



MECHANICAL SYSTEMS DATA SHEET: SBS

PLANT ITEM No.

**24590-HLW-MK-HOP-SCB-00001
24590-HLW-MK-HOP-SCB-00002**

Project:	RPP-WTP	P&ID:	24590-HLW-M6-HOP-00001,20001
Project No:	24590	Process Data Sheet:	24590-HLW-MKD-HOP-00006,00013
Project Site:	Hanford	Vessel Drawing:	24590-HLW-MK-HOP-00001001, 1002, 1003, 1004
		Calculation:	24590-HLW-MEC-HOP-00008, 24590-HLW-MEC-HOP-00009, 24590-HLW-MKC-HOP-00003, 24590-HLW-M4C-HOP-00011, 24590-HLW-M4C-30-00003, 24590-HLW-MVC-30-00001, 24590-HLW-N1D-HOP-00010
Description:	HLW Submerged Bed Scrubber		

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

Reference Data

Charge Vessels (Tag Numbers)	None
Pulsejet Mixers / Agitators (Tag Numbers)	None
RFDs/Pumps (Tag Numbers)	None

Design Data

Quality Level	Q	Fabrication Specs	24590-WTP-3PS-MV00-T0001: NDE requirements are L-1		
Seismic Category	SC-I	Design Code	ASME VIII Div 1		
Service/Contents	Radioactive Liquid	Code Stamp	Yes		
Design Specific Gravity	1.1	NB Registration	Yes		
Maximum Operating Volume (not counting internals)	gal 3,329	Weights (lbs)	Empty	Operating	Test
Total Volume (not counting internals)	gal 4,308	Estimated	50,790	81,900	88,490
Environmental Qualification Requirements	See Attachment 1	Actual *			
Dangerous Waste Permit Affecting	Yes				

Inside Diameter	inch	120	Wind Design	N/A	
Length/Height (TL-TL)	inch	69	Snow Design	N/A	
		Vessel Operating	Vessel Design	Coil/Jacket Design	Seismic Design
					24590-WTP-3PS-MV00-T0002 24590-WTP-3PS-SS90-T0001
Internal Pressure	psig	ATM	15	Note 15	Seismic Base Moment *
External Pressure	psig	1.5	6.0	-	ft*lb
			(Note 2)		Per Code
Temperature	°F	104 - 140	237	237	Corrosion Allowance
		(Note 3)			inch 0.08 (see Note 7)
Min. Design Metal Temp.	°F	41			Hydrostatic Test Pressure *
					psig

Materials of Construction

Component	Material	Minimum Thickness / Size	Containment
Top Head	SB575 N06022	See Drawing	Auxiliary
Shell	SB575 N06022	See Drawing	Primary
Bottom Head	SB575 N06022	See Drawing	Primary
Support	SA240 304 (Note 5)	See Drawing	N/A
Internal Coils/External Jacket	SB622 N06022/ SA312 304 (Note 5)	See Drawing	N/A
Internals	SB575 N06022 / SB622 N06022 (Note 6)	See Drawing	N/A
Pipe	SB622 N06022	See Drawing	Note 8
Forgings/ Bar stock	SB564 N06022	See Drawing	N/A
Gaskets	EPDM (Note 17)	N/A	N/A
Bolting	SA193 Grade B16	N/A	N/A

Miscellaneous Data

Orientation	Vertical	Support Type	Skirt
Insulation Function	None	Insulation Material	None
Insulation Thickness (inch)	None	Internal Finish	Welds descaled as laid

R11224692



MECHANICAL SYSTEMS DATA SHEET: SBS

PLANT ITEM No.

24590-HLW-MK-HOP-SCB-00001
24590-HLW-MK-HOP-SCB-00002

External Finish

Welds descaled as laid

Remarks

* To be determined by the vendor.

Note 1 : Deleted.

Note 2 : Design of shell & head under jacket is to be based on 65 psig internal jacket pressure plus 6.0 psig internal vacuum on main vessel.

Note 3 : The vessel headspace minimum operating temperature is 104 °F, however, operating fluctuations can allow it to reach 212 °F maximum.

Note 4 : Deleted.

Note 5 : SA240 304 & SA312 304 stainless steel material shall have carbon content of 0.030% maximum. Non welded items are excluded from this requirement.

Note 6 : Internal fasteners shall be of alloy N06022 material.

Note 7 : Corrosion allowances:

o Shell and bottom head jacket: A corrosion allowance of 0.01" shall be applied to external surfaces of vessel shell & bottom head exposed to cooling water. A corrosion allowance of 0.04" shall be applied to the stainless steel wetted parts of the shell and bottom head jacket.

o Cooling Coils: The cooling coils shall be provided with a 0.08" external corrosion allowance and 0.01" internal corrosion allowance.

Note 8 : Nozzle necks below the high operating liquid level are primary, the others are auxiliary.

Note 9 : Deleted.

Note 10 : The internal coils maximum operating pressure is 98 psig and maximum operating temperature is 113 °F.

Note 11 : Deleted.

Note 12 : Deleted.

Note 13: Deleted.

Note 14: Deleted.

Note 15: The internal design pressure for the internal coils is 150 psig and the internal design pressure for the cooling jacket is 65 psig.

Note 16: Deleted.

Note 17: EPDM is qualified for the radiation (~ 1.0E6 Rads) and temperature environment (~ 250°F) in the melter cave.

Note 18: Data from 24590-HLW-MVC-30-00001.

Note 19: Deleted.

Note 20: Contents of this document are Dangerous Waste Permit affecting.

Note 21: 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.

Note 22: Deleted.

Note 23: Attachment 2 added for BNI use only.

Note 24: The following nozzle loads are to be used for N11, N12, and N13 per CCN 151558:

Axis directions follow Global Axis Orientation: X = North, Y = Up, Z = East

N11 Design Loads						
Load Case	Flange Forces (Lbs)			Flange Moments (Ft-Lbs)		
	Fx	Fy	Fz	Mx	My	Mz
Weight	348	1314	401	2748	0	2387
Thermal (450 °F)	14	208	128	1078	362	740
Thermal (1000 °F)	198	424	329	2485	326	1981



MECHANICAL SYSTEMS DATA SHEET: SBS

PLANT ITEM No.

24590-HLW-MK-HOP-SCB-00001
24590-HLW-MK-HOP-SCB-00002

Seismic	329	414	342	1469	1333	1346
---------	-----	-----	-----	------	------	------

N12 Design Loads						
Load Case	Flange Forces (Lbs)			Flange Moments (Ft-Lbs)		
	Fx	Fy	Fz	Mx	My	Mz
Weight	0	683	11	38	0	0
Thermal (165 °F)	314	616	259	945	549	1801
Seismic	293	468	340	1763	148	1630

N13 Design Loads						
Load Case	Flange Forces (Lbs)			Flange Moments (Ft-Lbs)		
	Fx	Fy	Fz	Mx	My	Mz
Weight	343	1291	386	3128	58	2600
Thermal (1000 °F)	143	420	307	2538	572	1897
Seismic	356	418	362	1751	1847	1553

The following nozzle loads due to HLW jumpers are applied at the jumper connection and are to be used per 24590-WTP-3PN-MV00-00027:

Jumper Pipe Size	Load Type	Forces			Moments		
		Fx (lb)	Fy (lb)	Fz (lb)	Mx (ft-lb)	My (ft-lb)	Mz (ft-lb)
2 in	Weight	30	150	30	100	20	100
	Seismic	100	140	100	225	200	225
	Thermal	200	80	200	250	200	250
3 in	Weight	170	490	170	300	280	300
	Seismic	430	290	430	600	400	600
	Thermal	610	360	610	1010	500	1010
4 in	Weight	500	800	500	950	500	950
	Seismic	550	500	550	650	650	650
	Thermal	1300	600	1300	1050	1000	1050
6 in	Weight	600	2000	600	2000	700	2000
	Seismic	1500	1500	1500	1500	1500	1500
	Thermal	2000	2000	2000	2000	2000	2000
8 in	Weight	1800	3600	1800	3100	1800	3100
	Seismic	3100	3100	3100	3600	3100	3600
	Thermal	3100	3100	3100	3100	3100	3100



MECHANICAL SYSTEMS DATA SHEET: SBS

PLANT ITEM No.

24590-HLW-MK-HOP-SCB-00001
24590-HLW-MK-HOP-SCB-00002

Table of Nozzle Connections.

Nozzle	Connecting Jumper Size	Design Pressure (psig)	Design Temperature (°F)
N01	Nozzle sizes are the same as those listed in the Nozzle Table of BNI Dwg 24590-HLW-MK-HOP-00001001 Rev. 1.	135	113
N02		-6/15	237
N03		-14.7	113
N04		-14.7	113
N05		-6/15	237
N06		135	113
N07		NA	NA
N08		110	165
N09		NA	NA
N10		-6/15	237
N11		-6/15	237
N12		-6/15	237
N13		-6/15	237
N14		-6/15	237
N15		150	113
N16		150	113
N17		150	113
N18		150	113
N19		150	113
N20		150	113
N21		-14.7	165
N22		-14.7	165
N23		110	165
N24		110	165
N25		-14.7	165
N26		-14.7	165
N27		-14.7	165
N28		65	113
N29		65	113

Equipment Cyclic Data Sheet

Component Plant Item Number:	24590-HLW-MK-HOP-SCB-00001/-00002
Component Description	Vessel
<i>The information below envelopes operational duty for fatigue assessment. It is not to be used as operational data.</i>	
Materials of Construction	SB575 N06022 (Hastelloy C -22)
Design Life	40 years

13



MECHANICAL SYSTEMS DATA SHEET: SBS

PLANT ITEM No.

24590-HLW-MK-HOP-SCB-00001
24590-HLW-MK-HOP-SCB-00002

Component Function and Life Cycle Description	The SBS is a vessel designed for aqueous scrubbing of entrained radioactive particulate from the melter offgas. It also serves to cool and condense the melter vapor emissions.	13
	The inlet temperature ranges from 371°F to 764°F. Operating temperature of the SBS ranges from 104 - 140°F with nominal setpoint of 122°F. Cooling coils and a cooling jacket remove the heat from the inlet offgas stream.	13
	Deleted.	13
	Non-routine maintenance is expected to occur annually. During this period the SBS will be allowed to cool and remain at ambient temperature, from 59 to 113 °F.	13

Load Type (see Note 18)	Min	Max	Number of Cycles	Comment
Design Pressure psig	-6.0	15	10	Nominal assumption
Operating Pressure psig	-1.78	0	40	Assume an annual shutdown (40 cycles/life time).
Operating Temperature °F	104	140	40	Normal operating range
Contents Specific Gravity	1	1.1	40	Nominal operating is 1.1, assume annual flush out and replace with clean water. "Min" value per "Design Data" table, page 1 of this data sheet.
Contents Level inch	0	57	120	Nominal operating is 57 inch, assume annual 3x flush out and replace with clean water.
Localized Features	Temperatures below are in °F.			
Headspace temperature with inlet offgas flow through N11 only.	Deleted	Assume normal mode is feeding with 40 cycles to upset (122 to 212) and back to idle (212 to 140). Assume normal mode is feeding with 2100 cycles to idle (122 to 140) and back to feeding (140 to 122). Assume mode is idle with 40 cycles to upset (140 to 212), and return to idle (212 to 140). Assume mode is idle with 40 cycles to off (140 to 59) and back to idle (59 to 140).		
Headspace temperature with inlet offgas flow through N13 only.	Deleted	Assume normal mode is stand-by, with 40 cycles to upset (104 to 212) and back to stand-by (212 to 104). [Unplanned activations]. Assume mode is stand-by with 2100 cycles to upset (104 to 212), and return to stand-by (212 to 104). [Weekly surveillance tests] Assume mode is idle with 40 cycles to off (140 to 59) and back to idle (59 to 140).		
Cooling supply/returns	(1) Maximum cooling jacket: 83 in, 89 out; minimum cooling jacket: 63 in, 69 out (2) Maximum cooling coils: 83 in, 101 out; minimum cooling coils: 63 in, 81 out		Assume annual cooling outage with inlet cooling jacket & cooling coil temperatures of 63 and outlet temperatures of 69 & 81, respectively, and SBS vessel temperature of 140 with ambient temperature of 59 (40 cycles). Assume annual cooling supply failure/isolation during operation, in=out=212 (40 cycles).	



MECHANICAL SYSTEMS DATA SHEET: SBS

PLANT ITEM No.

24590-HLW-MK-HOP-SCB-00001
24590-HLW-MK-HOP-SCB-00002

Notes

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

The following off-gas temperatures are to be used for determining N11 & N13 vessel flange temperatures:

Temperature (°F)	Description
1,320	Bounding upper inlet bulk temperature of off-gas at maximum flow for N11
924	Pipe wall temperature @ bulk temperature of 1,320 °F for N11
497	Bounding lower bulk temperature while feeding for nominal feed case for N11 & N13



The maximum coincident local operating temperature at each jumper flange adjacent to N11 and N13 occurs at the lower bulk temperature (497°F) while feeding. The maximum non-coincident local operating temperature at each jumper flange at idle (1,320°F) for N11 and the lower bulk temperature (497°F) while feeding for N13.

Safety Screening/Evaluation Required? If yes per 24590-WTP-GPP-SREG-002, E&NS Signature below

Yes No

Approval

Rev	Description	System Engr	Vessel Engr	Checked	E&NS	Approved	Date
0	Issued For Purchase	M.S.	D.H.	C.S. W.D.	N/A	M.H. W.E	01/25/03
1	Issued For Purchase (Added Note 13)	M.S.	M.A.	W.D., C.S.	N/A	M.H., W.E.	4/18/03
2	Issued for Purchase	R. Peters	M. Arampalam	M. Studd	N/A	J. Pullen	4/1/04
3	Issued for Purchase	R. Peters	M. Arampalam	J. Rouse	N/A	E. Isern	9/2/04
4	Issued for Purchase	R. Peters	M. Arampalam	J. Rouse	N/A	E. Isern	11/30/04
5	Issued for Purchase	R. Peters	M. Arampalam	J. Rouse	N/A	E. Isern	6/30/05
6	Issued for Purchase	J. Rouse	R. Peters	A. Benamou	N/A	J. Julyk	12/8/05
7	Issued for Purchase (revised to SC-I from SC-III; revised nominal feed & upset temperatures; cooling water temps revised; EQ data updated)	J. Rouse	R. Peters	N. Johnson	C. Meng	J. Julyk	3/6/07
8	Updated EQ Data & added nozzle loads for N11, N12, & N13	J. Rouse	R. Peters	P. Pinto/ R. Hills	C. Meng	J. Julyk	4/17/07
9	Added jumper nozzle loads, Notes 20 & 21, & EQD	M. O'Neil	R. Peters	W. Wilcox	M. Hinton	J. Julyk	6/24/08
10	See Note 22.	A. Coulam	R. Peters	M. Seed	C. Meng	J. Julyk	10/21/08
11	Added Calc for HLW Vessel Cyclic Inputs & Deleted HPAV Loads	M. Kufahl	R. Peters	M. Seed	C. Meng	J. Julyk	2/17/09
12	Specified jumper load location; revised cooling water info; revised operating & total volumes, added corrosion allowance for vessel portion exposed to cooling water. Added nozzle temperatures	M. O'Neill	R. Peters	M. Seed	C. Meng	J. Julyk	10/22/09



MECHANICAL SYSTEMS DATA SHEET: SBS

PLANT ITEM No.

24590-HLW-MK-HOP-SCB-00001
24590-HLW-MK-HOP-SCB-00002

13	Revised vessel headspace temperatures, added local jumper flange temperatures, and clarified fatigue cycles.	M. O'Neill <i>m O'Neill</i>	Ray Peters <i>Ray PETERS</i>	Rich Peters <i>RDP</i>	C. Meng <i>CMeng</i>	J. Julyk <i>J Julyk</i>	6/16/10
----	---	--------------------------------	---------------------------------	---------------------------	-------------------------	----------------------------	---------



RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

EQUIPMENT QUALIFICATION DATA SHEET

FOR

HLW Submerged Bed Scrubber (SBS)

Attachment 1



EQUIPMENT QUALIFICATION DATASHEET (EQD)

24590-HLW-MKD-HOP-00016 Rev.: 13

Attachment 1, Page 2 of 4

Equipment Identification			
Component Tag Number	24590-HLW-MK-HOP-SCB-00001/00002	Safety Classification	<input checked="" type="checkbox"/> SC <input checked="" type="checkbox"/> SS <input type="checkbox"/> APC <input type="checkbox"/> SDC <input type="checkbox"/> SDS <input type="checkbox"/> RRC
Manufacturer / Supplier	GE - Hitachi		The SBS is SS for gas confinement and SC for liquid confinement following a seismic event.
Requisition Number	24590-QL-MRA-MKAS-00004		
Model	N/A	Seismic Category	<input checked="" type="checkbox"/> SC-I <input type="checkbox"/> SC-II <input checked="" type="checkbox"/> SC-III <input type="checkbox"/> SC-IV
Description (Include descriptive text [e.g., location, elevation])	The Submerged Bed Scrubbers are located in the melter caves in rooms H-0106 and H-0117 at column lines K-9 and K-14, respectively (El. 0' - 0").		The SBS is SC-III for gas confinement and SC-I for liquid confinement following a seismic event. The entire SBS vessel, including internals, shall be designed as SC-1.
Safety Function(s)	1. Safety Class Function - The SBS maintains its liquid level following a seismic DBE (24590-WTP-PSAR-ESH-01-002-04 Rev. 4m, Table 4A-1, page 4A-5). 2. Safety Significant Function - The SBS ensures confinement of radioactive materials during normal operations and accident conditions (24590-WTP-PSAR-ESH-01-002-04 Rev. 4m, Table 4A-2, page 4A-14).		
Seismic Safety Function	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Room Number(s): H-0106 & H-0117	
Maintenance Accessible	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Method of Maintenance Access: <input checked="" type="checkbox"/> Remote <input type="checkbox"/> Hands On <input type="checkbox"/> None	
Seismic Operability Requirements:	<input checked="" type="checkbox"/> During Seismic Event <input checked="" type="checkbox"/> After Seismic Event		
ITS Equipment Type:	<input checked="" type="checkbox"/> Passive Mechanical <input type="checkbox"/> Active Mechanical <input type="checkbox"/> Electrical		

Equipment Environmental Qualification (EEQ)					
Environment	<input checked="" type="checkbox"/> Mild <input type="checkbox"/> Harsh	Hi Rad Service	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Design Life (yrs)	<input checked="" type="checkbox"/> 40 <input type="checkbox"/> Other _____
Contamination Class:	C5				
Radiation Class:	R5				
Parameter Type/Units	Parameter Value	Time Duration (number)	Time Units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Normal					
Normal High Temperature (°F)	113	Continu-ous	yrs	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Normal Low Temperature (°F)	59	Continu-ous	yrs	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Normal High Relative Humidity (%RH)	100	Continu-ous	yrs	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Normal Low Relative Humidity (%RH)	5	Continu-ous	yrs	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Normal High Pressure (in.-w.g.)	0	Continu-ous	yrs	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Normal Low Pressure (in.-w.g.)	-1.4	Continu-ous	yrs	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Normal Radiation Dose Rate (mR/hr)	5.02E+04	40	yrs	Note 1	Note 5
Vibration Magnitude (g)	N/A	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	N/A
Vibration Frequency (Hz)	N/A	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	N/A



EQUIPMENT QUALIFICATION DATASHEET (EQD)

24590-HLW-MKD-HOP-00016
Rev.: 13

Attachment 1, Page 3 of 4

Equipment Environmental Qualification (EEQ) (continued)

Parameter Type/Units	Parameter Value	Time Duration (number)	Time units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Additional Normal Information:		Note 1: CCN 177691			
Abnormal					
Abnormal High Temperature (°F)	170	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Abnormal Low Temperature (°F)	40	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Abnormal High Relative Humidity (%RH)	100	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Abnormal Low Relative Humidity (%RH)	2	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Abnormal High Pressure (in.-w.g.)	4	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Abnormal Low Pressure (in.-w.g.)	-6.7	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
Abnormal Radiation Dose Rate (mR/hr)	1.52E+05	40	yrs	Note 2	Note 5
Wet Sprinkler System Present	Not required	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	N/A
Additional Abnormal Information		Note 2: CCN 177691			
Design Basis Events (DBE)					
DBE High Temperature (°F)	165	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
DBE Low Temperature (°F)	40	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
DBE High Relative Humidity (%RH)	100	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
DBE Low Relative Humidity (%RH)	2	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
DBE High Pressure (in.-w.g.)	4	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
DBE Low Pressure (in.-w.g.)	-6.7	N/A	N/A	24590-HLW-U0D-W16T-00001 Rev.0	TBD
DBE Radiation Dose Rate (mR/hr)	1.52E+05	0	yrs	Note 3	Note 5
Flood Height (ft)	3.80	1,000	hrs	24590-HLW-U0D-W16T-00001 Rev.0	N/A
Submergence (ft)	Note 4	N/A	N/A	N/A	N/A
Chemical/Spray Exposure	No	N/A	N/A	N/A	N/A
Additional DBE Information		Note 3: CCN 177691 Note 4: The SBS is not submerged during flood conditions.			



EQUIPMENT QUALIFICATION DATASHEET (EQD)

24590-HLW-MKD-HOP-00016 Rev.: 13

Attachment 1, Page 4 of 4

DBE Chemical Exposure Details	
DBE Chemical Types/Concentrations	1. There is no spray source present normally. 2. A nitric acid line is used for maintenance only and is normally inactive. 3. The SBS's are unaffected by glass formers since they are ~ 6 ft. from the feed vessel and separated from the feed vessels by a concrete wall.

Interfaces (Electrical)	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Interfaces (Mechanical)	
Mounting Configuration (orientation)	Vertical vessel
Mounting Method (bolts, welds, etc.)	Anchor bolts
Auxiliary Devices	N/A

Equipment Seismic Qualification (ESQ)				
Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification (BUYER)	Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks	24590-WTP-3PS-SS90-T0001	Rev. 1	N/A
Specified Seismic Load (BUYER)	HLW Vitrification Building Seismic Analysis - WSGM In-Structure Response Spectra (ISRS)	Calculation 24590-HLS-S0C-S15T-00057; ISRS Figures 554, 555, & 557; CCN 214807	Rev. 00A	N/A
Design Seismic Load (SELLER)	TBD	TBD	TBD	N/A
Qualification Method (SELLER)	TBD	TBD	TBD	Dynamic Analysis
Qualification Report Number (SELLER)	TBD	TBD	TBD	N/A
Submittal Number (BUYER)	TBD	TBD	TBD	N/A

Notes and Additional Information
Note 5: BNI (BUYER) shall perform Equipment Environmental Qualification in accordance with 24590-WTP-DC-ENG-06-001, Design Criteria for Equipment Seismic and Environmental Qualification.

13

FOR BNI USE ONLY

Attachment 2: References for Submerged Bed Scrubber Vessels 24590-HLW-MK-HOP-SCB-00001/00002

Data Sheet: 24590-HLW-MKD-HOP-00016 Rev. 12

Data	Document #	Rev	Document Title	Comments
Quality Level	24590-HLW-M6-HOP-00001	5	P&ID - HLW Melter Offgas System Melter 1 Primary Offgas Scrubber	
Seismic Category	24590-HLW-M6-HOP-00001	5	P&ID - HLW Melter Offgas System Melter 1 Primary Offgas Scrubber	
Design Specific Gravity	24590-HLW-MVC-30-00001	B	HLW Vessel Cyclic Datasheet Inputs	
Max Operating Volume	24590-HLW-MKC-HOP-00003	0	Process Sizing of the HLW Submerged Bed Scrubber	volumes are approximations only
Total Volume	24590-HLW-MKC-HOP-00003	0	Process Sizing of the HLW Submerged Bed Scrubber	volumes are approximations only
Inside Diameter	24590-HLW-MKC-HOP-00003	0	Process Sizing of the HLW Submerged Bed Scrubber	
Length TL-TL	24590-HLW-MKC-HOP-00003	0	Process Sizing of the HLW Submerged Bed Scrubber	
Vessel Operating Pressure (Min./Max.)	24590-HLW-MVC-30-00001	B	HLW Vessel Cyclic Datasheet Inputs	
Vessel Operating Pressure (external)	24590-HLW-MVC-30-00001	B	HLW Vessel Cyclic Datasheet Inputs	
Vessel Operating Pressure (internal)	24590-HLW-MVC-30-00001	B	HLW Vessel Cyclic Datasheet Inputs	
Vessel Design Pressure (internal)	24590-HLW-MVC-30-00001	B	HLW Vessel Cyclic Datasheet Inputs	15 psig value is provided in Section 16
Vessel Design Pressure (external)	24590-HLW-MVC-30-00001	B	HLW Vessel Cyclic Datasheet Inputs	
Internal Cooling Coils Operating Pressure	24590-HLW-M6X-HOP-00001	5	Line List	
Cooling Jacket Operating Pressure	24590-HLW-M6X-HOP-00001	5	Line List	
Internal Cooling Coils Design Pressure	24590-HLW-M6X-HOP-00001	5	Line List for 24590-HLW-M6-HOP-00001	
Cooling Jacket Design Pressure	24590-HLW-M6X-HOP-00001	5	Line List for 24590-HLW-M6-HOP-00001	
Vessel Operating Temperature (Min./Max.)	24590-HLW-MVC-30-00001	B	HLW Vessel Cyclic Datasheet Inputs	
Vessel Design Temperature	24590-HLW-MKC-HOP-00003	0	Process Sizing of the HLW Submerged Bed Scrubber	Sht. 9. Design Temp = Max Op (212) + 25 = 237 F
Corrosion Allowance	24590-HLW-N1D-HOP-00010	4	Corrosion Evaluation HOP-SCB-00001/2 (HLW)	
Vessel Materials of Construction	24590-HLW-N1D-HOP-00010	4	Corrosion Evaluation HOP-SCB-00001/2 (HLW)	
Cyclic Data (Vessel)	24590-HLW-MVC-30-00001	B	HLW Vessel Cyclic Datasheet Inputs	
Cooling Water Cooling Coil Temperature (Min./Max.)	24590-HLW-MEC-HOP-00009	0	HLW Submerged Bed Scrubber Cooling Coils Effectiveness	
Cooling Water Jacket Temperature (Min./Max.)	24590-HLW-MEC-HOP-00008	0	HLW Submerged Bed Scrubber Cooling Jacket Effectiveness	
Nozzle Loads	24590-WTP-3PN-MV00-00027	NA	Jumper Nozzle Loads	N11, N12, and N13 per CCN 151558.
Max. EPDM Radiation	3DG N61 005	0	Bechtel Corporation - Nuclear Engineering Design Guide for Radiation Damage Thresholds for Organic and Inorganic Materials	
Min. Cooling Water Temperature	24590-HLW-M6C-PCW-00010	A	Design Pressure & Temperature Calculation for Process Cooling Water System	
Headspace Temperature	24590-HLW-M4C-HOP-00011	1	HLW Melter Offgas System Design Basis Flowsheets	Page 11, Item 6. The offgas discharging from the SBS is saturated with water vapor since the gas is bubbled through a submerged packed bed. Therefore the water content of the discharge has a relative humidity of 100% and the outlet temperature is 212°F
Operating Temperatures	BNI Calc. 24590-HLW-M4C-HOP-00011 Rev 001	1	Maximum Wall Temperature of HLW Melter Offgas Piping Thermal Analysis for SBS Downcomer Pipe Assembly	1.) Stand-by is bounding lower operating temperature (104°F) for fatigue analysis. 2.) Idle temperature is bounding upper operating temperature (140°F) for fatigue analysis.

FOR BNI USE ONLY

Cooling supply/returns	<p>(1) Maximum cooling jacket: 83 in, 89 out jacket: 63 in, 69 out Refs: (a) Max/min inlet temps per sht ii of Calc 24590-HLW-MEC-HOP-00008 Rev 0, SBS Cooling jacket Effectiveness (b) Outlet temps from (a) above, sht 20</p> <p>(2) Maximum cooling coils: 83 in, 101 out; minimum cooling coils: 63 in, 81 out Refs: (a) Max/min inlet temps per sht ii of Calc 24590-HLW-MEC-HOP-00009 Rev 0, SBS Cooling jacket Effectiveness (b) Outlet temps from (a) above, sht 20</p>	<p>Assume annual cooling outage with inlet cooling jacket & cooling coil temperatures of 63 and outlet temperatures of 69 & 81, respectively, and SBS vessel temperature of 140 with ambient temperature of 59 (40 cycles). Assume annual cooling supply failure/isolation during operation, in = out = 212 (40 cycles). Ref: (a) 59 F is the bounding lower temp for normal conditions from EQ data sheet (b) Cooling water is at lowest operating temps and vessel is at highest operating condition, 140 F, to evaluate thermal stress (highest delta T)</p>
------------------------	---	---

Internal vessel piping and nozzle design shall be compatible with the following external connection pipe size and pressure/temperature conditions outside the vessel:

Nozzle	Connecting Jumper Size	Design Pressure (psig)	Design Temperature (°F)	Comments*
N01		135	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N02		-6/15	237	Spare nozzle; Vessel design T & P
N03		-14.7	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N04		-14.7	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N05		-6/15	237	Spare nozzle; Vessel design T & P
N06		135	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N07		NA	NA	Thermocouple; Vessel design T & P
N08		110	165	Line List 24590-HLW-M6X-HOP-00001 REV 5
N09		NA	NA	Thermocouple; Vessel design T & P
N10		-6/15	237	Spare nozzle; Vessel design T & P
N11		-6/15	237	Jumper Data Sheet Unissued; Vessel design T & P; Upset condition 1,000 F per Assumption 83 of Calc 24590-HLW-MVC-30-00001
N12	Nozzle sizes are the same as those listed in the Nozzle Table of BNI Dwg 24590-HLW-MK-HOP-00001001 Rev. 1.	-6/15	237	Jumper Data Sheet Unissued; Vessel design T & P
N13		-6/15	237	Jumper Data Sheet Unissued; Vessel design T & P; Upset condition 1,000 F per Assumption 83 of Calc 24590
N14		-6/15	237	Spare nozzle; Vessel design T & P
N15		150	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N16		150	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N17		150	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N18		150	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N19		150	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N20		150	113	Line List 24590-HLW-M6X-HOP-00001 REV 5
N21		-14.7	165	Line List 24590-HLW-M6X-HOP-00001 REV 5
N22		-14.7	165	Line List 24590-HLW-M6X-HOP-00001 REV 5
N23		110	165	Line List 24590-HLW-M6X-HOP-00001 REV 5
N24		110	165	Line List 24590-HLW-M6X-HOP-00001 REV 5
N25		-14.7	165	Line List 24590-HLW-M6X-HOP-00001 REV 5
N26		-14.7	165	Line List 24590-HLW-M6X-HOP-00001 REV 5
N27	-14.7	165	Line List 24590-HLW-M6X-HOP-00001 REV 5	
N28	65	113	Line List 24590-HLW-M6X-HOP-00001 REV 5	
N29	65	113	Line List 24590-HLW-M6X-HOP-00001 REV 5	

FOR BNI USE ONLY

Following are off-gas temperatures for determining the N11 & N13 flange temperatures:

Temperature (°F)	Description	Reference
1,320	Bounding upper inlet bulk temperature of off-gas at maximum flow	BNI Calc. 24590-HLW-PYC-HOP-00003 Rev 00A, p. 15
924	Pipe wall temperature @ bulk temperature of 1,320 °F	Ditto, p. 15
497	Bounding lower bulk temperature while feeding for nominal feed case	BNI Calc. 24590-HLW-M4C-HOP-00011 Rev 001, p. A6