~~ISSUED BY~~
RPP-WTP PDC

R11364431

MECHANICAL DATA SHEET: VESSEL

PLANT ITEM No.
24590-PTF-MV-FRP-VSL-00002C

Project	***RPP-WTP***	P&IDs	***24590-PTF-M6-FRP-00002, 24590-PTF-M6-FRP-00007, 24590-PTF-M6-FRP-00010, 24590-PTF-M6-FRP-00019***
Project No	***24590***	Calculations 12	***Attachment 1***
Project Site	***Hanford***	Vessel drawings	***24590-PTF-M2-FRP-00003***
Description	***Waste Feed Receipt Vessel***	Reports/Other Documents 12	***Attachment 1***

Reference Data

Charge Vessels (Tag Numbers)	***None***
Pulsejet Mixers / Agitators (Tag Numbers)	***FRP-PJM-00029, FRP-PJM-00030, FRP-PJM-00031, FRP-PJM-00032, FRP-PJM-00033, FRP-PJM-00034, FRP-PJM-00035, FRP-PJM-00036, FRP-PJM-00001, FRP-PJM-00002, FRP-PJM-00003, FRP-PJM-00004***
RFDs/Pumps (Tag Numbers)	***None***

Design Data

Quality Level		***Q***	Fabrication Specs	***24590-WTP-3PS-MV00-T0001***
Design Level		***L-1***	Design Code	***ASME Section VIII Div 1***
Seismic Category		***SC-I***	Equipment Qualification	***See EQ Sections***
Service/Contents		***Radioactive Liquid***	Code Stamp	***Yes***
Design Specific Gravity	12	***1.46***	NB Registration	***Yes***
Maximum Design Volume	gal	***402,300 (Note 6)***		
Total Volume	gal	***472,900 (Note 6)***		

Inside Diameter	inch	***564***			Wind Design	***Not Required***	
Length/Height (TL-TL)	inch	***322***			Snow Design	***Not Required***	
		Vessel Operating	Vessel Design	Coil/Jacket Design	Seismic Design	***24590-WTP-3PS-SS90-T0001 24590-WTP-3PS-MV00-T0002***	
Internal Pressure	psig	***0***	***15***	***N/A***	Corrosion Allowance	inch	***0.04 (Note 11)***
External Pressure	psig	***1.5***	***2.0 (Note 13)***	***N/A***	Min. Design Metal Temp.	°F	***40***
Temperature	°F	***140***	***215***	***N/A***			

Materials of Construction

Component	Material	Containment
Top Head	***SA 240 316 (Note 2)***	***Auxiliary (Note 1)***
Shell	***SA 240 316 (Note 2)***	***Primary (Note 1)***
Bottom Head	***SA 240 316 (Note 2)***	***Primary (Note 1)***
Support (Skirt)	***SA 240 304 (Note 2)***	***N/A***
Internals	***SA 240 316 / SA 479 316 (Note 2)***	***Thermocouples Primary (Note 1)***
Pipe	***SA 312 TP316 Smls (Notes 2 & 7)***	***Note 1***
Forgings/ Bar stock	***SA 182 F316 (Note 2)***	***N/A***

Miscellaneous Data

Orientation	***Vertical***	Support Type	***Skirt***
Insulation Function	***Not Applicable***	Insulation Material	***Not Applicable***
Insulation Thickness (inch)	***Not Applicable***	Internal Finish	***Note 4***
		External Finish	***Welds Descaled as Laid***

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

Note 3: ***Operating weight includes weight of liquid filled to top of overflow nozzle.***

Note 4: ***Descale all internal welds as laid, grind smooth and blend all starts/stops, high spots, and crevices, finish welds as required for NDE purposes.***

Note 5: ***Deleted.***

Note 6: ***Vessel volumes are approximated and do not account for manufacturing tolerances, nozzles, and displacement of internals.***

Note 7: ***Welded pipe may be used for 14" NPS PJM supports per 24590-WTP-SDDR-PROC-03-0154.***

Note 8: ***This vessel is located in a Black Cell.***

Note 9: ***Contents of this document are Dangerous Waste Permit affecting (internal use only).***

Note 10: ***Deleted.***

12 ***Note 11:*** ***Ensure that an additional 0.103" is available for erosion in the spherical portion of the bottom head and ensure an additional 0.054" is available for erosion on the lower portions of the PJM cone. The area affected on the bottom head by the PJM flow should be at least 78" in diameter centered under the nozzle of each PJM.***

12 ***Note 12:*** ***Deleted.***

Note 13: ***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 (see 24590-PTF-M6C-PVP-00017).***

Note 14: ***Revised P&IDs, Calculations, and added Reports/Other Documents section. Revised Design data. Deleted Notes 5 and 10. Revised Note 11 and 13. Revised Cyclic data for parent vessel and PJMs. Added Hydrodynamic Loading requirements section, added multiple overblow requirements section, added nozzle loads, added Equipment Qualification.***

12 ***Note 15:*** ***Added Attachment 1 (for BNI purposes only). Revised Hydrodynamic Loads, Nozzle Loads and Equipment Qualification data.***

Seismic 12

Seismic analysis to be combined with operating conditions, single PJM overblow, and any sloshing loads imposed. Sloshing loads on vessel shell and internals are calculated per ASCE 4-98. Analysis to consider worst case seismic loads on the vessel proper and on the vessel internals.

	MECHANICAL DATA SHEET: VESSEL	PLANT ITEM No. 24590-PTF-MV-FRP-VSL-00002C

Equipment Cyclic Data Sheet - Parent Vessel 12

Plant Item Number:	***24590-PTF-MV-FRP-VSL-00002C***
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. 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 with nitric acid and water***

Load Type		Range		Number of Cycles	Comment
Design Pressure	psig	***-2.5***	***15***	***10***	***Nominal assumption for testing, not to be used in conjunction with other design loads***
Operating Pressure	psig	***-1.5***	***0***	***7.0E6***	***PVP header pressure fluctuations***
Operating Pressure	psig	***-1.5***	***2.8***	***40***	***Loss of Power***
Operating Temperature	°F	***59***	***140***	***310***	
Contents Specific Gravity		***1.0***	***1.46***	***310***	***Assume vessel empty at beginning of cycle***
Contents Level	inch	***18***	***409***	***233***	***Liquid level measured from crown of bottom head***
Localized Features					
Supports		***Same as vessel***		***Number of cycles same as vessel***	

Equipment Cyclic Data Sheet - PJMs 12

Component Plant Item Number:	24590-PTF-MV-FRP-PJM-00001, 24590-PTF-MV-FRP-PJM-00002, 24590-PTF-MV-FRP-PJM-00003, 24590-PTF-MV-FRP-PJM-00004, 24590-PTF-MV-FRP-PJM-00029, 24590-PTF-MV-FRP-PJM-00030, 24590-PTF-MV-FRP-PJM-00031, 24590-PTF-MV-FRP-PJM-00032, 24590-PTF-MV-FRP-PJM-00033, 24590-PTF-MV-FRP-PJM-00034, 24590-PTF-FRP-MV-PJM-00035, 24590-PTF-MV-FRP-PJM-00036
Component Description:	Pulse Jet Mixer Vessels (PJM)

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 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. They shall be designed to cycle between the maximum pressure and the minimum pressure plus the external static head imposed by the parent vessel. The PJM supports shall be designed to cycle between the fully buoyant (parent vessel full and PJM empty) and fully loaded (parent vessel empty and PJM full) conditions.

Load Type		Range		Number of Cycles	Comment
Design Pressure	psig	FV	80	100	
Operating Pressure	psig	FV	47	4.2E6	
Operating Temp	°F	59	140	310	Same as parent vessel.
Contents Specific Gravity		1.0	1.46	4.2E6	Same as parent vessel.
Contents Level	inch	Empty	Flooded	4.2E6	
PJM Thrust	lbf	-420	420	4.2E6	
Localized Features					
Supports		Fully Buoyant	Fully Loaded	4.2E6	

Notes

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) 12

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
** By extrapolation from 1 inch and 2 inch

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 PJM Operations 12

Normal operation imposes a cyclical load ranging between -0.06 and 0.12 psi in the radial direction and -0.03 to 0.1 psi in the vertical direction for 4.2E6 cycles. The hydrodynamic pressure applies across the projected area of the component. Positive hydrodynamic forces act in the radial, outward direction and the vertical, upward 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 12

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 8, 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.***
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***

Figure 1: Acoustic Design Load

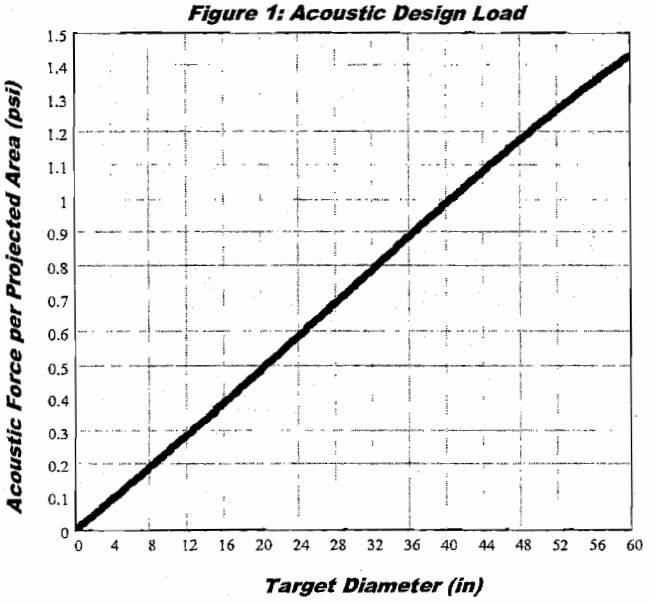
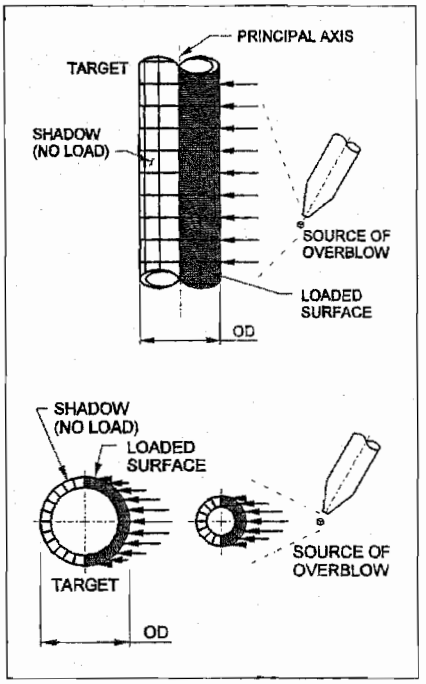


Figure 2: Load Application



The following data is required to determine the load:

- ***Target Diameter***
- ***Target Principal Axis***
- ***Overblow Source Coordinates***

Nozzle Loads (12)

Nozzle	Design Nozzle Press (psig) (Note E)	Design Nozzle Temp (°F) (Note E & Note G)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N01	15	215	24"	Weight	Manway					
				Seismic						
				Thermal						
N02	400	215	3"	Weight	52	132	52	119	75	78
				Seismic	350	238	770	1897	1227	1391
				Thermal	140	141	190	502	810	810
N03	15	215	6"	Weight	N03 is parent nozzle, nozzle loads are applied via N03A, N03B, N03C					
				Seismic						
				Thermal						
N03A (Note C)	115	215	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	30	50	50
N03B (Note C)	115	215	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	30	50	50
N03C (Note C)	115	215	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	30	50	50
N08	22	215	8"	Weight	273	915	200	1746	300	3634
				Seismic	2100	656	2625	3544	17675	4200
				Thermal	975	525	1600	4425	10675	1925
N10	15	215	6"	Weight	210	335	210	598	374	374
				Seismic	1160	775	1160	4240	6367	6367
				Thermal	600	530	800	2180	4350	4350
N11	15	215	8"	Weight	234	373	234	741	464	464
				Seismic	1285	858	1285	5159	7732	7732
				Thermal	730	650	970	2920	5830	5830
N18	15	215	2"OD	Weight	15	21	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	40	50	50
N19 spare	15	215	2"OD	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	30	50	50
N20	190	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	130	186	277	415	415
				Thermal	147	238	100	110	210	210
N21 spare	15	215	2"OD	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	30	50	50

Nozzle	Design Nozzle Press (psig) (Note E)	Design Nozzle Temp (°F) (Note E & Note G)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N22 spare	15	215	3"	Weight	52	84	52	119	75	75
				Seismic	284	189	284	819	1227	1227
				Thermal	140	130	190	410	810	810
N42	125	215	3"	Weight	52	140	52	119	75	170
				Seismic	284	389	982	1825	1227	1227
				Thermal	140	130	190	410	810	810
N44	150	215	2"	Weight	50	60	50	75	75	75
				Seismic	455	123	186	277	488	473
				Thermal	70	70	100	110	210	210
N45	150	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	605	183	100	110	398	738
N46	150	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	275	200	100	110	268	718
N47	150	215	2"	Weight	50	60	50	134	75	75
				Seismic	186	123	186	277	415	415
				Thermal	70	70	100	110	210	210
N48	150	215	2"	Weight	50	60	50	134	75	75
				Seismic	186	123	186	277	415	415
				Thermal	70	70	100	110	210	210
N49	150	215	2"	Weight	50	60	50	134	75	75
				Seismic	186	123	186	277	415	415
				Thermal	70	70	100	110	210	210
N50	150	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	70	70	100	110	210	210
N51	150	215	2"	Weight	50	60	50	134	75	75
				Seismic	186	123	186	277	415	415
				Thermal	70	70	100	110	210	210
N52	150	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	70	184	100	269	210	276
N53	150	215	2"	Weight	50	60	50	75	75	75
				Seismic	455	123	186	277	488	473
				Thermal	70	70	100	110	210	210
N54	150	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	70	92	100	242	210	210
N55	150	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	605	183	100	110	398	738

Nozzle	Design Nozzle Press (psig) (Note E)	Design Nozzle Temp (°F) (Note E & Note G)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N56	170	215	2"	Weight	50	98	50	75	75	201
				Seismic	186	123	186	424	415	513
				Thermal	70	70	100	110	210	210
N57	170	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	770	520
				Thermal	70	70	100	194	210	210
N58	170	215	2"	Weight	50	60	50	75	75	75
				Seismic	152	86	130	383	289	543
				Thermal	200	242	100	201	210	471
N59	170	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	70	70	100	184	210	210
N60	170	215	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	320	635	415	415
				Thermal	70	70	100	110	210	210
N61	170	215	2"	Weight	50	60	50	75	75	75
				Seismic	242	123	186	277	415	415
				Thermal	70	70	100	110	210	210
N62	170	215	2"	Weight	50	71	50	75	75	135
				Seismic	186	123	186	277	415	415
				Thermal	70	70	100	110	210	210
N63	170	215	4"	Weight	87	225	87	235	135	150
				Seismic	422	282	558	613	875	613
				Thermal	325	100	466	250	2500	500
N64	15	215	1 1/2"	Weight	35	39	35	100	40	40
				Seismic	105	70	105	165	240	240
				Thermal	40	40	60	60	120	120
N70	15	215	6"	Weight	N70 is parent nozzle, nozzle loads are applied via N70A, N70B, N70C					
				Seismic						
				Thermal						
N70A (Note C)	115	215	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	30	50	50
N70B (Note C)	115	215	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	30	50	50
N70C (Note C)	115	215	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	20	20	30	30	50	50

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. Values provided at plate on top of parent nozzle.

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

E. Design Temperatures and Pressures for qualification of nozzles only.

12 F. All Pretreatment RGM Seismic Piping Nozzles 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 24590-WTP-GPG-ENG-0150 for nozzle load management).

12 G. Nozzles temperatures that are equal or less than vessel design temperature shall use the vessel design temperature as the bounding temperature to perform the nozzle analysis. Nozzles temperatures that are greater than the vessel design temperature shall be used to analyze the hot nozzles.

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification		
Full Component Tag Number or BNI Stock Code Number	24590-PTF-MV-FRP-VSL-00002C	Safety Classification ☒ SC ☐ SS ☐ APC-PAM
Equipment Datasheet Number	24590-PTF-MVD-FRP-00007	
Description	Waste Feed Receipt Process System (FRP) Vessel.	Seismic Category ☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV ☐ SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	PTF Building; located in Room P-0108B, Elev. 0'-00", column lines F/2.5	
Safety Function(s)	FRP-VSL-00002C (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, Table 4A-1, Preliminary Documented Safety Analysis to Support Construction Authorization; PT Facility Specific Information.	
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)	761000 (E-Note 4)	40 (E-Note 3)	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)	120	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)	8	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)	761000 (E-Note 4)	0 (E-Note 3)	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)	139	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	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)	761000 (E-Note 4)	0 (E-Note 3)	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 Water Sodium Hydroxide (FEP21), 86°F, pH 15.5 Sodium Hydroxide (FRP02), 110°F, pH 14.5 Sodium Hydroxide (FRP13), 110°F, pH 14.5 Sodium Hydroxide (TCP05), 120°F, pH 15.0 Sodium Hydroxide (FRP01), 121°F, pH 14.5 Sodium Hydroxide (FEP19), 121°F, pH 15.0 Sodium Hydroxide (FRP14), 191°F, pH 15.0

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)	Vertically Mounted
Mounting Method (bolts, welds, etc.)	Welded skirt to embed plates. Embed plate details per 24590-PTF-DD-S13T-00039, 24590-PTF-DD-S13T-00036, 24590-PTF-DD-S13T-00042
Auxiliary Devices	FRP-PJM-00029, FRP-PJM-00030, FRP-PJM-00031, FRP-PJM-00032, FRP-PJM-00033, FRP-PJM-00034, FRP-PJM-00035, FRP-PJM-00036, FRP-PJM-00001, FRP-PJM-00002, FRP-PJM-00003, FRP-PJM-00004

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 61 thru 66

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 24590-WTP-DC-ENG-06-001, Design Criteria for Environmental and Natural Phenomena Hazard Qualification of Equipment.

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: 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 4: Radiation Dose Rates are for determining shielding requirements only for the black cell and are not at the source (vessel). Since the vessel is all metallic and the source has no neutron components for material embrittlement, the dose rates are of no concern on the vessel or its subcomponents.

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	System Engineer	Vessel Engineer	Checked	MET	E&NS	Approved	Date
0	Issue for Purchase	Y. Hovanski	R. Simmons	C. Slater/ CEC	N/A	N/A	S. Kirk	04/18/02
1	Revised as Noted	Y. Hovanski	R. Simmons	C. Corriveau	N/A	N/A	S. Kirk	06/02/02
2	Revised Cyclical Data	Y. Hovanski	R. Simmons	C. Slater	N/A	N/A	S. Kirk	08/29/02
3	Revised as Noted, Deleted Charge Vessels	Y. Hovanski	R. Simmons	CS / JJ	N/A	N/A	M..Hoffmann	12/13/02
4	Revised per Note 5	Y. Hovanski	R. Simmons	CS / JJ	N/A	N/A	M..Hoffmann	05/16/03
5	Revised per Note 7	Y. Hovanski	R. Simmons	CS / JJ	N/A	N/A	M..Hoffmann	11/03/03
6	Added Black Cell Requirements	R. Rider	R. Simmons	YH/CS/JJ	N/A	N/A	M. Hoffmann	04/05/04
7	Added Material Specification for Internal Supports and Hydrodynamic Loads	R. Rider	R. Simmons	YH/RT/JJ D. Adler	N/A	N/A	M. Hoffmann	06/23/04
8	Revised Hydrodynamic Loading Criteria	R. Rider	R. Simmons	YH/CS/JJ	N/A	N/A	M. Hoffmann	07/13/04
9	Revised Hydrodynamic Loading Criteria	R. Rider	R. Simmons	CS/JJ	N/A	N/A	M. Hoffmann	07/20/04
10	Revised per Note 12 on sheet 2 of 5.	R. Rider	J. Polani	M. Seed C. Slater	D. Adler	N/A	J. Julyk	10/28/05
11	Revised per Note 14 and as noted by revision triangles. Supersedes 24590-PTF-MVD-FRP-P0006, Rev 4.	B Lindberg	M Seed	S Jain	D Adler	J Hinckley	J Julyk	05/14/09
12	Revised per Note 15 and as noted by revision triangles.	B Lindberg	D Harris	M Arulampalam	D Adler	G Hendricks	J Julyk	5/10/11

ATTACHMENT 1: Page 1 of 2
REFERENCES for Data Sheets: 24590-PTF-MVD-FRP-00005, 00006, 00007, and 00008, Rev 12 △12 *(For BNI Use only)*
Vessel Tags: FRP-VSL-00002A/B/C/D

Data	Document #	Rev	Document Title
Quality Level	24590-PTF-M6-FRP-00001 24590-PTF-M6-FRP-00002	3 3	*P&ID PTF Waste Feed Receipt Vessels FRP-VSL-00002A and FRP-VSL-00002B* *P&ID PTF Waste Feed Receipt Vessels FRP-VSL-00002C and FRP-VSL-00002D*
Seismic Category	24590-PTF-M6-FRP-00001 24590-PTF-M6-FRP-00002	3 3	*P&ID PTF Waste Feed Receipt Vessels FRP-VSL-00002A and FRP-VSL-00002B* *P&ID PTF Waste Feed Receipt Vessels FRP-VSL-00002C and FRP-VSL-00002D*
Design Specific Gravity	24590-WTP-ICD-MG-01-019	4	*ICD 19 - Interface Control Document for Waste Feed* / Section 2.4.3.2, Table 6
Max Operating Volume	24590-PTF-MTC-FRP-00001	E	*Vessel Sizing Calculation FRP-VSL-00002A/B/C/D*
Total Volume	24590-PTF-MTC-FRP-00001	E	*Vessel Sizing Calculation FRP-VSL-00002A/B/C/D*
Inside Diameter	24590-PTF-MTC-FRP-00001	E	*Vessel Sizing Calculation FRP-VSL-00002A/B/C/D*
Length TL-TL	24590-PTF-MTC-FRP-00001	E	*Vessel Sizing Calculation FRP-VSL-00002A/B/C/D*
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)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs*
Design Pressure (internal)	24590-WTP-DB-ENG-01-001	1P	*Basis of Design*
Design Pressure (external)	24590-PTF-M6C-PVP-00017	A	*HADCRT Analysis of PTF PVP System at various Operating Scenarios /* External design pressure of 2.5 psig is based on a normal operating pressure of -35 in WG (1.26 psig) with an additional margin
Operating Temp	24590-WTP-RPT-ENG-07-007	0A	*Process Stream Properties* / page 12 based on maximum of all FRP streams (max operating 140 F). (Note - FRP14 stream is not an input to these vessels per Section 4.1.6)
Design Temp	24590-WTP-RPT-ENG-07-007	0A	*Process Stream Properties* / maximum off normal temp per this report page 12
Corrosion Allowance, Erosion Allowance	24590-PTF-N1D-FRP-00001 24590-WTP-M0C-50-00004	7 E	*Corrosion Evaluation FRP-VSL-00002A/B/C/D* *Wear Allowance for WTP Waste Slurry Systems*
Materials of Construction	24590-PTF-N1D-FRP-00001	7	*Corrosion Evaluation FRP-VSL-00002A/B/C/D*
Design Pressure (PJM)	24590-PTF-MVC-10-00003 24590-PTF-M6-FRP-00005	C 3	*PTF Vessel Cyclic Datasheet Inputs* *P&ID PTF Waste Feed Receipt - PSA Rack* / ITS pressure regulator set at 75 psig plus a margin
Operating Pressure (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs*
Operating Temperature (PJM)	N/A	N/A	same as parent vessel
Cyclic Data (Vessel)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* (24590-PTF-MVE-10-00008)
Cyclic Data (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* (24590-PTF-MVE-10-00012)

ATTACHMENT 1: Page 2 of 2
REFERENCES for Data Sheets: 24590-PTF-MVD-FRP-00005, 00006, 00007, and 00008, Rev 12 12 *(For BNI Use only)*
Vessel Tags: FRP-VSL-00002A/B/C/D

Data	Document #	Rev	Document Title
Hydrodynamic Loads	24590-WTP-MVC-50-00001	A	*Hydrodynamic Loads for Normal PJM Operation in Vessels with Newtonian Fluids*
Single PJM Overblow Loads	24590-WTP-MVC-50-00001	A	*Hydrodynamic Loads for Normal PJM Operation in Vessels with Newtonian Fluids*
PJM Overblow Loads	24590-WTP-MVC-50-00011	B	*Pulse Jet Mixer Overblow Vessel Loads*
Single Overblow Cycles	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00004)*
Multiple Overblow Cycles	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00004)*
Nozzle Loads	CCN 125802 CCN 125803 CCN 125804 CCN 125805 CCN 198206 CCN 230856 CCN 230857 CCN 230858 CCN 230859	N/A N/A N/A N/A N/A N/A N/A N/A N/A	*Nozzle Design Loads for FRP-VSL-00002A* *Nozzle Design Loads for FRP-VSL-00002D* *Nozzle Design Loads for FRP-VSL-00002B* *Nozzle Design Loads for FRP-VSL-00002C* *Supplemental Design Nozzle Loads for FRP-VSL-00002C/D* *Supplemental Nozzle Design Loads for FRP-VSL-00002A* *Supplemental Nozzle Design Loads for FRP-VSL-00002B* *Supplemental Nozzle Design Loads for FRP-VSL-00002C* *Supplemental Nozzle Design Loads for FRP-VSL-00002D*
Nozzle Design Pressures and Temperatures (FRP-VSL-00002A)	24590-PTF-M6X-FRP-00007 24590-PTF-M6X-FRP-00011 24590-PTF-M6X-FRP-00027 24590-PTF-M6X-FRP-00038	3 3 3 0	*MS Line List for P&ID 24590-PTF-M6-FRP-00001, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00005, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00009, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00017, Rev 0*
Nozzle Design Pressures and Temperatures (FRP-VSL-00002B)	24590-PTF-M6X-FRP-00007 24590-PTF-M6X-FRP-00015 24590-PTF-M6X-FRP-00027 24590-PTF-M6X-FRP-00043	3 3 3 0	*MS Line List for P&ID 24590-PTF-M6-FRP-00001, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00006, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00009, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00018, Rev 0*
Nozzle Design Pressures and Temperatures (FRP-VSL-00002C)	24590-PTF-M6X-FRP-00009 24590-PTF-M6X-FRP-00019 24590-PTF-M6X-FRP-00031 24590-PTF-M6X-FRP-00048	3 3 3 0	*MS Line List for P&ID 24590-PTF-M6-FRP-00002, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00007, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00010, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00019, Rev 0*
Nozzle Design Pressures and Temperatures (FRP-VSL-00002D)	24590-PTF-M6X-FRP-00009 24590-PTF-M6X-FRP-00023 24590-PTF-M6X-FRP-00031 24590-PTF-M6X-FRP-00053	3 3 3 0	*MS Line List for P&ID 24590-PTF-M6-FRP-00002, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00008, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00010, Rev 3* *MS Line List for P&ID 24590-PTF-M6-FRP-00020, Rev 0*
Equipment Qualification Datasheet	24590-PTF-U0D-W16T-00001	2	*PTF-Room Environment Datasheet* (24590-PTF-U0N-W16T-00007)
Nozzle Load Management	24590-WTP-GPG-ENG-0150	0	*Plant Design/Mechanical Systems Equipment Interfaces: Terminal End Equipment* / CCN 229865