
316L (S31603)	1.18		X
6% Mo (N08367/N08926)	7.64	X	
Alloy 22 (N06022)	11.4	X	
Ti-2 (R50400)	10.1		X

Recommended Material: UNS N08367 or N08926

Recommended Corrosion Allowance: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)

Process & Operations Limitations:

- Develop flushing/rinsing procedure

STEVEN WAKEMAN VAIL
STATE OF WASHINGTON
39250
REGISTERED
PROFESSIONAL ENGINEER
4/18/06
EXPIRES: 12/07/07

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 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.

This bound document contains a total of 5 sheets.

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	APPROVER
1	4/18/06	Issued for Permitting Use	[signature]	[signature]	[signature]
0	3/4/04	Issued for Permitting Use	DLA	JRD	APR

PLANT ITEM MATERIAL SELECTION DATA SHEET

Corrosion Considerations:

a General Corrosion
In this vessel, the normal pH conditions and temperatures are such that 316L stainless steel would be acceptable if no chlorides are present. However, because of the of expected halide concentration, a 6% Mo alloy will be necessary.

Conclusion:
A 6% Mo alloy is recommended.

b Pitting Corrosion
Chloride is known to cause pitting in acid and neutral solutions. Under the stated conditions, for temperature and pH, a 6% Mo alloy or better is needed.

Conclusion:
Localized corrosion, such as pitting, is common and would be a serious concern at the expected halide levels. Under the stated conditions, 6% Mo is recommended.

c End Grain Corrosion
End grain corrosion only occurs in metal with exposed end grains and in highly oxidizing acid conditions.

Conclusion:
Not likely in this system.

d Stress Corrosion Cracking
The exact amount of chloride required to cause stress corrosion cracking is unknown. In part this is because the amount varies with temperature, metal sensitization, and the environment. But it is also unknown because chloride tends to concentrate under heat transfer conditions, by evaporation, and electrochemically during a corrosion process. Hence, even as little as 10 ppm can lead to cracking under some conditions. Generally, as seen in Sedriks (1996) and Davis (1987), stress corrosion cracking does not usually occur below about 140 °F. With the maximum fluid temperature stated at 92 °F and with a large concentration of chlorides, 316L is not recommended. A more resistant alloy such as 6% Mo alloys or better will be needed.

Conclusion:
A 6% Mo alloy or better is recommended.

e Crevice Corrosion
Non-negligible amounts of solids are expected to accumulate at the bottom of the vessel. With the proposed operating conditions, 304L and 316L are not acceptable. A 6% Mo alloy or better is recommended. In addition, see Pitting.

Conclusion:
A resistant alloy such as a 6% Mo is recommended.

f Corrosion at Welds
Other than pitting or crevice corrosion, corrosion at welds is not considered a problem in the proposed environment.

Conclusion:
Weld corrosion is not considered a problem for this system.

g Microbiologically Induced Corrosion (MIC)
The proposed operating conditions are suitable for microbial growth. However, liquids received should either be treated or DIW so the possibility of infection is small.

Conclusion:
MIC is not considered a problem.

h Fatigue/Corrosion Fatigue
Not expected to be a concern.

Conclusions
Not believed to be a concern.

i Vapor Phase Corrosion
Vapor phase corrosion is not expected to be a concern.

Conclusion:
Not a concern.

PLANT ITEM MATERIAL SELECTION DATA SHEET

j Erosion
Velocities within the vessel are expected to be small. Erosion allowance of 0.004 inch for components with low solids content (< 2 wt%) at low velocities is based on 24590-WTP-RPT-M-04-0008.

Conclusion:
Not a concern.

k Galling of Moving Surfaces
Not applicable.

Conclusion:
Not applicable.

l Fretting/Wear
No contacting surfaces expected.

Conclusion:
Not applicable.

m Galvanic Corrosion
No dissimilar metals are present.

Conclusion:
Not applicable.

n Cavitation
None expected.

Conclusion:
Not a concern.

o Creep
The temperatures are too low to be a concern for metallic vessels.

Conclusion:
Not applicable.

PLANT ITEM MATERIAL SELECTION DATA SHEET

References:

1. 24590-LAB-MVC-RLD-00002, Rev. A, *Material Selection Data Sheet*
2. 24590-WTP-RPT-M-04-0008, Rev. 2, *Evaluation Of Stainless Steel Wear Rates In WTP Waste Streams At Low Velocities*
3. Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073
4. Sedriks, AJ, 1996, *Corrosion of Stainless Steels*, John Wiley & Sons, Inc., New York, NY 10158

Bibliography:

1. Davis, JR (Ed), 1994, *Stainless Steels*, In ASM Metals Handbook, ASM International, Metals Park, OH 44073
2. Hamner, NE, 1981, *Corrosion Data Survey*, Metals Section, 5th Ed, NACE International, Houston, TX 77218
3. Jones, RH (Ed.), 1992, *Stress-Corrosion Cracking*, ASM International, Metals Park, OH 44073
4. Koch, GH, 1995, *Localized Corrosion in Halides Other Than Chlorides*, MTI Pub No. 41, Materials Technology Institute of the Chemical Process Industries, Inc, St Louis, MO 63141
5. Phull, BS, WL Mathay, & RW Ross, 2000, *Corrosion Resistance of Duplex and 4-6% Mo-Containing Stainless Steels in FGD Scrubber Absorber Slurry Environments*, Presented at Corrosion 2000, Orlando, FL, March 26-31, 2000, NACE International, Houston TX 77218.
6. Uhlig, HH, 1948, *Corrosion Handbook*, John Wiley & Sons, New York, NY 10158
7. Van Delinder, LS (Ed), 1984, *Corrosion Basics*, NACE International, Houston, TX 77084

PLANT ITEM MATERIAL SELECTION DATA SHEET

OPERATING CONDITIONS

Materials Selection Data

Component (Name/ID) Radioactive Liquid Disposal Vessel (24590-LAB-MV-RLD-VSL-00164)
System RLD

Chemicals	Unit	Operations Cold Startup	Normal Operation	Standby/Idle	Cleaning	Accident
		Note 1		Note 2		
Aluminum	g/l		1.51E-02			
Bromide	g/l		3.44E-06			
Chloride	g/l		1.88E+00			
Fluoride	g/l		1.62E-01			
Hydroxide	g/l		1.47E-01			
Iron	g/l		4.80E-03			
Nitrate	g/l		1.98E+00			
Nitrite	g/l		6.89E-03			
Phosphate	g/l		2.26E-03			
TOC*	g/l		1.99E-01			
Sulfate	g/l		3.79E-01			
Undissolved solids	g/l		See comments (1)			
Particle size/hardness	μm (##)		NA			
Other ($NaMnO_4$, Hg, etc)	g/l		3.86E-06 (Hg)			
Carbonate	g/l		7.12E+00			
pH	-		6 to 8			
Dose rate – β/γ (inside)	Rad		See comments (2)			
Temperature	°F		See comments (3)			
Velocity	fps		NA			
Vibration			NA			
Time of exposure	#		NA			

- % of total; ## - use Mho scale

Based on Calc. No. 24590-LAB-MVC-RLD-00002, Rev. A

Notes:
Note 1: Assume same as normal operations minus radionuclides.
Note 2: Same as normal operation.

Comments:
(1) Total Solids accumulation per month at the bottom of the C3 vessel (RLD-VSL-00164) = 0.20 m.
(2) Activity in C3 vessel: 137-Cs: 1.10E-07 Ci/gal and 90-Sr: 2.52E-06 Ci/gal.
(3) The minimum, normal, and maximum fluid temperatures will be approximately 50°F, 78°F, and 92°F, respectively.

☐ Black Cell

☐ Flushing

* List expected organic species: Potassium hydrogen phthalate, Ammonium hydrogen malate, Ethanol, Glacial acetic acid, Chloramine-T

Use maximum of 2 significant figures

PLANT ITEM MATERIAL SELECTION DATA SHEET

R10684181

ISSUED BY
RPP-WTP PDC

RLD-VSL-00165 (LAB)
Hotcell Drain Collection Vessel

- Design Temperature (°F)(max/min): 240/-20
- Design Pressure (psig) (max/min): 15/7
- Location: Lab

Contents of this document are Dangerous Waste Permit affecting

Operating conditions as stated on attached Material Selection Data Sheet

Options Considered:

- Vessel contains contaminated liquid effluent at normal operating temperatures less than 92°F.
- Mixing will be provided by pumps and eductors. Solid accumulation at bottom of vessel is anticipated. Wash rings are available for flushing.
- Dilute acid is available for cleaning vessel internals.

Materials Considered:

Material (UNS No.)	Relative Cost	Acceptable Material	Unacceptable Material
Carbon Steel	0.23		X
304L (S30403)	1.00		X
316L (S31603)	1.18		X
6% Mo (N08367/ N08925/N08926)	7.64	X	
Alloy C-276 (N10276)	~10	X	
Alloy C-22 (N06022)	11.4	X	
Ti-2 (R50400)	10.1		X

Recommended Material: UNS N08367, N08925 or N08926 (6% Mo alloys) or better

Recommended Corrosion Allowance: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)

Process & Operations Limitations:

- Develop flushing/rinsing procedure

STEVEN WAKEMAN VAIL
STATE OF WASHINGTON
39250
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES: 12/07/07
1/12/06

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 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.

This bound document contains a total of 5 sheets.

1	1/12/06	Issued for Permitting Use	[signature]	[signature]	[signature]
0	3/14/04	Issued for Permitting Use	DLA	JRD	APR
REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	APPROVER

PLANT ITEM MATERIAL SELECTION DATA SHEET

Corrosion Considerations:

a General Corrosion
In this vessel, the normal pH conditions and temperatures are such that 316L stainless steel would be acceptable if no chlorides are present. However, because of the expected halide concentration, a 6% Mo alloy is recommended.

Conclusion:
A 6% Mo alloy is recommended.

b Pitting Corrosion
Chloride is known to cause pitting in acid and neutral solutions. At the lower end of the stated pH range, with the expected halide concentrations, 316L is a marginal choice. A 6% Mo alloy or better is needed.

Conclusion:
Localized corrosion, such as pitting, is common and would be a concern at the expected halide levels. Under the stated conditions, a 6% Mo alloy is the minimum recommended.

c End Grain Corrosion
End grain corrosion only occurs in metal with exposed end grains and in highly oxidizing acid conditions.

Conclusion:
Not likely in this system.

d Stress Corrosion Cracking
The exact amount of chloride required to cause stress corrosion cracking is unknown. In part this is because the amount varies with temperature, metal sensitization, and the environment. But it is also unknown because chloride tends to concentrate under heat transfer conditions, by evaporation, and electrochemically during a corrosion process. Hence, even as little as 10 ppm can lead to cracking under some conditions. Generally, as seen in Sedriks (1996) and Davis (1987), stress corrosion cracking does not usually occur below about 140°F. With the maximum fluid temperature stated at 92 °F and with a large concentration of chlorides, 316L is not recommended. A more resistant alloy such as 6% Mo alloys or better will be needed.

Conclusion:
A 6% Mo alloy or better is recommended.

e Crevice Corrosion
Non-negligible amounts of solids are expected to accumulate at the bottom of the vessel. With the proposed operating conditions, 304L and 316L are not acceptable. A 6% Mo alloy or better is recommended. In addition, see Pitting.

Conclusion:
A resistant alloy such as a 6% Mo is recommended.

f Corrosion at Welds
Other than pitting or crevice corrosion, corrosion at welds is not considered a problem in the proposed environment. 6% Mo alloys must be welded with a high molybdenum filler metal such as NiCrMo-3.

Conclusion:
Weld corrosion is not considered a problem for this system.

g Microbiologically Induced Corrosion (MIC)
The proposed operating conditions are suitable for microbial growth. However, liquids received should either be treated or DIW so the possibility of infection is small.

Conclusion:
MIC is not considered a problem.

h Fatigue/Corrosion Fatigue
Not expected to be a concern.

Conclusion:
Not believed to be a concern.

i Vapor Phase Corrosion
Vapor phase corrosion is not expected to be a concern.

Conclusion:
Not a concern.

PLANT ITEM MATERIAL SELECTION DATA SHEET

j Erosion
Velocities within the vessel are expected to be low. Erosion allowance of 0.004 inch for components with low solids content (< 2 wt%) at low velocities is based on 24590-WTP-RPT-M-04-0008.

Conclusion:
Not a concern.

k Galling of Moving Surfaces
Not applicable.

Conclusion:
Not applicable.

l Fretting/Wear
No contacting surfaces expected.

Conclusion:
Not applicable.

m Galvanic Corrosion
No dissimilar metals are present.

Conclusion:
Not applicable.

n Cavitation
None expected.

Conclusion:
Not a concern.

o Creep
The temperatures are too low to be a concern for metallic vessels.

Conclusion:
Not applicable.

p Inadvertent Addition of Nitric Acid
Higher chloride contents and higher temperatures usually require higher alloy materials. Nitrate ions inhibit the pitting and crevice corrosion of stainless alloys. Furthermore, nitric acid passivates these alloys; therefore, lower pH values brought about by increases in the nitric acid content of process fluid will not cause higher corrosion rates for these alloys. The upset condition that was most likely to occur is lowering of the pH of the vessel content by inadvertent addition of 0.5 M nitric acid. Lowering of pH may make a chloride-containing solution more likely to cause pitting of stainless alloys. Increasing the nitric acid content of the process fluid adds more of the pitting-inhibiting nitrate ion to the process fluid. In addition, adding the nitric acid solution to the stream will dilute the chloride content of the process fluid.

Conclusion:
The recommended materials will be able to withstand a plausible inadvertent addition of 0.5 M nitric acid.

PLANT ITEM MATERIAL SELECTION DATA SHEET

References:

1. 24590-LAB-MVC-RLD-00003, Rev. A, *Material Selection Data Sheet*
2. 24590-WTP-RPT-M-04-0008, Rev. 2, *Evaluation Of Stainless Steel Wear Rates In WTP Waste Streams At Low Velocities*
3. Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073
4. Sedriks, AJ, 1996, *Corrosion of Stainless Steels*, John Wiley & Sons, Inc., New York, NY 10158

Bibliography:

1. 24590-LAB-3YD-RLD-00001, *System Description for the Radioactive Liquid Waste Disposal System (RLD) for the Analytical Laboratory.*
2. Davis, JR (Ed), 1994, *Stainless Steels*, In ASM Metals Handbook, ASM International, Metals Park, OH 44073
3. Hamner, NE, 1981, *Corrosion Data Survey*, Metals Section, 5th Ed, NACE International, Houston, TX 77218
4. Jones, RH (Ed.), 1992, *Stress-Corrosion Cracking*, ASM International, Metals Park, OH 44073
5. Koch, GH, 1995, *Localized Corrosion in Halides Other Than Chlorides*, MTI Pub No. 41, Materials Technology Institute of the Chemical Process Industries, Inc, St Louis, MO 63141
6. Phull, BS, WL Mathay, & RW Ross, 2000, *Corrosion Resistance of Duplex and 4-6% Mo-Containing Stainless Steels in FGD Scrubber Absorber Slurry Environments*, Presented at Corrosion 2000, Orlando, FL, March 26-31, 2000, NACE International, Houston TX 77218.
7. Uhlig, HH, 1948, *Corrosion Handbook*, John Wiley & Sons, New York, NY 10158
8. Van Delinder, LS (Ed), 1984, *Corrosion Basics*, NACE International, Houston, TX 77084

PLANT ITEM MATERIAL SELECTION DATA SHEET

OPERATING CONDITIONS

CALCULATION SHEET

BY: Rudi N. Kapoor
DATE: 04/16/2003
SUBJECT: Process and Materials Selection Data for Hotcell Drain Collection Vessel (RLD-VSL-00165)

PROJECT: RPP-WTP
JOB NO: 24590
CALC NO: 24590-LAB-MVC-RLD-00003
SHEET REV: A
SHEET NO: [illegible]
[illegible] 4/21/03

Materials Selection Data

Document No. 24590-LAB-MVC-RLD-00003, Rev. A

Component (Name/ID) Radioactive Liquid Disposal Vessel (24590-LAB-MV-RLD-VSL-00165)

System RLD-VSL-00165

Fabrication/Construction

Welded
Heat treatment
Mechanical treatment
Surface finish
Coating
Lining
Corrosion allowance

Transportation

Procedure

External Environment

Humidity
Adjacent flooding

Chemicals	Unit	Operations: Cold Startup	Normal Operation*	Standby/Idle	Cleaning	Accident
		Note 1		Note 2		
Aluminum	g/l		[illegible]			
Bromide	g/l		[illegible]			
Chloride	g/l		[illegible]			
Fluoride	g/l		[illegible]			
Hydroxide	g/l		[illegible]			
Iron	g/l		[illegible]			
Nitrate	g/l		[illegible]			
Nitrite	g/l		[illegible]			
Phosphate	g/l		[illegible]			
TOC[a]	g/l		[illegible]			
Sulfate	g/l		[illegible]			
Undissolved solids	g/l		See comment (1)			
Particle size/hardness	µm (##)		NA			
Other ($NaMnO_4$, Hg, etc)	g/l		[illegible] (Hg)			
Carbonate	g/l		[illegible]			
pH	-		[illegible]			
Dose rate, α, β/γ (mode)	Rad		See comment (2)			
Temperature	°F		See comment (3)			
Velocity	ft/s		NA			
Vibration			NA			
Time of exposure	#		NA			

* Based on Calc. No. 24590-LAB-MVC-RLD-00003, Rev A

\# - % of total; ## - use Mohs scale

Assumptions:

Remarks:

Notes
Note 1: Assume same as normal operations minus radionuclides
Note 2: Same as normal operation

Comments:
(1) Total Solids accumulation per month at the bottom of the CS vessel (RLD-VSL-00165) = 0.20 in
(2) Activity in CS vessel: 137-Cs: 1.82E-03 Ci/gal and 90-Sr: 1.80E-03 Ci/gal
(3) The minimum, normal, and maximum fluid temperatures will be approximately 59°F, 78°F, and 97°F, respectively.

Prepared by: R. Kapoor RNK Checked by: S. Ruff Approved by: Abdul Dada
Dates 4/17/03 SRR 4-17-03 [signature] 4/22/03

☐ Black Cell

☐ Flushing

[a] List expected organic species. Potassium hydrogen phthalate, Ammonium hydrogen oxalate, Ethanol, Glacial acetic acid, Chloramine-T

* Use maximum of 2 significant figures

THIS FAGE INTENTIONALLY
LEFT BANK