MECHANICAL DATA SHEET: VESSEL

PLANT ITEM No.
24590-PTF-MV-HLP-VSL-00022

Project:	***RPP-WTP***	P&ID: 8	***24590-PTF-M6-HLP-00002001, 24590-PTF-M6-HLP-00007007, 24590-PTF-M6-PWD-00033, 24590-PTF-M6-HLP-00027006***
Project No:	***24590***	Calculations:	***Attachment 1***
Project Site:	***Hanford***	Vessel Drawing	***24590-PTF-MV-HLP-00003***
Description:	***HLW Feed Receipt Vessel***	Reports 8	***Attachment 1***

ISSUED BY RPP-WTP PDC

Reference Data

Charge Vessels (Tag Numbers)	***Deleted***
Pulsejet Mixers / Agitators (Tag Numbers) 8	***HLP-PJM-00056, HLP-PJM-00057, HLP-PJM-00084, HLP-PJM-00085, HLP-PJM-00086, HLP-PJM-00087, HLP-PJM-00088, HLP-PJM-00089, HLP-PJM-00090, HLP-PJM-00091, HLP-PJM-00092, HLP-PJM-00093, HLP-PJM-00095, HLP-PJM-00096, HLP-PJM-00097, HLP-PJM-00098, HLP-PJM-00099, HLP-PJM-00100***
RFDs/Pumps (Tag Numbers)	***Deleted***

Design Data

Quality Level	***Q (See Note 12)***	Fabrication Specs	***24590-WTP-3PS-MV00-T0001***		
Seismic Category	***SC-I***	Design Code	***ASME Section VIII Div 1***		
Service/Contents	***Radioactive Liquid***	Code Stamp	***Yes***		
Design Specific Gravity	***1.50***	NB Registration	***Yes***		
Maximum Operating Volume gal	***235,400 (Note 5)***	Weights (lbs)	Empty	Operating	Test
Total Volume gal	***268,800 (Note 5)***	Estimated	***399,000***	***3,357,400***	***2,725,500***
Equipment Qualification	***See EQ Sections***				

Inside Diameter	inch	***456***			Wind Design	***Not Required***	
Length/Height (TL-TL)	inch	***290***			Snow Design	***Not Required***	
		Vessel Operating	Vessel Design	Coil/Jacket Design	Seismic Design	***24590-WTP-3PS-MV00-T0002 24590-WTP-3PS-SS90-T0001***	
Internal Pressure	psig	***0***	***15***	***35***			
External Pressure	psig	***1.5***	***2.0 (Note 4)***	***15***	Postweld Heat Treat	***Not Required***	
Temperature	°F	***150 8 (Note 15)***	***240 8***	***240 8***	Corrosion Allowance	Inch	***0.04 (Note 7)***
Min. Design Metal Temp.	°F	***40***					

Materials of Construction

Component	Material	Minimum Thickness / Size	Containment
Top Head	***SA-240 316 (Note 3)***	***See Drawing***	***Auxiliary (Note 1)***
Shell	***SA-240 316 (Note 3)***	***See Drawing***	***Primary (Note 1)***
Bottom Head	***SA-240 316 (Note 3)***	***See Drawing***	***Primary (Note 1)***
Wear Plate	***SA 240 316 (Note 3)***	***See Drawing***	***N/A***
Support	***SA-240 304 (Note 3)***	***See Drawing***	***N/A***
Jacket/Coils/Half-Pipe Jacket	***SA-240 316 (Note 3)***	***See Drawing***	***N/A***
Internals	***SA-240 316 (Note 3)***	***See Drawing***	***Thermowells Primary (Note 1)***
Pipe	***SA-312 TP316 Smls (Note 3)***	***See Drawing***	***Note 1***
Pulse Jet Mixer Nozzles	***Cast Stellite 12***	***See Drawing***	***N/A***
Forgings/ Bar stock	***SA-182 F316 (Note 3)***	***See Drawing***	***Note 1***
Wash Ring Pipe	***SA-312 TP316 Smls (Note 3)***	***See Drawing***	***N/A***
Bolting/ Gaskets	***N/A***	***N/A***	***N/A***

Miscellaneous Data

Orientation	***Vertical***	Support Type	***Skirt***
Insulation Function	***Not Applicable***	Insulation Material	***Not Applicable***
Insulation Thickness (inch)	***Not Applicable***	Weld Surface Finish	***Welds Descaled as Laid (Note 2)***

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Notes/Remarks

Note 1: ***All welds forming part of the primary and auxiliary containments, including the nozzle attachment welds shall be subjected to 100% volumetric examination.***

Note 2: ***Grind smooth shell welds at shell-jacket welds.***

Note 3: ***Maximum carbon content of 0.030% for all welded components.***

Note 4: ***External design pressure under the jacket shall be rated for the jacket internal design pressure plus vessel external design pressure to account for ventilation fan pressures.***

Note 5: ***Vessel volumes are approximate and do not account for manufacturing tolerances, nozzles, and displacement of internals.***

Note 6: ***Contents of this document are Dangerous Waste Permit affecting.***

8 ***Note 7:*** ***Corrosion allowance for jacket shall be 0.04 inch. 24590-WTP-M0C-50-00004, Table 10-5, requires an additional wear allowance of 0.499" for the PJM nozzles and 0.903" for the vessel bottom head under the PJM nozzles. Wear Plates are added under the PJMs and stellite cone is provided for the PJM cones to account for the additional erosion allowance. Wear rate for the stellite cones are 0.110". Vendor is not required to account for this additional allowance.***

Note 8: ***The vessel design external pressure is estimated only and shall be confirmed by the Seller's calculations.***

Note 9: ***This vessel is located in a Black Cell.***

Note 10: ***Deleted.*** 8

Note 11: ***Deleted.*** 8

8 ***Note 12:*** ***Vessel to be designed, fabricated, tested to design level L-1 and black cell requirements defined in 24590-WTP-3PS-MV00-T0001.***

Note 13: ***Change to quality level, maximum operating volume, total volume, operating external pressure, added Data Reference, revised Note 4, added Note 12 and Note 13, change to parent vessel cyclic data, change to hydrodynamic loads for normal operations, change to PJM cyclic data, added E&NS table and signature. Revised/added P&IDs, Calculations, and Reports. Revised Design data. Added Functional Safety Requirements. Added Seismic section. Revised Equipment Cyclic Data Parent Vessel and PJMs. Revised Hydrodynamic Loads Criteria. Added nozzle loads table. Added EQ sections. Added Attachment 1.***

8 ***Note 14:*** ***Added six PJMs to Reference Data (Page 1) and to the Equipment Cyclic Data Sheet - PJMs section, (page 3). Added two camera ports identified as N42 and N43. Added N44 pump suction line per M3. Revised Equipment Qualification data to new datasheet form and renumbered Equipment Qualification Notes for clarity. Revised Cyclic Data, Hydrodyanamic Loading, PJM Overblow Loads, and Nozzle Loads. Deleted the Functional/Safety Requirements section as this is discussed in the EQ section of this datasheet. Deleted the Seismic section.***

8 ***Note 15:*** ***Values of 113°F and 150°F are given per 24590-WTP-RPT-ENG-07-007 and 24590-PTF-MVC-10-00003 respectively. 150°F is being specified by this MDS as it bounds both references.***

Equipment Cyclic Data Sheet - Parent Vessel ⚠8

Component Plant Item Number	*PTF-MV-HLP-VSL-00022*
Component Description	*Parent 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		*SA-240 316 with maximum carbon content of 0.030%*			
Design Life		*40 Years*			
Component Function and Life Cycle Description		*This vessel receives and stores waste in a batch transfer from off-site tanks. It shall be designed to be filled to the maximum content level over a period of one day and emptied to complete a 92 day cycle. Additionally, this vessel will be subjected to fluid dynamic forces from the operation of the pulse jet mixers during the process of suspending the solids in the waste feed. This vessel is washed down not more than once per year. The process fluid enters the vessel at 150°F and is cooled to 113°F and maintained at that setting until transferred.*			
Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*-2.0*	*15*	*10*	*Nominal assumption for testing- not to be used in conjunction with any other load conditions applied with 35 psig in cooling jacket.*
Operating Pressure	psig	*-1.5* *-1.5*	*0* *2.8*	*7.0E6* *40*	*Maximum Operating* *Loss of Power*
Operating Temperature	°F	*59*	*150*	*664*	*The process fluid enters the vessel at a maximum of 150°F and is cooled to 113°F and maintained at that setting until transferred. (Min temp per 24590-PTF-MVE-10-00012).*
Contents Specific Gravity		*1.00*	*1.50*	*664*	*Assume vessel empty at start of cycle (batch feeding).*
Contents Level	inch	*24*	*363*	*664*	*Liquid level measured from crown of bottom head.*
Localized Features					
Nozzles (N29)		*50°F*	*150°F*	*664*	*Transfer of Waste Feed from Tank Farms. (Max temp is per 24590-PTF-MVE-10-00008).*
Cooling Jacket (operating conditions)		*50°F chilled water inlet temp*	*N/A*	*664*	*Fluid entering the vessel is at a maximum of 150°F, chilled water input to cooling jacket at 50°F maximum to cool the vessel fluid contents to 113°F and maintain at 113°F until transferred. Maximum differential temperature is not to exceed 100°F (BNI Use Only).*

Equipment Cyclic Data Sheet Notes - Parent Vessel

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

Equipment Cyclic Data Sheet - PJMs ⚠8

Component Plant Item Number	*HLP-PJM-00056, HLP-PJM-00057, HLP-PJM-00084, HLP-PJM-00085, HLP-PJM-00086, HLP-PJM-00087, HLP-PJM-00088, HLP-PJM-00089, HLP-PJM-00090, HLP-PJM-00091, HLP-PJM-00092, HLP-PJM-00093, HLP-PJM-00095, HLP-PJM-00096, HLP-PJM-00097, HLP-PJM-00098, HLP-PJM-00099, HLP-PJM-00100*
Component Description	*Pulse Jet Mixers*

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

Materials of Construction		*SA-240 316 with maximum carbon content of 0.030%*			
Design Life		*40 Years*			
Component Function and Life Cycle Description		*These pulse jet mixers (PJMs) are cyclically loaded using vacuum to fully fill the PJM with process liquid and compressed air to fully empty the PJM. The PJMs are contained within a parent vessel with varying liquid level. Cyclic loading shall be between the maximum operating pressure and the minimum operating pressure plus the external static head imposed by the parent vessel. The PJM supports shall cycle between fully buoyant (PJM empty and parent vessel full) and fully loaded (PJM full and parent vessel empty) states. Thrust load shall be applied only to the fully buoyant state.*			
Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*FV*	*80*	*100*	*24590-PTF-M6-HLP-00007001 through 00007006 - nominal assumption for testing*
Operating Pressure	psig	*FV*	*40*	*4.0E6*	
Operating Temperature	°F	*59*	*150*	*664*	*The process fluid enters the vessel at 150°F and is cooled to 113°F and maintained at that setting until transferred. (Operating Temp is same as parent)*
Contents Specific Gravity		*1.00*	*1.50*	*664*	*Assume PJM is empty (air) at beginning of cycle.*
Contents Level	inch	*Empty*	*Flooded*	*4.0E6*	
Thrust	lbf	*-444*	*444*	*4.0E6*	
Localized Features					
Supports		*buoyant to loaded*		*4.0E6*	

Equipment Cyclic Data Sheet Notes - PJMs

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

Design Considerations for Loads Induced by Pulse Jet Mixers (PJMs) 8

Pulse Jet Mixers (PJMs) are designed to mix the vessel contents using a liquid jet discharge. PJMs are driven by compressed air. The mixing is required to enhance heat transfer, to break up hydrogen-containing particles, and to homogenize the solution. Normally, the PJMs are operated simultaneously within the parent vessel.

The PJMs operate in the following three cycles: Suction, Drive and Vent. During the suction cycle a vacuum is created in the PJM headspace and the level within the PJM rises to fill the PJM. During the drive cycle the PJM is pressurized and liquid is discharged. During the vent cycle, the pressure in the headspace approaches atmospheric and the level within the PJM is allowed to reach equilibrium.

Vessel components shall be designed to withstand loading induced by PJM operations as described herein.

Normal Operations: Liquid flows around internal structures within the parent vessel producing hydrodynamic loads such as drag and vortex shedding.

To mitigate the dynamic effects, the following pipe sizes dipped internal to the vessel are required to have a minimum first natural frequency that is double the vortex shedding frequency:

Nominal Pipe Size	Minimum First Natural Frequency
1 inch	14 Hz*
2 inch	8.0 Hz*
3 inch	5.0 Hz

* See 24590-WTP-MVC-50-00001, Section 8.1.5.2

Overblow Condition: Occasionally the drive cycle lasts too long and compressed air is discharged from the PJM. Overblows can also occur during system calibration. One or multiple PJMs may overblow at any time. These conditions induce acoustic and bubble rise loads on structures.

All internal components shall be designed for the combination of normal operational hydrodynamic loads and overblow loads. Single overblows (SOB) are assumed to act concurrently with the seismic event, however multiple overblows (MOB) are not assumed to act concurrently with the seismic event. Figure 1 (below) provides the acoustic load intensity that encompasses both SOB and MOB.

Hydrodynamic Loads Due to Normal PJM Operations 8

Normal operation imposes a cyclical load ranging between -0.06 and 0.12 psi in the radial direction and -0.03 to 0.10 psi in the vertical direction for 4.0E6 cycles. The hydrodynamic pressure applies across the projected area of the component. Positive hydrodynamic forces act in the radial, outward direction and the axial direction. Seller shall apply the radial load simultaneously in the radial direction and normal to the radial direction in the horizontal plane.

PJM Overblow Loads (8)

Discussion: *During normal operation, pulse jet mixers (PJMs) mix the fluid by pulling in (suction) and pushing out (drive) fluid. During an upset condition, designated as an 'overblow', air is discharged following the drive cycle of one or more PJMs. The load consists of acoustic pressure (2Hz to 200Hz) developed in the first 200ms of the event and a load due to the bubble rising through the fluid.*

The acoustic load and the bubble load are design loads as defined by ASME B&PVC, Section VIII, Division 1, UG-22, applied statically. The acoustic load is not added to the bubble rise load because they occur at different times during the overblow event.

Acoustic Load

- ***The acoustic design load in Figure 1 is applied to the visible (as viewed from the overblow origin) surface of cylindrical targets such as pipes, charge vessels, and PJMs. The load is applied in the direction normal to the principal axis of the target as illustrated in Figure 2. Note: The intended net effective load on the target is equal to the projected (i.e. cross-sectional) area of the object times the acoustic design load (psi) indicated in Figure 1.***
- ***Each target is considered independent of the surrounding targets: e.g. the surrounding targets do not impede the acoustic wave by casting a shadow, as illustrated in Figure 2.***
- ***The load is <u>not</u> applied to small supports such as gussets, brackets, tabs, clamps, and bolts because they are rigid and the pressure drop across the target is negligible.***
- ***When the vessel contains multiple PJMs, the load from one PJM is independent of the load from other PJMs. The loads are not additive for multiple overblows.***
- ***No internal components shall be placed within 5 PJM nozzle diameters (5 * 4 in = 20 in) of a spherical zone centered at any overblowing PJM nozzle.***

Figure 1: Acoustic Design Load

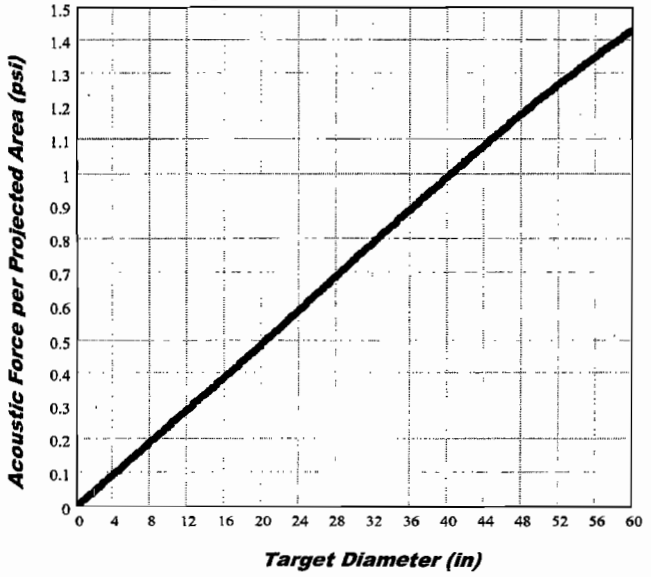
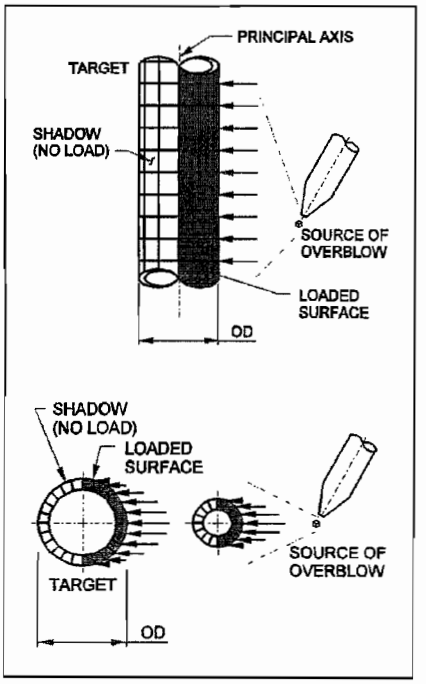


Figure 2: Load Application



The following data is required to determine the load:

- ***Target Diameter***
- ***Target Principal Axis***

Overblow Source Coordinates

Number of Acoustic Cycles	***1000 events X 40 cycles/event for a total of 40,000 acoustic cycles.***
Bubble Rise Load	***A vertical force per projected area of 1.7 psi is applied to the surfaces in the 36-inch diameter cylindrical zone centered at the overblowing PJM(s). The bubble can be at any elevation above the overblowing PJM and only affects one zone (36-inch diameter region) at a time. When there are multiple PJMs in a vessel (MOB), each PJM has it's own bubble. To simplify analysis the bubble can be applied in a continuous cylindrical zone above each PJM top head.***
Number Bubble Rise Cycles	***1000 events X 1 cycle/event***

NOZZLE LOADS (8)

Nozzle	Design Nozzle Press (psig) (Note E)	Design Nozzle Temp (°F) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N01	15	240	24"	Weight / Seismic / Thermal	Manway					
N02	15	240	8"	Weight	234	752	234	1120	696	464
				Seismic	1433	2074	1780	5159	9961	8992
				Thermal	893	795	1193	3600	7193	7193
N04	15	240	6"	Weight	210	335	210	598	374	374
				Seismic	1160	775	1160	4240	6367	6367
				Thermal	735	654	983	2685	5370	5370
N05	15	240	8"	Weight	234	373	234	741	464	464
				Seismic	1285	858	1285	5159	7732	7732
				Thermal	893	795	1193	3600	7193	7193
N07	15	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N08	15	240	6	Weight / Seismic / Thermal	N08 is a parent nozzle, nozzle loads are applied via N08A, N08B, and N08C					
N08A (Note D)	100	240	1"	Weight	15	20	15	20	20	20
				Seismic	56	35	53	72	96	186
				Thermal	30	26	40	38	77	77
N08B (Note D)	100	240	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	163
				Thermal	30	26	40	38	77	77
N08C (Note D)	100	240	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	158
				Thermal	30	26	40	38	77	77
N10	125	240	2"	Weight	50	155	50	75	75	75
				Seismic	186	313	186	350	175	700
				Thermal	114	100	152	150	75	75
N11	125	240	2"	Weight	50	71	50	75	75	75
				Seismic	186	590	354	277	495	415
				Thermal	114	100	152	169	337	337
N12	125	240	2"	Weight	50	127	50	100	75	75
				Seismic	186	469	308	350	263	438
				Thermal	114	100	152	150	75	75
N13	125	240	2"	Weight	50	112	50	75	75	75
				Seismic	186	303	186	432	415	443
				Thermal	114	100	152	169	337	337
N14	125	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	1113	774	961	415	415
				Thermal	114	100	152	169	337	337

Nozzle	Design Nozzle Press (psig) (Note E)	Design Nozzle Temp (°F) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N15	125	240	2"	Weight	50	80	50	75	75	75
				Seismic	208	158	270	719	485	522
				Thermal	114	202	152	169	337	337
N16	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	217	123	186	350	131	525
				Thermal	114	100	152	100	75	150
N17	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	322	415	466
				Thermal	114	100	152	169	337	337
N18	150	240	2"	Weight	50	64	50	75	75	85
				Seismic	186	123	186	277	415	478
				Thermal	114	100	152	169	337	337
N19	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N20	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	424
				Thermal	114	100	152	169	337	337
N21	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	110	152	197	337	337
N22	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	212	933	415	415
				Thermal	114	100	152	169	337	337
N23	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	511	438	674
				Thermal	114	100	152	169	337	337
N24	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	247	123	203	588	488	595
				Thermal	114	100	152	169	337	337
N25	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	313	187	329	788	525	438
				Thermal	260	215	152	75	75	150
N29	400	240	3"	Weight	52	173	52	100	100	250
				Seismic	452	354	429	438	1488	875
				Thermal	171	153	229	150	350	150
N30	195	240	2"	Weight	50	73	50	75	75	75
				Seismic	186	123	186	277	415	560
				Thermal	114	100	152	203	337	337
N31	195	240	3"	Weight	52	197	52	100	100	100
				Seismic	550	333	313	613	350	1400
				Thermal	171	216	229	400	200	150
N33	170	240	3"	Weight	52	150	52	100	100	200
				Seismic	284	263	284	525	263	1138
				Thermal	283	153	229	650	1700	250

Nozzle	Design Nozzle Press (psig) (Note E)	Design Nozzle Temp (°F) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N34	170	240	3"	Weight	52	281	111	290	75	104
				Seismic	306	541	361	1001	1227	1227
				Thermal	171	153	229	498	998	998
N35	35	240	6"	Weight	210	437	210	797	498	1400
				Seismic	1160	775	1160	2538	1838	1750
				Thermal	735	654	983	1000	1000	1000
N36	35	240	6"	Weight	210	445	210	797	498	650
				Seismic	1160	775	1160	1750	1750	1750
				Thermal	735	654	983	1000	1000	1000
N37	170	240	3"	Weight	52	133	52	119	75	108
				Seismic	284	189	460	973	1386	1227
				Thermal	171	186	229	498	998	998
N38	15	240	1.5"	Weight	35	35	35	40	40	40
				Seismic	105	70	105	159	240	240
				Thermal	64	56	86	96	192	192
N39	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	264	887	700	415
				Thermal	114	100	152	169	337	337
N40	150	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	131	292	910	415	415
				Thermal	114	100	152	169	337	337
N41	15	240	6"	Weight	N41 is a parent nozzle, nozzle loads are applied via N41A, N41B, and N41C					
				Seismic						
				Thermal						
N41A (Note D)	100	240	1"	Weight	15	20	15	20	20	20
				Seismic	56	35	53	72	96	186
				Thermal	30	26	40	38	77	77
N41B (Note D)	100	240	1"	Weight	15	20	15	20	20	20
				Seismic	56	35	53	72	96	186
				Thermal	30	26	40	38	77	77
N41C (Note D)	100	240	1"	Weight	15	20	15	20	20	20
				Seismic	56	35	53	72	96	186
				Thermal	30	26	40	38	77	77
N42	15	240	8"	Weight	475	750	475	1500	950	950
				Seismic	1313	875	1313	5163	7744	7744
				Thermal	600	550	800	2400	4800	4800
N43	15	240	8"	Weight	475	750	475	1500	950	950
				Seismic	1313	875	1313	5163	7744	7744
				Thermal	600	550	800	2400	4800	4800
N44	15	240	3"	Weight	52	281	111	290	75	104
				Seismic	306	541	361	1001	1227	1227
				Thermal	171	153	229	498	998	998
N51	15	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	1113	774	961	415	415
				Thermal	114	100	152	169	337	337

Nozzle	Design Nozzle Press (psig) (Note E)	Design Nozzle Temp (°F) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N52	15	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	1113	774	961	415	415
				Thermal	114	100	152	169	337	337
N53	15	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	1113	774	961	415	415
				Thermal	114	100	152	169	337	337
N54	15	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	1113	774	961	415	415
				Thermal	114	100	152	169	337	337
N55	15	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	1113	774	961	415	415
				Thermal	114	100	152	169	337	337
N56	15	240	2"	Weight	50	60	50	75	75	75
				Seismic	186	1113	774	961	415	415
				Thermal	114	100	152	169	337	337

Notes for Nozzle Loads

A. Direction of load application is per diagrams in 24590-WTP-3PS-MV00-T0001, Appendix A.

B. For nozzles in head: x = North/South, y = Vertical, and z = East/West - Vessel 0° defined as north.

C. Nozzle loads shown are to be used in place of those specified in 24590-WTP-3PS-MV00-T0001 – do not apply any thermal reduction factor.

D. Values provided at plate on top of parent nozzle.

E. Design nozzle pressures and temperatures to be used for nozzle qualification only. △8

F. All Pretreatment RGM Seismic Piping Nozzle loads from Plant Design have a 1.75 load factor applied to all seismic loads to address coupling effects between the flexible vessels and piping in accordance with the Seismic Classification and Evaluation for the Pretreatment Facility Piping and Vessels 24590-WTP-RPT-ENG-09-040. (BNI use only, see CCN 229865 for nozzle load management). △8

EQUIPMENT QUALIFICATION DATASHEET (EQD) 8

Equipment Identification		
Full Component Tag Number or BNI Stock Code Number	24590-PTF-MV-HLP-VSL-00022	Safety Classification ☒ SC ☐ SS ☐ APC-PAM
Equipment Datasheet Number	24590-PTF-MVD-HLP-00006	
Description	HLW Feed Receipt Vessel for the HLW Lag Storage and Feed Blending Process System (HLP).	Seismic Category ☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV ☐ SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	Pretreatment Building; located in Room P-0102A, Elev. 0'-00", column lines K/18.5	
Safety Function(s)	HLP-VSL-00022 (parent vessel) is considered a high active process vessel credited to prevent spills of large quantities of high activity process liquid and provide primary confinement for radioactive releases. Pulse Jet Mixers (PJMs) provide a mixing function in the vessel to prevent hydrogen accumulation. Reference 24590-WTP-PSAR-ESH-01-002-02, Preliminary Documented Safety Analysis to Support Construction Authorization; PT Facility Specific Information, Table 4A-1.	
Equipment Safety Function Type	☒ Passive Mechanical	☐ Active Mechanical ☐ Electrical
Seismic Safety Function ☒ Yes ☐ No	Seismic Operability Requirements ☒ During Seismic Event	☒ After Seismic Event ☐ None

Equipment Environmental Qualification (EEQ)

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

Classification of Environment ☒ Mild ☐ Harsh

Qualified Life (years) ☒ 40 ☐ Other

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	113	Note a	Years	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	59	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	90	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	5	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g.)	0 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g.)	(-) 1.4 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mRad/hr)	991000	40 (E-Note 4)	Years (Note e-1)	24590-PTF-U0D-W16T-00001, E-Note 1
Plant/Process Induced Vibration	☐ Yes ☒ No			

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
Additional Normal Ambient Information:	N/A			
Abnormal Ambients				
High Temperature (°F)	127	8	hours / year	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	40	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	100c	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	6	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g)	4 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g)	(-) 7.3 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mR/hr)	991000	0 (E-Note 4)	Years (Note e-1)	24590-PTF-U0D-W16T-00001, E-Note 1
Exposure to Wet Sprinkler System	☐ Yes ☒ No	N/A	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Additional Abnormal Ambient Information	N/A			
Design Basis Events (DBE) Ambients				
High Temperature (°F)	138	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	40	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	100c	40	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	4	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g)	4 (E-Note 2)	8	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g)	(-) 7.3 (E-Note 2)	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mR/hr)	991000	0 (E-Note 4)	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Submergence	☐ Yes ☒ No	N/A	hours	24590-PTF-U0D-W16T-00001, E-Note 5
Chemical/Spray Exposure	☒ Yes ☐ No	12.5	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Additional DBE Information	N/A			

DBE Chemical Exposure Details

DBE Chemical Exposure Details				
DBE Chemical Types / Concentrations	Process Rad Condensate			
	Sodium Hydroxide (2M)			
	Water			
	Nitric Acid	CNP12	212 °F	-0.5 pH
	Sodium Hydroxide	FEP19	121 °F	15.5 pH
	Sodium Hydroxide	FRP14	191 °F	15.5 pH
	Sodium Hydroxide	HLP09	113 °F	13.5 pH
	Sodium Hydroxide	HLP11	113 °F	14.5 pH
	Sodium Hydroxide	HLP12	113 °F	15.5 pH
	Sodium Hydroxide	HLP13	113 °F	15.5 pH
	Sodium Hydroxide	PVP06	79 °F	12.5 pH
	Sodium Hydroxide	RLD03	101 °F	11.5 pH
	Sodium Hydroxide	UFP01	77 °F	15.5 pH

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

Mechanical Interfaces	
Mounting Configuration (orientation)	Vertical Mounted , Skirt
Mounting Method (bolts, welds, etc.)	Welded skirt to ring beam welded to embedment plates. Embedment plate details per 24590-PTF-DD-S13T-00039, 24590-PTF-DD-S13T-00036, 24590-PTF-DD-S13T-00042, and 24590-PTF-DD-S13T-00045
Auxiliary Devices	Pulse Jet Mixers - HLP-PJM-00056, HLP-PJM-00057, HLP-PJM-00084, HLP-PJM-00085, HLP-PJM-00086, HLP-PJM-00087, HLP PJM-00088, HLP-PJM-00089, HLP-PJM-00090, HLP-PJM-00091, HLP-PJM-00092, HLP-PJM-00093. Auxiliary Devices are located within the vessel.

Equipment Seismic Qualification (ESQ)				
Parameter	**Title**	**Reference/Document Number**	**Version / Revision**	**Remarks**
WTP Seismic Design Specification	Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks Engineering Specification for Seismic Qualification Criteria for Pressure Vessels	24590-WTP-3PS-SS90-T0001 24590-WTP-3PS-MV00-T0002	2 3	N/A
Specified Seismic Load Parameters	Seismic Analysis of Pretreatment Building - WSGM In-Structure Response Spectra (ISRS)	24590-PTF-S0C-S15T-00057	A	CCN: 185271; WSGM ISRS Curves: Figures 21E, 22E and 24E

Equipment Qualification Notes and Additional Information

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

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

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

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

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

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

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

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

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

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

E-Note 1: BNI (BUYER) shall perform Equipment Environmental Qualification in accordance with listed parameters and applicable specification requirements.

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

E-Note 3: BNI (BUYER) shall perform Equipment Seismic Qualification in accordance with the listed parameters and the applicable specification requirements.

E-Note 4: Normal, Abnormal, and DBE dose rates are the same, therefore, abnormal and DBE doses do not add to total integrated dose based on normal dose rates over 40 years.

E-Note 5: Flood height is 2.08 ft above the floor, bottom of vessel is above this level therefore, no submergence evaluation is required.

EQUIPMENT QUALIFICATION DATASHEET (EQD)

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

Screening / Evaluation Required? If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below	X	Yes		No

Approval

Rev	Description	Vessel Engineer	Checked	System Engineer	Reviewed/ MET	E&NS	Approved	Date
0	Issued for Purchase	S.Suharto	C Slater / P Aviguetero	R.Rider	N/A	N/A	S.Kirk	09/06/02
1	Revised as Marked, Delete Charge Vessel and RFD Per Rev. 0 P&ID, Add 2 PJM's Per DCA No.24590-PTF-DCA-M-02-017 Rev. 0	S. Suharto	C. Slater / S. Arora	R. Rider	N/A	N/A	M. Hoffmann	07/10/03
2	Revised Jacket External Design Pressure and Design Temperature, Vessel Internal Operating Pressure. Other Revisions are for Clarity and Consistency.	R. Simmons	Y. Hovanski / C. Slater	R. Rider	R. Stevens	N/A	M. Hoffmann	11/14/03
3	Added Black Cell Requirements	R. Simmons	Y. Hovanski / C. Slater	R. Rider	N/A	N/A	M. Hoffmann	02/04/04
4	Added Erosion Protection, Revised Load Types	R. Simmons	Y. Hovanski / C. Slater	R. Rider	J. Julyk	N/A	M. Hoffmann	05/12/04
5	Revised Hydrodynamic Loading, Deleted Note 10	R. Simmons	S. V. / C. Slater	R. Rider	J. Julyk	N/A	M. Hoffmann	11/22/04
6	Revised per note 11 on sheet 2 of 5	M Arulumpalam	J. Polani / M. Seed	R. Rider	C. Slater / D. Adler	N/A	J. Julyk	10/28/05
7	Revised per Note 13 on page 2 of 12, and as noted by revision triangles. Supersedes 24590-PTF-MVD-HLP-P0006, Rev 2.	M Seed	S Jain	M Dingeldein	D Adler	J Hinckley	J Julyk	05/11/09
8	Revised per Note 14 and as noted by revision triangles.	M Arulumpalam	M Seed	D Evans	D Adler	J Hinckley	J Julyk	3/21/11

ATTACHMENT 1: Page 1 of 2
REFERENCES for Data Sheet: 24590-PTF-MVD-HLP-00006, Rev 8 *(For BNI Use only)*
Vessel Tag Number: HLP-VSL-00022

Data	Document #	Rev	Document Title
Quality Level	24590-PTF-M6-HLP-00002001	0	*P&ID PTF-HLP System HLW Feed Receipt Vessel HLP-VSL-00022*
Seismic Category	24590-PTF-M6-HLP-00002001	0	*P&ID PTF-HLP System HLW Feed Receipt Vessel HLP-VSL-00022*
Design Specific Gravity	24590-WTP-RPT-ENG-07-007	0A 8	*Process Stream Properties*
Max Operating Volume	24590-PTF-M6C-HLP-00006	C	*Vessel Sizing Calculation for HLW Feed Receipt Vessel (HLP-VSL-00022)* / Section 8
Total Volume	24590-PTF-M6C-HLP-00006	C	*Vessel Sizing Calculation for HLW Feed Receipt Vessel (HLP-VSL-00022)* / Sheet A-1
Inside Diameter	24590-PTF-M6C-HLP-00006	C	*Vessel Sizing Calculation for HLW Feed Receipt Vessel (HLP-VSL-00022)*
Length TL-TL	24590-PTF-M6C-HLP-00006	C	*Vessel Sizing Calculation for HLW Feed Receipt Vessel (HLP-VSL-00022)*
Operating Pressure (external)	24590-PTF-M6C-PVP-00017	A	*HADCRT Analysis of PTF PVP System at various Operating Scenarios / (see sheet 14 - the PVP scrubber inlet is controlled to 35 in-wg)* External pressure of 1.5 psig is based on a normal operating pressure of -35 in WG (1.26 psig) with an additional margin. (24590-PTF-M5-V17T-00021001 & 00021004 indicate the process flow diagrams)
Operating Pressure (internal)			Maximum value possible, assuming fans off, is atmospheric pressure
Design Pressure (internal)	24590-WTP-DB-ENG-01-001	01P 8	*Basis of Design* 8
Design Pressure (external)	24590-PTF-M6C-PVP-00017	A	*HADCRT Analysis of PTF PVP System at various Operating Scenarios /* External design pressure of 2.0 psig is based on a normal operating pressure of -35 in WG (1.26 psig) with an additional margin
Jacket Design Pressure (internal)	24590-PTF-MVC-10-00003	8 C	*PTF Vessel Cyclic Datasheet Inputs/* Sheet A-3,use 35 psig
Operating Temp 8	24590-WTP-RPT-ENG-07-007 24590-PTF-MVC-10-00003	0A C	*Process Stream Properties* *PTF Vessel cyclic Datasheet Inputs*
Design Temp	24590-WTP-RPT-ENG-07-007	0A	*Process Stream Properties* / maximum operating plus margin - use 240 F for maximum off-normal 8
Jacket Design Temp 8	24590-PTF-MVC-HLP-00006	D	*Design of Cooling Jacket for HLW Feed Receipt Vessel HLP-VSL-00022* *Design temp of 240 is same as parent vessel.*
Corrosion Allowance, Erosion Allowance 8	24590-PTF-N1D-HLP-00003 24590-WTP-M0C-50-00004	5 E	*Corrosion Evaluation HLP-VSL-00022* *Wear Allowance for WTP Waste Slurry Systems*
Materials of Construction	24590-PTF-N1D-HLP-00003 24590-PTF-MV-HLP-00003	5 2	*Corrosion Evaluation HLP-VSL-00022* *Equipment Assembly HLW Feed Receipt Vessel HLP-VSL-00022*
Design Pressure (PJM) 8	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00012)*
Operating Pressure (PJM) 8	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00012)*
Operating Temperature (PJM)			same as parent vessel
Cyclic Data (Vessel) 8	24590-PTF-MVC-10-00003 24590-PTF-MVC-HLP-00006	C D	*PTF Vessel Cyclic Datasheet Inputs* / (24590-PTF-MVE-10-00008 and 24590-PTF-MVE-10-00012) *Design of Cooling Jacket for HLW Feed Receipt Vessel HLP-VSL-00022* / chilled water inlet temp is 50 F and the temperature rise is 23.2 F (section 7.8 of calc).

REFERENCES for Data Sheet: 24590-PTF-MVD-HLP-00006, Rev 8 *(For BNI Use only)*
Vessel Tag Number: HLP-VSL-00022

Data	Document #	Rev	Document Title
Cyclic Data (PJM)	24590-PTF-MVC-10-00003	8 C	*PTF Vessel Cyclic Datasheet Inputs*
Hydrodynamic Loads	24590-WTP-MVC-50-00001	A	*Hydrodynamic Loads for Normal PJM Operation in Vessels with Newtonian Fluids*
PJM Overblow Loads 8	24590-WTP-MVC-50-00011	A	*Pulse Jet Mixer Overblow Vessel Loads* / Section 8
PJM Overblow Cycles 8	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* (24590-PTF-MVE-10-00004)
Nozzle Loads 8	CCN 124017 CCN 230849	N/A N/A	*Nozzle Loads for HLP-VSL-00022* *Supplemental Nozzle Design Loads for HLP-VSL-00022*
Nozzle Design Pressure and Temperature	24590-PTF-M6X-HLP-00095 24590-PTF-M6X-HLP-00195 24590-PTF-M6X-PWD-00131	0 0 2	*MS Line List for 24590-PTF-M6-HLP-00002001, Rev 0* *MS Line List for 24590-PTF-M6-HLP-00007007, Rev 0* *MS Line List for 24590-PTF-M6-PWD-00033, Rev 2*