R11249138

MECHANICAL SYSTEMS DATA SHEET: VESSEL

PLANT ITEM No. ***24590-PTF-MV-UFP-VSL-00062A***

Project:	***RPP-WTP***	P&ID:	***24590-PTF-M6-UFP-00004001, 24590-PTF-M6-UFP-00005007, 24590-PTF-M6-UFP-00006007, 24590-PTF-M6-UFP-00015001***
Project No:	***24590***	Calculations:	***Attachment 1 (Page 1 of 2)***
Project Site:	***Hanford***	Vessel Drawing	***24590-PTF-MV-UFP-00005***
Description:	***Ultrafilter Permeate Collection Vessel***	Reports/Other Documents	***Attachment 1 (Page 1 of 2)***

ISSUED BY RPP-WTP PDC

Reference Data

Charge Vessels (Tag Numbers)	***UFP-VSL-00032, UFP-VSL-00033, UFP-VSL-00034, UFP-VSL-00072, UFP-VSL-00073, UFP-VSL-00082***
Pulsejet Mixers / Agitators (Tag Numbers)	***UFP-PJM-00018, UFP-PJM-00019, UFP-PJM-00020, UFP-PJM-00021, UFP-PJM-00022, UFP-PJM-00052***
RFDs/Pumps (Tag Numbers)	***UFP-RFD-00027, UFP-RFD-00028, UFP-RFD-00030, UFP-RFD-00037, UFP-RFD-00038, UFP-RFD-00049***

Design Data

Quality Level		***Q (Note 11)***	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		***1.5***	NB Registration	***Yes***		
Maximum Operating Volume	gal	***30,058***	Weights (lbs)	Empty	Operating	Test
Total Volume	gal	***34,700***	Estimated	***103,000***	***512,285***	***401,100***
Environmental Qualification		***See EQ Sections***	11			

Inside Diameter	inch	***180***			Wind Design	***Not Required***	
Length/Height (TL-TL)	inch	***255***			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	***ATM***	***15***	***N/A***			
External Pressure	psig	***1.5***	***2.0 (Note 14)***	***N/A***	Postweld Heat Treat	***Not Required***	
Temperature	°F	***133***	***230***	***N/A***	Corrosion Allowance	Inch	***0.04***
Min. Design Metal Temp.	°F	***40***					

Materials of Construction

Component	Material	Minimum Thickness / Size	Containment
Top Head	***SA 240 316 (Note 1)***	***See Drawing***	***Auxiliary (Note 6)***
Shell	***SA 240 316 (Note 1)***	***See Drawing***	***Primary (Note 6)***
Bottom Head	***SA 240 316 (Note 1)***	***See Drawing***	***Primary (Note 6)***
Support	***SA 240 304 (Note 1)***	***See Drawing***	***N/A***
Jacket/Coils/Half-Pipe Jacket	***N/A***	***N/A***	***N/A***
Internals	***SA 240 316 (Note 1)***	***See Drawing***	***Thermowells Primary***
Pipe Nozzles	***SA 312 TP316 (Note 1)***	***See Drawing***	***Primary (Note 6)***
Forgings/ Bar stock	***SA 182 F316 (Note 1)***	***See Drawing***	***N/A***
Wash Ring Pipe	***SA 312 TP316 (Note 1)***	***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***	Internal Finish	***Note 3***
		External Finish	***Note 3***

Notes/Remarks

△11

Note 1: *Maximum 0.030% carbon.*

Note 2: *Deleted.*

Note 3: *Welds de-scaled as laid.*

Note 4: *Vessel volumes are approximate and do not account for the manufacturing tolerances, nozzles, and displacement of internals.*

Note 5: *This vessel is in a Black Cell.*

Note 6: *All welds forming part of the primary and auxiliary containment including nozzle attachment welds shall be subjected to 100% volumetric examination.*

Note 7: *Contents of this document are Dangerous Waste Permit affecting.*

Note 8: *Deleted as per Report No. 24590-WTP-RPT-M-04-0007 Rev. 0 dated Nov. 01, 2004.*

Note 9: *Deleted*

Note 10: *Deleted*

Note 11: *Vessel to be designed, fabricated, tested to Q, L-1 requirements defined in 24590-WTP-3PS-MV00-T0001.*

Note 12: *Deleted.*

Note 13: *If any Sections contains a revision triangle next to the Section heading, this means the entire section has been revised or is new - the entire section must be reviewed for changes/additions.*

Note 14: *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 15: *Revised Design Data, revised P&IDs, revised Calculation, added Reports/Other Documents change to parent vessel cyclic data, change to hydrodynamic loads for normal operations, revised single overblow loads, added MOB loads, change to parent vessel cyclic data, change to PJM cyclic data, change to CV cyclic data, added nozzle loads, added Equipment Qualification Data Sheet and Notes, added DOE Radioactive Material Disclaimer, added E&NS table and signature, revised Note 9, added Notes 11 through 15, added Attachment 1 for BNI use only.*

Note 16: *Revised as follows: operating and design temperatures and the Hydrodynamic Loading section including overblow.*

Equipment Cyclic Data Sheet - Parent Vessel

Component Plant Item Number:	*PTF-MV-UFP-VSL-00062A*
Component Description	*Ultrafilter Permeate Collection Vessel (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	*ASME SA 240 316 with max. Carbon of 0.030%*
Design Life	*40 Years*
Component Function and Life Cycle Description △11	*This vessel collects permeate from the Ultrafiltration tube units. The permeate is transferred from this vessel to the Cesium Ion Exchange Process System, vessel CXP-VSL-00004, for further processing. The permeate is also sampled to check for solids in this vessel. The operating cycle for this vessel, filled then emptied, is approximately 24 hours.*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*-2.0*	*15*	*10*	*Nominal assumption for testing*
Operating Pressure	psig	*-1.5* *0* △11	*0* *2.8*	*7.0E6* *40*	*Normal Operations* *Loss of Power*
Operating Temp	°F	*59*	*133*	*13300*	
Contents Specific Gravity		*1.0*	*1.5*	*13300*	*Assume vessel empty for min value*
Contents Level	inch	*27*	*288*	*13300*	
Localized Features					
Nozzles		*Within 9 °F of operating temperature range.*		*As above*	

Notes

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

Equipment Cyclic Data Sheet - PJMs

Component Plant Item Number:	*UFP-PJM-00018, UFP-PJM-00019, UFP-PJM-00020, UFP-PJM-00021, UFP-PJM-00022, UFP-PJM-00052*
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	*ASME SA 240 316 with max. Carbon of 0.030%*
Design Life	*40 Years*
Component Function and Life Cycle Description	*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. They shall be designed to cycle between the maximum design pressure and the minimum design pressure plus the external static head imposed by the parent vessel. The PJM supports shall be designed to 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. Assume the parent vessel is full for 50% of the number of PJM cycles.*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*FV*	*80* △11	*100*	*Nominal assumption for testing, not combined with other load cases*
Operating Pressure	psig	*FV*	*25* △11	*1.9E7* △11	
Operating Temperature	°F	*59*	*133*	*13300*	*Same as Parent Vessel*
Contents Specific Gravity		*1.0*	*1.5*	*13300* △11	*Assume for buoyancy PJM is empty*
Contents Level	inch	*Empty*	*Flooded*	*1.9E7* △11	
Thrust △11	lbf	*-394*	*394*	*1.9E7*	
Localized Features					
Nozzles		*Within 9°F of operating temperature range.*		*As above*	
Supports		*Buoyant*	*Loaded*	*1.9E7* △11	

Notes

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

Equipment Cyclic Data Sheet - Charge Vessels

Component Plant Item Number:	*PTF-MV-UFP-VSL-00032, PTF-MV-UFP-VSL-00033, PTF-MV-UFP-VSL-00034, PTF-MV-UFP-VSL-00072, PTF-MV-UFP-VSL-00073, PTF-MV-UFP-00082*
Component Description	*Charge Vessels for the following RFDs: UFP-RFD-00027, UFP-RFD-00028, UFP-RFD-00030, UFP-RFD-00037, UFP-RFD-00038, UFP-RFD-00049*

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

Materials of Construction	*ASME SA 240 316 with max. Carbon of 0.030%*
Design Life	*40 Years*
Component Function and Life Cycle Description	*These charge vessels are cyclically loaded using vacuum to fully fill the charge vessel with process liquid and compressed air to fully empty the charge vessel. The charge vessels are contained within a parent vessel with varying liquid level. They shall be designed to cycle between the maximum design pressure and the minimum design pressure plus the external static head imposed by the parent vessel. The charge vessel supports shall be designed to cycle between fully buoyant (charge vessel empty and parent vessel full) and fully loaded (charge vessel full and parent vessel empty).*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*FV*	*135* △11	*100*	*Max value based on operating plus a margin - not to be used concurrent with any other occasional load case.*
Operating Pressure	psig	*FV*	*80*	*4.1E6* △11	*Maximum value for all charge vessels 24590-PTF-MVC-10-00003*
Operating Temperature	°F	*59*	*133*	*13300*	*Same as parent Vessel*
Contents Specific Gravity		*1.0*	*1.5*	*13300*	*For Buoyancy assume CV is empty*
Contents Level	inch	*Empty*	*Flooded*	*4.1E6* △11	*Maximum value for all charge vessels 24590-PTF-MVC-10-00003*
Localized Features					
Nozzles		*Within 9°F of operating temperature range.*		*As above*	
Supports		*Buoyant*	*Loaded*	*4.1E6* △11	*Maximum value for all charge vessels 24590-PTF-MVC-10-00003*

Notes

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

Hydrodynamic Loads Due to PJM Operations 11

Normal operation imposes a cyclical load as described in the following table:

6 PJM Class	Radial Direction		Axial Direction		Number of Cycles
	Peak Positive (psi)	Peak Negative (psi)	Peak Positive (psi)	Peak Negative (psi)	
Targets above 12" from vessel bottom	0.22	-0.02	0.4	-0.01	1.9E7
Targets 6" to 12" from vessel bottom	0.29	-0.09	0.48	-0.74	

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.

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

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 (<12" from bottom head)	14 Hz*
1 inch (>12" from bottom head)	12 Hz*
2 inch	8.0 Hz*
3 inch	5.0 Hz**

* See 24590-WTP-MVC-50-00001

** By extrapolation from 1 inch and 2 inch

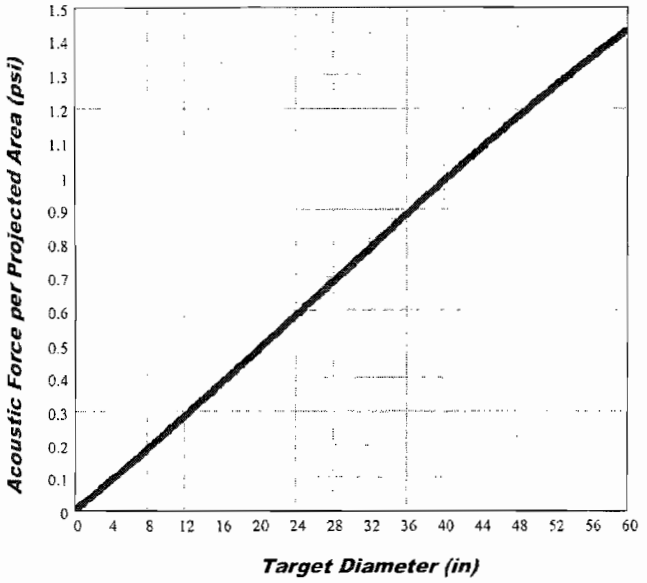
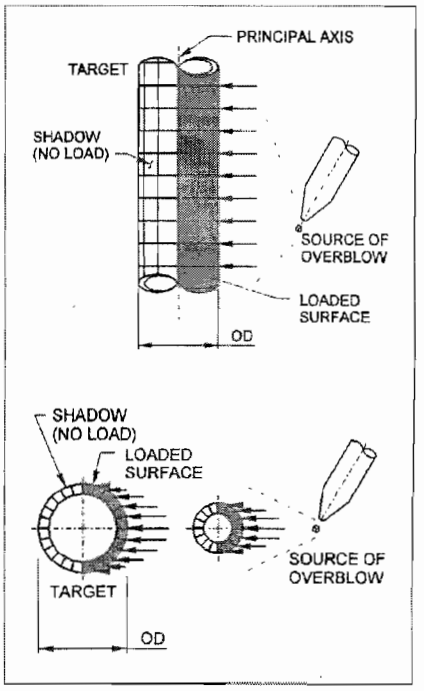
Overblow Condition: Occasionally the drive cycle lasts too long and compressed air is discharged from the PJM. Overblows can also occur during system calibration. One or multiple PJMs may overblow at any time. These conditions induce acoustic and bubble rise loads on structures.

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.

PJM Overblow Loads

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.*** ***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

Nozzle	Design Pressure (psig) (Note E)	Design Temp (°F) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N05	15	138	2"OD	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	20	30	40	70	70
N06	15 (11)	230 (11)	6"	Weight	N06 is parent nozzle, nozzle loads are applied via N06A, N06B, N06C					
				Seismic						
				Thermal						
N06A (Note C)	150	140	1"	Weight	15	20	15	20	20	20
				Seismic	30	20	30	37	55	55
				Thermal	10	10	10	10	20	20
N06B (Note C)	150	140	1"	Weight	15	20	15	20	20	20
				Seismic	30	20	30	37	55	55
				Thermal	10	10	10	10	20	20
N06C (Note C)	150	140	1"	Weight	15	20	15	20	20	20
				Seismic	30	20	30	37	55	55
				Thermal	10	10	10	10	20	20
N07	170	150	2"	Weight	50	71	50	75	75	75
				Seismic	106	70	106	264	237	257
				Thermal	45	33	30	41	70	130
N09	30	212	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	67	86	45	245	70	249
N10	30	111	2"	Weight	50	75	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	60	30	43	70	85
N11	15	160	2"	Weight	50	98	50	75	75	75
				Seismic	106	71	106	158	237	237
				Thermal	30	20	30	40	70	70
N12	124	140	2"OD	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	20	30	40	70	70
N13	80	111	2"OD	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	20	30	40	70	70
N14	80	111	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	20	30	40	70	70
N16	124	140	2"	Weight	50	104	50	75	75	75
				Seismic	106	77	106	158	237	237
				Thermal	30	20	30	94	70	70
N17	150	185	2"	Weight	50	60	50	75	75	90
				Seismic	106	70	177	158	453	237
				Thermal	30	20	30	40	70	70
N18	124	140	2"	Weight	50	102	50	75	75	75
				Seismic	106	93	106	197	237	237
				Thermal	30	20	30	99	70	70

Nozzle	Design Pressure (psig) (Note E)	Design Temp (°F) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N19	124	140	2"	Weight	50	72	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	25	30	60	70	82
N20	124	140	2"	Weight	50	72	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	28	30	112	70	85
N21	124	140	2"	Weight	50	81	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	21	30	84	70	70
N22	15	185	6"	Weight	210	335	210	598	374	374
				Seismic	663	443	663	2920	3638	3638
				Thermal	180	160	240	640	1280	1280
N23	124	140	3"	Weight	52	227	52	119	75	81
				Seismic	162	166	162	468	701	701
				Thermal	50	40	60	341	240	240
N24	124	140	3"	Weight	52	186	52	119	75	75
				Seismic	162	133	162	468	701	701
				Thermal	50	50	60	227	240	240
N25	124	140	3"	Weight	52	190	52	119	75	75
				Seismic	162	136	162	468	701	701
				Thermal	50	78	60	354	240	240
N26	124	140	3"	Weight	52	225	52	119	75	150
				Seismic	168	236	162	468	701	736
				Thermal	50	40	60	283	240	240
N28	75	185	4"	Weight	87	212	87	216	135	135
				Seismic	274	194	498	2734	1320	1365
				Thermal	80	70	100	230	450	450
N29	75	185	4"	Weight	87	205	87	216	135	135
				Seismic	466	183	274	1091	1320	1443
				Thermal	134	70	100	266	450	450
N30	75	185	4"	Weight	87	253	87	216	135	135
				Seismic	274	192	318	1468	1320	1320
				Thermal	86	143	100	230	450	450
N32	75	111	4"	Weight	87	271	87	216	135	135
				Seismic	359	227	385	2703	1320	1976
				Thermal	163	173	100	541	450	739
N34	134	175	2"	Weight	50	125	50	75	75	75
				Seismic	106	90	106	158	237	237
				Thermal	30	20	30	40	70	70
N35	134	175	2"	Weight	50	114	50	75	75	75
				Seismic	106	82	106	194	237	311
				Thermal	30	37	30	110	70	73
N36	134	175	2"	Weight	50	88	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	38	30	86	70	86
N37	15	120	6"	Weight	210	485	210	1092	374	1285
				Seismic	663	637	767	2423	4153	3638
				Thermal	180	160	240	640	1280	1280

Nozzle	Design Pressure (psig) (Note E)	Design Temp (°F) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N38 △11	169	120	2"	Weight	5	155	15	45	15	20
				Seismic	100	135	85	385	165	450
				Thermal	10	30	10	10	5	5
N39	15 △11	230 △11	24"	Weight	Manway - No Loads Applied					
				Seismic						
				Thermal						
N40	125	120	3"	Weight	52	84	52	119	75	75
				Seismic	162	108	162	506	701	701
				Thermal	50	59	60	162	240	240
N41	124	140	2"	Weight	50	93	50	75	75	75
				Seismic	106	73	106	158	237	237
				Thermal	30	20	30	91	70	70
N44	75	111	4"	Weight	87	214	87	216	135	135
				Seismic	327	215	364	2330	1320	1672
				Thermal	233	210	100	328	450	1021
N45	124	140	3"	Weight	52	180	52	119	75	75
				Seismic	162	129	162	468	701	701
				Thermal	50	49	60	238	240	240
N46	15	160	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	30	36	30	40	70	70

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. Nozzle Pressures and Temperatures to be used to qualify the nozzles only.
F. All Pretreatment RGM Seismic Piping Nozzles loads from Plant Design shall have a 1.75 load factor applied 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. △11

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification				
Full Component Tag Number or BNI Stock Code Number	24590-PTF-MV-UFP-VSL-00062A			Safety Classification ☒ SC ☐ SS ☐ APC-PAM
Equipment Datasheet Number	24590-PTF-MVD-UFP-00005			
Description	Ultrafilter Permeate Collection Vessel			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-0106, Elev. 0'-00", column lines K.5/10.5			
Safety Function(s)	UFP-VSL-00062A (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. 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)	255000 (E-Note 4)	40 (E-Note 7)	Years (Note e-1)	24590-PTF-U0D-W16T-00001, E-Note 1
Plant/Process Induced Vibration	☐ Yes ☒ No			
Additional Normal Ambient Information:	N/A			

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Abnormal Ambients				
High Temperature (°F)	128	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)	255000 (E-Note 4)	0 (E-Note 7)	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)	255000 (E-Note 4)	0 (E-Note 7)	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	Nitric Acid (RDP09), 87 °F, 2.5 pH Process Rad Condensate Sodium Hydroxide (FEP01), 103 °F, 14.5 pH Sodium Hydroxide (FEP08a), 104 °F, 11.5 pH Sodium Hydroxide (FEP12a), 104 °F, 11.5 pH Sodium Hydroxide (FEP19), 121 °F, 15.5 pH Sodium Hydroxide (FRP01), 121 °F, 14.5 pH Sodium Hydroxide (FRP02), 110 °F, 14.5 pH Sodium Hydroxide (FRP13), 110 °F, 14.5 pH Sodium Hydroxide (FRP14), 191 °F, 15.5 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 (PWD01), 106 °F, 14 pH Sodium Hydroxide (TCP05), 120 °F, 15.5 pH Sodium Hydroxide (UFP04), 77 °F, 15.5 pH Sodium Hydroxide (UFP33), 84 °F, 14.5 pH Sodium Hydroxide (2M) Sodium Permanganate (1M) Strontium Nitrate (1M) Water

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, 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-00043, and 24590-PTF-DD-S13T-00045
Auxiliary Devices	UFP-PJM-00018, UFP-PJM-00019, UFP-PJM-00020, UFP-PJM-00021, UFP-PJM-00022, UFP-PJM-00052,UFP-VSL-00032, UFP-VSL-00033, UFP-VSL-00034, UFP-VSL-00072, UFP-VSL-00073, UFP-VSL-00082, UFP-RFD-00027, UFP-RFD-00028, UFP-RFD-00030, UFP-RFD-00037, UFP-RFD-00038, UFP-RFD-00049 - all auxiliary devices are located internal to 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: 203392; WSGM ISRS Curves: Figures 66, 67 and 68

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 Equipment Seismic and Environmental Qualification.

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: 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.

E-Note 6: Environmental data shown are for the room only.

Equipment Qualification Notes and Additional Information
E-Note 7: Normal, Abnormal, and DBE dose rates are the same, therefore, abnormal & DBE doses do not add to total integrated dose based on normal dose rates over 40 years.

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	HK	US/CS	PA	N/A	N/A	SK	10/10/02
1	Revised as Noted	HK	PA/CS	MA	JJ	N/A	MWH	08/18/03
2	Revised as Noted	HK	PA/CS	MA	JJ	N/A	MWH	09/11/03
3	Revised as Noted	HK	PA/CS	MA	JJ	N/A	MWH	12/10/03
4	Revised as Noted	H Khurana	P. Aviguetero C. Slater	M. Askar	J. Julyk	N/A	C. Morley for M. Hoffmann	02/05/04
5	Added hydrodynamic loads and other revisions as noted.	H Khurana	P. Aviguetero R. Tiwari	M. Askar	J. Julyk	N/A	M. Hoffmann	09/08/04
6	Added note 9, deleted note 8. and changes as noted.	H Khurana	P. Aviguetero	M. Askar	J. Julyk	N/A	M. Hoffmann	12/17/05
7	Over-blow cycles revised from 100 to 1000, on page 3. Deleted note 9 on page 2 and revised as noted.	H Khurana	J. Olson R. P. Voria	A.Moretta	CS	N/A	J. Julyk	09/04/05
8	Revised per note 10 on page 2 and as noted	H Khurana	J. Polani P Aviguetero	M. Askar	C. Slater D. Adler	N/A	J. Julyk	10/28/05
9	Revised per Note 15. Supersedes 24590-PTF-MVD-UFP-P0005, Rev 2.	M. Seed	S Jain	D. Vo	D Adler	J Hinckley	J Julyk	05/11/09
10	Revised per Note 16 and as noted by revision triangles.	M Seed	D Harris	D. Vo	D Adler	J Hinckley	J Julyk	06/17/10
11	Incorporated 24590-PTF-MVN-UFP-00047. Revised Equipment Qualification data to new form, Hydrodynamic Loads Due to PJM Operations, and as noted by revision triangles.	M Seed MA Seed	L Rodgers	R Zielinski for B Lindberg R Zielinski	D Adler	J Hinckley	J Julyk	12/22/10

ATTACHMENT 1: Page 1 of 2
REFERENCES for Data Sheets: 24590-PTF-MVD-UFP-00005, 00006, 00007, Rev 11 *(For BNI Use only)*
Vessel Tags: UFP-VSL-00062A/B/C

Data	Document #	Rev	Document Title/ Comments
Quality Level	24590-PTF-M6-UFP-00004001	0	*P&ID Ultrafiltration Permeate Collection System Vessels*
Seismic Category	24590-PTF-M6-UFP-00004001	0	*P&ID Ultrafiltration Permeate Collection System Vessels*
Design Specific Gravity	24590-WTP-RPT-ENG-07-007	0A 11	*Process Stream Properties* / Section 4.18
Max Operating Volume	24590-PTF-M6C-UFP-00005	D	*Vessel Sizing Calc for Ultrafiltration Permeate Vessels UFP-62A, 62B, 62C* / Section 8
Total Volume	24590-PTF-M6C-UFP-00005	D	*Vessel Sizing Calc for Ultrafiltration Permeate Vessels UFP-62A, 62B, 62C* / Section 7.1.20
Inside Diameter	24590-PTF-M6C-UFP-00005	D	*Vessel Sizing Calc for Ultrafiltration Permeate Vessels UFP-62A, 62B, 62C* / Section 8
Length TL-TL	24590-PTF-M6C-UFP-00005	D	*Vessel Sizing Calc for Ultrafiltration Permeate Vessels UFP-62A, 62B, 62C* / Ssection 8
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)
Design Pressure (internal)	24590-WTP-DB-ENG-01-001	1P 11	*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 2.0 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 11	*Process Stream Properties, Section 4.18*
Design Temp	24590-WTP-RPT-ENG-07-007	0A 11	*Process Stream Properties* / Section 4.18
Corrosion Allowance, Erosion allowance	24590-PTF-N1D-UFP-00008	5	*Corrosion Evaluation, UFP-VSL-00062A/B/C*
Materials of Construction	24590-PTF-N1D-UFP-00008	5	*Corrosion Evaluation, UFP-VSL-00062A/B/C* / identifies use of 316 SST with max carbon content of 0.03% - this is for material in contact with process fluids, the vessel support material is 304 SST
Cyclic Data (Vessel)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00008)* 11
Cyclic Data (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00012)* 11
Design Pressure (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00012)* 11
11 Operating Pressure (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs*
Operating Temperature (PJM)			*Same as parent vessel*
11 PJM Thrust	24590-WTP-M6C-50-00011	A	*Pulse Jet Mixer Internal Pressures and Thrust*
11 Operating Pressure (Charge Vessels)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00011)*
11 Operating Temperature (Charge Vessels)			*Same as parent vessel*

REFERENCES for Data Sheets: 24590-PTF-MVD-UFP-00005, 00006, 00007, Rev 11 *(For BNI Use only)*
Vessel Tags: UFP-VSL-00062A/B/C

Data	Document #	Rev	Document Title/ Comments
Cyclic Data (Charge Vessels)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00011)* 11
Design Pressure (Charge Vessels)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00011)*
Hydrodynamic Loads 11	24590-WTP-MVC-50-00001	A	*Hydrodynamic Loads for Normal PJM Operation in Vessels with Newtonian Fluids* / Section 8 for 6 PJM
Single PJM Overblow Loads	24590-WTP-MVC-50-00008	C	*Hydrodynamic Loads for PJM Overblow in Vessels* / Figure 5, sheet 27
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) 11
Multiple Overblow Cycles	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* (24590-PTF-MVC-10-00004) 11
Nozzle Loads 11	CCN 126197 (UFP-62A)	N/A	*Nozzle Loads for UFP-VSL-00062A*
	CCN 126198 (UFP-62B)	N/A	*Nozzle Loads for UFP-VSL-00062B*
	CCN 125817 (UFP-62C)	N/A	*Nozzle Loads for UFP-VSL-00062C*
	CCN 224448 (UFP-62A)	N/A	*Supplemental Nozzle Design Loads for UFP-VSL-00062A (Supplements CCN 126197)*
	CCN 224449 (UFP-62B)	N/A	*Supplemental Nozzle Design Loads for UFP-VSL-00062B (Supplements CCN 126198)*
	CCN 224450 (UFP-62C)	N/A	*Supplemental Nozzle Design Loads for UFP-VSL-00062C (Supplements CCN 125817)*
Nozzle Design Pressures and Temperatures (UFP-62A)	24590-PTF-M6X-UFP-00317	0	*MS Line List for 24590-PTF-M6-UFP-00004001*
	24590-PTF-M6X-UFP-00094	0	*MS Line List for 24590-PTF-M6-UFP-00005007*
	24590-PTF-M6X-UFP-00122	0	*MS Line List for 24590-PTF-M6-UFP-00006007*
	24590-PTF-M6X-UFP-00428	0	*MS Line List for 24590-PTF-M6-UFP-00015001*
Nozzle Design Pressures and Temperatures (UFP-62B)	24590-PTF-M6X-UFP-00320	0	*MS Line List for 24590-PTF-M6-UFP-00004002*
	24590-PTF-M6X-UFP-00094	0	*MS Line List for 24590-PTF-M6-UFP-00005007*
	24590-PTF-M6X-UFP-00122	0	*MS Line List for 24590-PTF-M6-UFP-00006007*
	24590-PTF-M6X-UFP-00428	0	*MS Line List for 24590-PTF-M6-UFP-00015001*
Nozzle Design Pressures and Temperatures (UFP-62C)	24590-PTF-M6X-UFP-00323	0	*MS Line List for 24590-PTF-M6-UFP-00004003*
	24590-PTF-M6X-UFP-00199	0	*MS Line List for 24590-PTF-M6-UFP-00009006*
	24590-PTF-M6X-UFP-00362	0	*MS Line List for 24590-PTF-M6-UFP-00011005*
	24590-PTF-M6X-PWD-00113	2	*MS Line List for 24590-PTF-M6-PWD-00046*