



R11249140

MECHANICAL SYSTEMS DATA SHEET: VESSEL

PLANT ITEM No.

24590-PTF-MV-UFP-VSL-00062C

Project:	RPP-WTP	P&ID:	24590-PTF-M6-UFP-00004003, 24590-PTF-M6-UFP-00009006, 24590-PTF-M6-UFP-00011005, 24590-PTF-M6-PWD-00046
Project No:	24590	Calculations:	Attachment 1 (Page 1 of 2)
Project Site:	Hanford	Vessel Drawing	24590-PTF-MV-UFP-00007
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-00023, UFP-VSL-00024, UFP-VSL-00025, UFP-VSL-00069, UFP-VSL-00070, UFP-VSL-00084
Pulsejet Mixers / Agitators (Tag Numbers)	UFP-PJM-00070, UFP-PJM-00073, UFP-PJM-00076, UFP-PJM-00077, UFP-PJM-00078, UFP-PJM-00107
RFDs/Pumps (Tag Numbers)	UFP-RFD-00042, UFP-RFD-00043, UFP-RFD-00044, UFP-RFD-00045, UFP-RFD-00046, UFP-RFD-00048

Design Data

Quality Level	Q (Note 11)		Fabrication Specs	24590-WTP-3PS-MV00-T0001		
Seismic Category	SC-1		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					

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	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



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Notes/Remarks



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.*



MECHANICAL SYSTEMS DATA SHEET: VESSEL

PLANT ITEM No.
24590-PTF-MV-UFP-VSL-00062C

Equipment Cyclic Data Sheet - Parent Vessel

Component Plant Item Number:	PTF-MV-UFP-VSL-00062C
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	<i>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.</i>



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	0 2.8	7.0E6 40	Normal Operations Loss of Power
Operating Temp	°F	59	133	13300	
Contents Specific Gravity		1.00	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



MECHANICAL SYSTEMS DATA SHEET: VESSEL

PLANT ITEM No.

24590-PTF-MV-UFP-VSL-00062C

Equipment Cyclic Data Sheet - PJMs

Component Plant Item Number:	UFP-PJM-00070, UFP-PJM-00073, UFP-PJM-00076, UFP-PJM-00077, UFP-PJM-00078, UFP-PJM-00107
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	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. 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 Δ_{11}	100	Nominal assumption for testing, not combined with other load cases
Operating Pressure	psig	FV	25 Δ_{11}	1.9E7 Δ_{11}	
Operating Temperature	°F	59	133	13300	Same as Parent Vessel
Contents Specific Gravity		1.0	1.5	13300 Δ_{11}	Assume for buoyancy PJM is empty
Contents Level	inch	Empty	Flooded	1.9E7 Δ_{11}	
Thrust Δ_{11}	lbf	-394	394	1.9E7	
Localized Features					
Nozzles	Within 9°F of operating temperature range.		As above		
Supports	Buoyant	Loaded	1.9E7 Δ_{11}		

Notes

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



MECHANICAL SYSTEMS DATA SHEET: VESSEL

PLANT ITEM No.

24590-PTF-MV-UFP-VSL-00062C

Equipment Cyclic Data Sheet - Charge Vessels

Component Plant Item Number:	PTF-MV-UFP-VSL-00023, PTF-MV-UFP-VSL-00024, PTF-MV-UFP-VSL-00025, PTF-MV-UFP-VSL-00069, PTF-MV-UFP-VSL-00070, PTF-MV-UFP-00084 ¹¹
Component Description	Charge Vessels for the following RFDs UFP-RFD-00042, UFP-RFD-00043, UFP-RFD-00044, UFP-RFD-00045, UFP-RFD-00046, UFP-RFD-00048

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	4.2E6 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		1.00	1.5	13300 ¹¹	For Buoyancy assume CV is empty
Contents Level	inch	Empty	Flooded	4.2E6 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	4.2E6 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**



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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.



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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 not 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 ($5 * 4 \text{ in} = 20 \text{ in}$) of a spherical zone centered at any overblowing PJM nozzle.

Figure 1: Acoustic Design Load

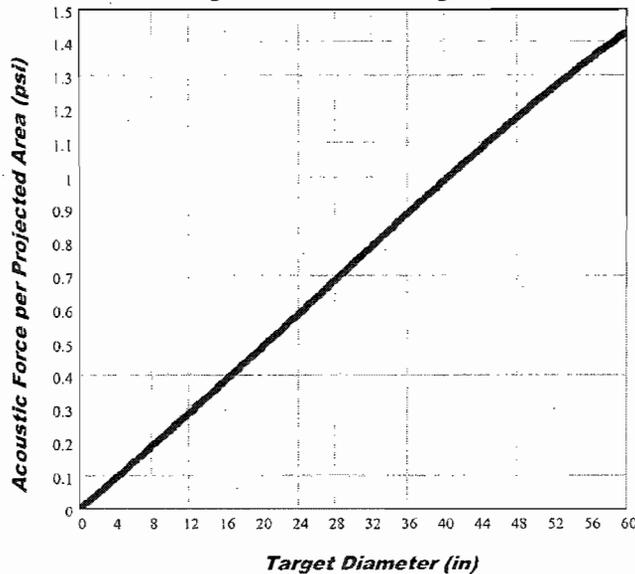
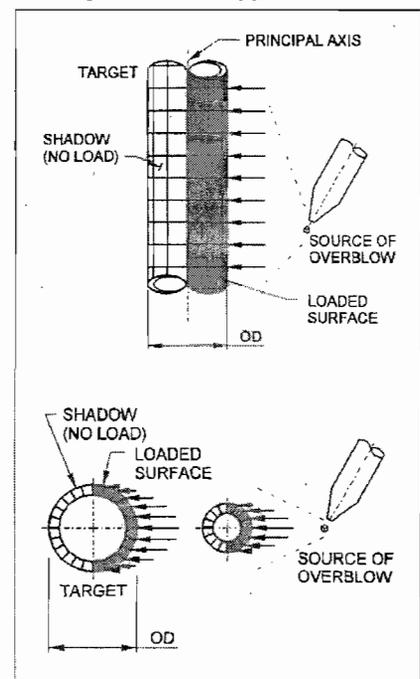


Figure 2: Load Application



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



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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	40	30	50	50	100	100
N06	15 \triangle_{11}	230 \triangle_{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	27	15	20	20	20
				Seismic	30	39	30	44	55	55
				Thermal	10	10	20	20	30	30
N06B (Note C)	150	140	1"	Weight	15	24	15	20	20	20
				Seismic	30	21	30	40	55	55
				Thermal	10	10	20	20	30	30
N06C (Note C)	150	140	1"	Weight	15	26	15	20	20	20
				Seismic	30	33	30	40	55	55
				Thermal	10	10	20	20	30	30
N07	170	150	2"	Weight	50	60	50	75	75	75
				Seismic	177	70	129	275	521	423
				Thermal	40	30	50	50	100	100
N09	30	212	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	299	237
				Thermal	40	30	50	50	100	100
N10	30	111	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	174	437	237
				Thermal	40	30	50	50	100	100
N11	15	160	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	52	50	50	100	114
N12	124	140	2"OD	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	30	50	50	100	100
N13	80	111	2"OD	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	30	50	50	100	100
N14	80	111	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	30	50	50	100	100
N16	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	44	50	50	100	100
N17	150	185	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	30	105	50	242	100
N18	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	278	237
				Thermal	40	75	50	50	100	100



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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	100	50	75	75	75
				Seismic	106	84	106	188	237	237
				Thermal	40	30	50	50	100	100
N20	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	36	50	57	100	100
N21	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	30	50	50	100	100
N22	15	185	6"	Weight	210	335	210	598	374	374
				Seismic	663	443	663	2423	3638	3638
				Thermal	280	250	380	1030	2050	2050
N23	124	140	3"	Weight	52	132	52	119	75	75
				Seismic	162	147	162	840	701	701
				Thermal	70	62	90	190	380	380
N24	124	140	3"	Weight	52	84	52	119	75	75
				Seismic	162	108	162	468	701	701
				Thermal	70	82	90	190	380	380
N25	124	140	3"	Weight	52	134	52	119	75	75
				Seismic	162	222	162	580	701	701
				Thermal	70	87	90	190	380	380
N26	124	140	3"	Weight	52	140	52	119	75	150
				Seismic	162	164	162	468	701	701
				Thermal	70	60	90	190	380	380
N28	75	185	4"	Weight	87	140	87	216	135	135
				Seismic	274	183	274	878	1320	1320
				Thermal	120	100	150	360	720	720
N29	75	111	4"	Weight	87	147	87	216	135	135
				Seismic	274	183	274	878	1320	1320
				Thermal	120	100	150	360	720	720
N30	75	185	4"	Weight	87	191	87	216	135	135
				Seismic	274	183	274	878	1320	1320
				Thermal	120	100	150	360	720	720
N32	75	185	4"	Weight	87	291	130	246	135	135
				Seismic	274	183	274	878	1320	1320
				Thermal	120	100	556	2097	720	720
N34	170	175	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	362	237
				Thermal	40	30	50	50	100	100
N35	170	175	2"	Weight	50	69	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	30	50	50	100	100
N36	170	175	2"	Weight	50	65	50	75	75	75
				Seismic	106	70	106	218	237	237
				Thermal	40	40	50	50	100	100



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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
N37	15	120	6"	Weight	210	470	210	972	543	1263
				Seismic	723	730	663	2577	3638	3638
				Thermal	280	250	417	1030	2050	2050
N38 	169	120	2"	Weight	5	145	5	5	5	20
				Seismic	35	60	25	95	5	140
				Thermal	5	30	5	20	5	15
N39	N/A	N/A	24"	Weight	Manway - No Loads Applied					
				Seismic						
				Thermal						
N40	125	120	3"	Weight	52	108	52	119	75	75
				Seismic	162	108	162	468	701	701
				Thermal	106	60	102	190	380	380
N41	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	30	50	50	100	100
N44	75	111	4"	Weight	87	177	87	216	135	135
				Seismic	274	183	274	878	1320	1320
				Thermal	120	100	150	360	720	720
N45	124	140	3"	Weight	52	84	52	119	86	75
				Seismic	162	108	162	468	794	701
				Thermal	70	66	90	246	380	380
N46	15	160	2"	Weight	50	63	50	75	75	75
				Seismic	106	70	106	158	237	237
				Thermal	40	30	50	50	100	100

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. 



EQUIPMENT QUALIFICATION DATASHEET (EQD)

24590-PTF-MVD-UFP-00007

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Equipment Identification			
Full Component Tag Number or BNI Stock Code Number	24590-PTF-MV-UFP-VSL-00062C	Safety Classification	
Equipment Datasheet Number	24590-PTF-MVD-UFP-00007	<input checked="" type="checkbox"/> SC <input type="checkbox"/> SS <input type="checkbox"/> APC-PAM	
Description	Ultrafilter Permeate Collection Vessel	Seismic Category	
		<input checked="" type="checkbox"/> SC-I <input type="checkbox"/> SC-II <input type="checkbox"/> SC-III <input type="checkbox"/> SC-IV <input type="checkbox"/> SC-III Seismic Interaction only	
Location (Facility / Building and Room No.)	Pretreatment Building; located in Room P-0104, Elev. 0'-00", column lines K.5/13.5		
Safety Function(s)	UFP-VSL-00062C (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	<input checked="" type="checkbox"/> Passive Mechanical	<input type="checkbox"/> Active Mechanical	<input type="checkbox"/> Electrical
Seismic Safety Function	Seismic Operability Requirements		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> During Seismic Event	<input checked="" type="checkbox"/> After Seismic Event	<input type="checkbox"/> None

Equipment Environmental Qualification (EEQ)				
(Parameter values stated in this section do not include process conditions or operation induced conditions)				
Classification of Environment <input checked="" type="checkbox"/> Mild <input type="checkbox"/> Harsh		Qualified Life (years) <input checked="" type="checkbox"/> 40 <input type="checkbox"/> 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)	533000 (E-Note 4)	40 (E-Note 7)	Years (Note e-1)	24590-PTF-U0D-W16T-00001, E-Note 1
Plant/Process Induced Vibration	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Additional Normal Ambient Information:	N/A			



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Equipment Environmental Qualification (EEQ) (continued)

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
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)	533000 (E-Note 4)	0 (E-Note 7)	Years (Note e-1)	24590-PTF-U0D-W16T-00001, E-Note 1
Exposure to Wet Sprinkler System	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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)	135	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)	6	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)	533000 (E-Note 4)	0 (E-Note 7)	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Submergence	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	N/A	hours	24590-PTF-U0D-W16T-00001, E-Note 5
Chemical/Spray Exposure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	12.5	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Additional DBE Information	N/A			

DBE Chemical Exposure Details



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DBE Chemical Exposure Details	
DBE Chemical Types / Concentrations	Neutral Solution (RLD45), 77 °F, 7 pH Nitric Acid (2M) Process Rad Condensate Sodium Hydroxide (FEP08a), 104 °F, 11.5 pH Sodium Hydroxide (FEP12), 104 °F, 11.5 pH Sodium Hydroxide (FEP19), 121 °F, 15.5 pH Sodium Hydroxide (FRP13), 110 °F, 14.5 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 (PVP02), 77 °F, 15.5 pH Sodium Hydroxide (PVP04), 77 °F, 12 pH Sodium Hydroxide (PVP06), 79 °F, 12.5 pH Sodium Hydroxide (TCP05), 120 °F, 15.5 pH Sodium Hydroxide (UFP01), 77 °F, 15.5 pH Sodium Hydroxide (UFP04), 77 °F, 15.5 pH Sodium Hydroxide (UFP26), 77 °F, 14.5 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 provided to the vendor in the material requisition
Auxiliary Devices	UFP-VSL-00023, UFP-VSL-00024, UFP-VSL-00025, UFP-VSL-00069, UFP-VSL-00070, UFP-VSL-00084, UFP-PJM-00070, UFP-PJM-00073, UFP-PJM-00076, UFP-PJM-00077, UFP-PJM-00078, UFP-PJM-00107, UFP-RFD-00042, UFP-RFD-00043, UFP-RFD-00044, UFP-RFD-00045,



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Mechanical Interfaces	
UFP-RFD-00046, UFP-RFD-00048. All auxiliary devices are located internal to the parent 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	24590-WTP-3PS-SS90-T0001	2	N/A
	Engineering Specification for Seismic Qualification Criteria for Pressure Vessels	24590-WTP-3PS-MV00-T0002	3	
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)	<p>(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."</p> <p>(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."</p>
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.



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Equipment Qualification Notes and Additional Information

- 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.
- 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
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Approval

Rev	Description	System Engineer	Vessel Engineer	Checked	Reviewed/ MET	E&NS	Approved	Date
0	Issued For Purchase	PA	HK	US/CS	N/A	N/A	SK	10/10/02
1	Revised as Noted	MA	HK	PA/CS	JJ	N/A	MWH	08/18/03
2	Revised as Noted	MA	HK	PA/CS	JJ	N/A	MWH	09/11/03
3	Revised as Noted	MA	HK	PA/CS	JJ	N/A	MWH	12/10/03
4	Revised as Noted	M. Askar	H Khurana	P. Aviguetero C. Slater	J. Julyk	N/A	C. Morley for M. Hoffmann	02/05/04
5	Added hydrodynamic loads and other revisions as noted.	M. Askar	H Khurana	P. Aviguetero R. Tiwari	J. Julyk	N/A	M Hoffmann	09/08/04
6	Added note 9, deleted note 8. revised P&ID references and changes as noted.	M. Askar	H Khurana	P. Avigue	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.	A. Moretta	H Khurana	J. Olson R. P. Voria	CS	N/A	J. Julyk	09/04/05
8	Revised per note 10 on page 2 and as noted	M. Askar	H Khurana	J. Polani P Aviguetero	C. Slater D. Adler	N/A	J. Julyk	10/28/05
9	Revised per Note 15. Supersedes 24590-PTF-MVD-UFP-P0007, Rev 2.	D Vo	M Seed	S Jain	D Adler	J Hinckley	J Julyk	05/11/09
10	Revised per Note 16 and as noted by revision triangles.	D Vo	M Seed	D Harris	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. Revised a charge vessel CTN (typo).	M Seed <i>M Seed</i>	L Rodgers <i>L Rodgers</i>	R Zielinski for B Lindberg <i>R Zielinski</i>	D Adler <i>D Adler</i>	J Hinckley <i>J Hinckley</i>	J Julyk <i>J Julyk</i>	12/22/10

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 / Section 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

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) 
Design Pressure (Charge Vessels)	24590-PTF-MVC-10-00003	C	PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVE-10-00011)
Hydrodynamic Loads 	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) 
Multiple Overblow Cycles	24590-PTF-MVC-10-00003	C	PTF Vessel Cyclic Datasheet Inputs (24590-PTF-MVC-10-00004) 
Nozzle Loads 	CCN 126197 (UFP-62A) CCN 126198 (UFP-62B) CCN 125817 (UFP-62C) CCN 224448 (UFP-62A) CCN 224449 (UFP-62B) CCN 224450 (UFP-62C)	N/A N/A N/A N/A N/A N/A	Nozzle Loads for UFP-VSL-00062A Nozzle Loads for UFP-VSL-00062B Nozzle Loads for UFP-VSL-00062C Supplemental Nozzle Design Loads for UFP-VSL-00062A (Supplements CCN 126197) Supplemental Nozzle Design Loads for UFP-VSL-00062B (Supplements CCN 126198) Supplemental Nozzle Design Loads for UFP-VSL-00062C (Supplements CCN 125817)
Nozzle Design Pressures and Temperatures (UFP-62A)	24590-PTF-M6X-UFP-00317 24590-PTF-M6X-UFP-00094 24590-PTF-M6X-UFP-00122 24590-PTF-M6X-UFP-00428	0 0 0 0	MS Line List for 24590-PTF-M6-UFP-00004001 MS Line List for 24590-PTF-M6-UFP-00005007 MS Line List for 24590-PTF-M6-UFP-00006007 MS Line List for 24590-PTF-M6-UFP-00015001
Nozzle Design Pressures and Temperatures (UFP-62B)	24590-PTF-M6X-UFP-00320 24590-PTF-M6X-UFP-00094 24590-PTF-M6X-UFP-00122 24590-PTF-M6X-UFP-00428	0 0 0 0	MS Line List for 24590-PTF-M6-UFP-00004002 MS Line List for 24590-PTF-M6-UFP-00005007 MS Line List for 24590-PTF-M6-UFP-00006007 MS Line List for 24590-PTF-M6-UFP-00015001
Nozzle Design Pressures and Temperatures (UFP-62C)	24590-PTF-M6X-UFP-00323 24590-PTF-M6X-UFP-00199 24590-PTF-M6X-UFP-00362 24590-PTF-M6X-PWD-00113	0 0 0 2	MS Line List for 24590-PTF-M6-UFP-00004003 MS Line List for 24590-PTF-M6-UFP-00009006 MS Line List for 24590-PTF-M6-UFP-00011005 MS Line List for 24590-PTF-M6-PWD-00046