U.S. Department of Energy
Office of River Protection
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

0097105

JUN 16 2011

11-ESQ-118

RECEIVED
JUN 17 2011
EDMC

Ms. Jane A. Hedges, Program Manager
Nuclear Waste Program
Washington State
Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354

Dear Ms. Hedges:

SUBMITTAL OF HANFORD FACILITY RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) PERMIT MODIFICATION NOTIFICATION FORM 24590-PTF-PCN-ENV-10-031

Reference: WA7890008967, "Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit 10, 'Waste Treatment and Immobilization Plant.'"

This letter transmits the Hanford Facility RCRA Permit Modification Notification Form 24590-PTF-PCN-ENV-10-031 attached, for the Washington State Department of Ecology (Ecology) review and approval. The form describes a requested Class 1 modification requiring concurrence or approval to the Reference.

Modification Notification Form 24590-PTF-PCN-ENV-10-031 submits a mechanical data sheet (24590-PTF-MKD-PVP-00002) and engineering specification (24590-PTF-3PS-MKAS-T0001) for the Pretreatment Facility vessel vent caustic scrubber (PVP-SCB-00002) to replace the permitted design documents currently found in Appendices 8.6 and 8.7, respectively, of the Reference.

Ecology was provided an opportunity to review the modification notification form and had no comments on this modification.

H-0-8

If you have any questions, please contact me, or your staff may contact Gae M. Neath, Office of Environmental Safety and Quality, (509) 376-7828.

Sincerely,

P. G. Harrington

Paul G. Harrington, Acting Assistant Manager
Office of Environmental Safety and Quality

ESQ:GMN

Attachment

cc w/attach:
J. Brown, BNI
J. M. Colby, BNI
B. L. Curn, BNI
B. G. Erlandson, BNI
P. A. Fisher, BNI
S. K. Murdock, BNI
F. M. Russo, BNI
Administrative Record (WTP H-0-8)
BNI Correspondence
Environmental Portal, LMSI

cc electronic:
R. K. Biyani, Ecology
A. S. Carlson, Ecology
S. L. Dahl, Ecology (1 hard copy)
M. E. Jones, Ecology
D. W. Mears, Ecology
J. J. Wallace, Ecology (2 hard copies)
T. R. Williams, Ecology
J. F. Ollero, MSA
A. C. McKarns, RL
D. J. Sommer, SCS

cc w/o attach:
D. M. Busche, BNI
J. Cox, CTUIR
S. G. Harris, CTUIR
D. McDonald, Ecology
G. P. Bohnee, NPT
K. Niles, Oregon Energy
S. R. Weil, RL
R. Jim, YN

Attachment
11-ESQ-118
(21 Pages – Double Sided)

Hanford Facility RCRA Permit Modification Notification
Form 24590-PTF-PCN-ENV-10-031

Quarter Ending June 30, 2011 24590-PTF-PCN-ENV-10-031

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant
Replace mechanical data sheet and engineering specification for the PTF Vessel Vent Caustic Scrubber (PVP-SCB-00002) in Appendix 8.6 and Appendix 8.7, respectively, of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator:

Donna M Busche 4/22/11

D. M. Busche Date

Reviewed by ORP Program Office:

6/15/11

D. L. Noyes Date

Quarter Ending June 30, 2011

24590-PTF-PCN-ENV-10-031

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update the mechanical data sheet and engineering specification for the PTF Vessel Vent Caustic Scrubber (PVP-SCB-00002) in Appendix 8.6 and 8.7, respectively of the DWP.

The following mechanical data sheet and engineering specification are being submitted to replace the documents currently in Appendix 8.6 and 8.7, respectively.

Appendix 8.6			
Replace:	24590-PTF-MKD-PVP-P0002, Rev. 2	With:	24590-PTF-MKD-PVP-00002, Rev. 11
Appendix 8.7			
Replace:	24590-PTF-3PS-MKAS-T0001, Rev. 1	With:	24590-PTF-3PS-MKAS-T0001, Rev. 2

This modification requests Ecology approval and incorporation into the permit the changes to the above DWP documents. Changes to earlier revisions of source documents not captured by change bars are identified in the revision history summary. Revisions are the result of ongoing design (changes from vendor preliminary data to vendor detailed design), seismic and mixing analyses, and general criteria from design verification review. The following identifies the significant changes that have been incorporated:

Engineering Specification (24590-PTF-3PS-MKAS-T0001, Rev. 2)

- Administrative revision. Corrected Table of Contents (i.e., added Section 3.9 which was not included in the Table of Contents for Rev. 1)
- Corrected the titles of document referenced in Sections 2.3.1 and 3.9.3 and defined a previously undefined acronym in Section 2.2.5

Mechanical Data Sheet (24590-PTF-MKD-PVP-00002, Rev. 11)

- Modified, deleted, and added notes; added references
- Added Equipment Qualification Datasheet
- Added materials for packing support plate, bed limiter, support grid and all hardware for internals
- Revised inlet offgas and scrubber sump vessel operating temperatures and added recirculation to sump mixing temperature
- Revised minimum and maximum operating temperatures and the number of specific gravity and content level cycles
- Added nozzle loads table
- Revised seismic category
- Revised total and maximum operating volumes
- Added hydrostatic test pressure per ASME Section VIII, Division 1
- Revised nozzle data in Note 7 for N03, N07 and N11
- Revised process data as indicated on the data sheet including the scrubber sump vessel liquid levels
- Added design pressure and temperature to nozzle load table
- Added notes to nozzle load table
- Provided a revised equipment qualification datasheet

There are no outstanding change documents against the documents included in this permit modification.

Quarter Ending June 30, 2011 24590-PTF-PCN-ENV-10-031

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: NA

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: ☐ Yes ☐ Denied (state reason below) Reason for denial:	Reviewed by Ecology:
	J. J. Wallace — Date

ISSUED BY RPP-WTP PDC

BECHTEL	**Mechanical Data Sheet:** **PTF Vessel Vent Caustic Scrubber**	Plant Item Number 24590-PTF-MK-PVP-SCB-00002 Data Sheet Number 24590-PTF-MKD-PVP-00002, Rev 11

Project:	*WTP*	P&ID	*24590-PTF-M6-PVP-00017001* 11
Project No:	*24590*	Calculation	*Attachment 1* 11
Project Site:	*DOE Hanford*	11	
Area No.	*200E*		
Building:	*PTF*	Vessel Drawing	*24590-QL-POA-MKAS-00002-02-00011*
System No.	*PVP*		

Service Data

Quality Level		*Q*	Fabrication Specification	*24590-WTP-3PS-MV00-T0001 & 24590-PTF-3PS-MKAS-T0001*
Seismic Category	11	*SC-I (Note 12)*	Design Code	*ASME Section VIII, Division 1*
Service/Contents		*Radioactive Liquid*	Code Stamp	*Yes*
Design Specific Gravity		*1.04*	NB Registration	*Yes*
Max Operating Volume	gal	*2040*	Wind Design	*None*
Total Volume 11	gal	*2310*	Snow/Ash Design	*None*
Postweld Heat Treat		*Not Required*	Seismic Design	*24590-WTP-3PS-MV00-T0002*
Seismic Base Moment	ft*lb	*Deleted*		*24590-WTP-3PS-SS90-T0001*
Environmental Qualification		*See EQ Sections (All Metal Construction)*		

Design Data

Packed Column Inside Diameter (A)	*48"*	Floor to Bottom of Sump Vessel (E)	*105 1/8"*	Corrosion Allowance	*0.04" (Note3)*
Sump Vessel Inside Diameter (B)	*108"*	Scrubber Height (F)	*630 11/16"*	Minimum Design temperature for Metal °F	*-20*
Sump Height	*83" min.*	Ring Beam Height (G)	*18"*	Hydrostatic Test Pressure PSIG	*ASME Section VIII, Division 1* 11
Dimension D	*525 9/16"*	Ring Beam Center-to Center Diameter (H)	*108"*		

		Vessel Oper	Vessel Design	Deleted	Notes
Internal Pressure	PSIG	*-1.5*	*-5/+15*	Deleted	
External Pressure	PSIG	*0*	*0*	Deleted	Deleted
Temperature	°F	*120*	*150*	Deleted	
Deleted		*Deleted*			
Deleted		*Deleted*			

Materials of Construction

Component	Material	Containment	Notes
Column Top Head	*SA-240 316*	*Primary*	*Notes 4 and 8*
Column Shell	*SA-240 316*	*Primary*	*Notes 4 and 8*
Sump Vessel Top Head	*SA-240 316*	*Primary*	*Notes 4 and 8*
Sump Vessel Shell	*SA-240 316*	*Primary*	*Notes 4 and 8*
Sump Vessel Bottom Head	*SA-240 316*	*Primary*	*Notes 4 and 8*
Vessel Internals	*SA-240 316*	*N/A*	*Notes 4, 5 and 8*
Dry Packing	*UNS N08367/N08926*	*N/A*	*0.012" material thickness or maximum standard thickness available*
Wet Packing	*UNS N08367/N08926*	*N/A*	*0.012" material thickness or maximum standard thickness available*
Vessel Support	*SA-240 304*	*N/A*	*Note 4*
Deleted			
Pipe	*SA-312 TP316*	*Primary (Note 6)*	*Notes 4 and 8*
Forgings/ Bar stock	*SA-182 F316*	*N/A*	*Notes 4 and 8*
Gaskets	*None*		
Packing support plate, bed limiter, support grid and all hardware for the internals	*UNS N08367/N08926*		
Mounting Base	*Note 7*	*N/A*	*18" high ring beam*

Miscellaneous Data

Orientation		*Vertical*
Support Type		*Skirt*
Insulation Function		*None*
Insulation Thickness	inch	*None*
Insulation Material		*None*
External Finish		*Welds descaled as laid*
Internal Finish		*Welds ground smooth*

Reference 3	Dry Weight (lbs)	Dry C.G. (inches: X,Y,Z)	Operating Weight (lbs)	Operate C.G. (inches: X,Y,Z)	Testing Weight (lbs)	Shipping Wt (lbs)
Scrubber	*61,242*	*0.351, 0.694, 240.327*	*80,919*	*0.265, 0.525, 220.179*	*NA*	*66,242*
Packed Column	*18,114*	*0.000, 0.000, 412.096*	*19,137*	*0.000, 0.000, 412.641*		
Sump Vessel	*26,315*	*0.000, 0.000, 175.098*	*44,969*	*0.000, 0.000, 161.762*		

Notes

Note 1: Deleted.

Note 2: Deleted.

Note 3: The corrosion allowance of 0.04" shall apply to all surfaces in contact with process fluids except for the dry and wet packings and associated hardware which has 0.0" corrosion allowance.

Note 4: Material shall have a carbon content not to exceed 0.030%, dual certified.

Note 5: Seller shall submit item details for customer review.

Note 6: Nozzles are primary confinement. The spare nozzle shall have a welded cap. See Note 8.

Note 7: Ring Beam web and top flange shall be SA-240 304L, bottom flange shall be A-572 GR50.

Note 8: All welds forming part of the primary and auxiliary confinements, including the nozzle attachment welds shall be subjected to 100% volumetric examination.

Note 9: The scrubber is located in a Black Cell. (R5 / C5 area)

Note10: Contents of this document are Dangerous Waste Permit Affecting.

Note 11: References are included for BNI use only and will not be shown with revision triangles - only data being changed will require revision triangles.

Note 12: Internal packings and demister sections qualified to SC-I.

11

BECHTEL	**Mechanical Data Sheet:** **PTF Vessel Vent Caustic Scrubber**	Plant Item Number **24590-PTF-MK-PVP-SCB-00002** Data Sheet Number **24590-PTF-MKD-PVP-00002, Rev 11**

Notes for Outline Profile of the PTF Vessel Vent Caustic Scrubber

Note 1: See "Design Data" in sheet 1 of 11 for the bounding dimensions of the scrubber.

Note 2: The maximum sump batch volume shall be determined based on given dimensions:
- Seller to provide the batch volume and total time of operation per batch based on runback, maximum expected condensate and caustic makeup.

Note 3: The minimum allowance from maximum sump operating volume to overflow shall satisfy the larger of all three conditions below:
- minimum 2" liquid depth
- at least 2% of maximum operating liquid depth
- change in liquid level equivalent to 5 minutes of maximum liquid accumulation in the scrubber sump

Note 4: Nozzle requirements are as follows:
- Unless noted otherwise, nozzles shall extend 12 inches beyond the vessel.
- Nozzle schedule shall be determined by the Seller, taking into consideration all requirements stated in Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication.*
- All nozzles with connecting pipes shall be end-prepared per Buyer document # 24590-WTP-PW-P30T-00001, *WTP End Prep Detail for Field Butt Welds*, to tie in with the respective connecting pipe size and schedule in note 7.
- Seller shall confirm size and schedule/wall thickness for all nozzles,specified in note 7 below.

Note 5: Ring Beam Detail
- Refer to Buyer document 24590-WTP-MV-M59T-00001, for ring beam details.
- Ring beam top and bottom flanges shall be 6" wide.
- Ring beam web shall be 3/4" thick.
- The ring beam web to flange weld shall be full penetration.
- Ring beam design per River Protection Project - Waste Treatment Plant, vessel supports at El. 0' and below, 24590-PTF-DDC-S13T-00001.
- NDE requirements shall be in accordance with 24590-WTP-3PS-SS00-T0002, section 11.6 "Additional Examination for Quality Levels 1 and 2 Structural Steel Welds". All welds of Ring beam are critical welds.
  Section 11.6 is mandatory even if the web to flange weld NDE is not indicated on the drawing.

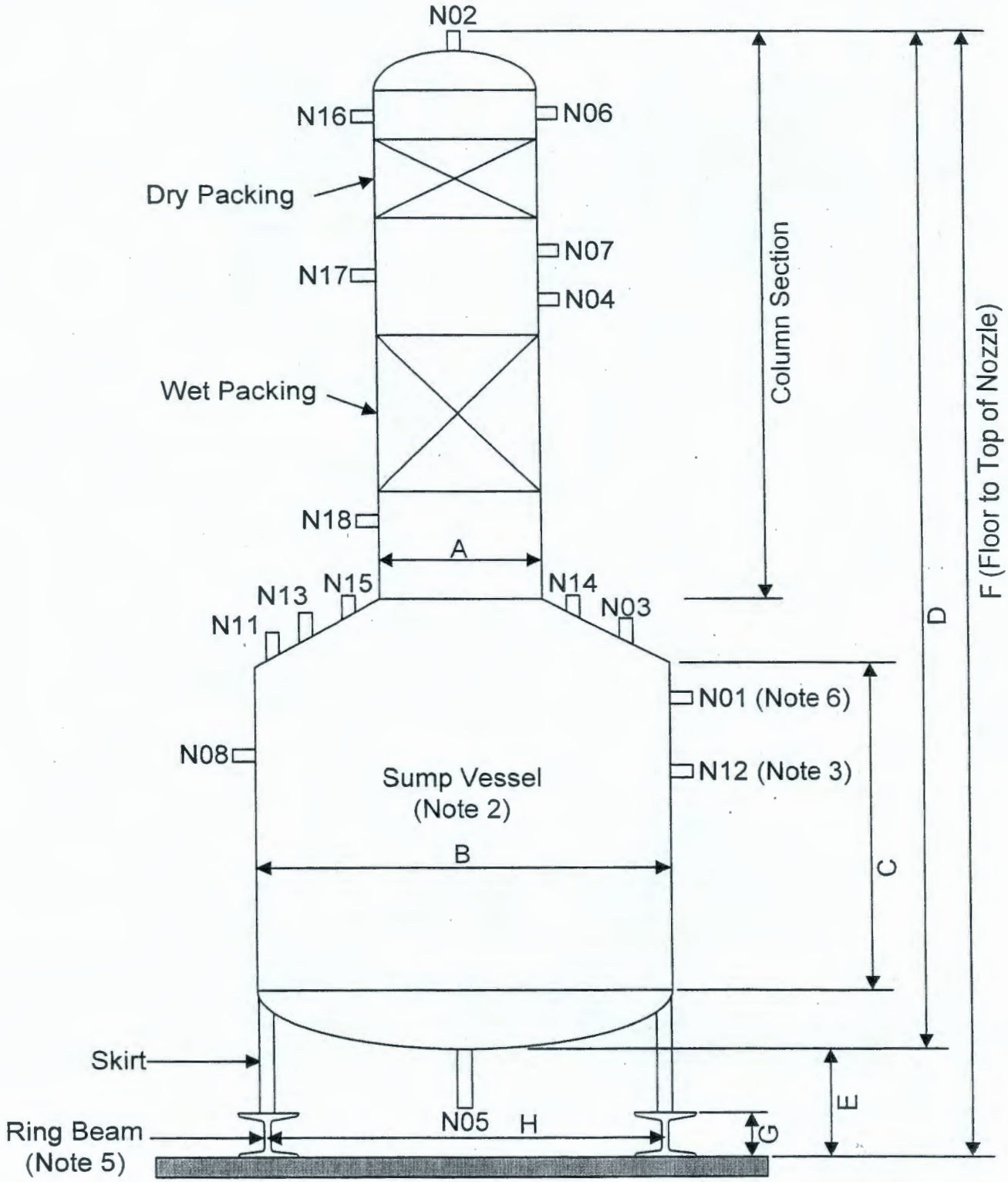
Note 6: Locate inlet nozzle (N01) on the sump vessel and use as inspection manway. Inlet nozzle (N01) must be higher than the overflow nozzle (N12).

Note 7: Nozzle data are as follows:

Nozzle		Connecting Pipe		Function
No.	Size	NPS	Schedule	
N01	24" NPS	24	0.375"	Offgas Inlet
N02	24" NPS	24	0.375"	Offgas Outlet
N03	2" NPS	1.5	40S	Recirculated Caustic Solution for Mixing (dip pipe) 11
N04	2" NPS	2	40S	Recirculated Caustic Solution for Scrubbing
N05	4" NPS	4	40S	Pump Suction
N06	2" OD	1	40S	Demineralized Water Inlet (See Detail 7, Dwg 24590-WTP-MV-M59T-00016001)
N07	2" OD	1	40S	Demineralized Water Inlet (See Detail 7, Dwg 24590-WTP-MV-M59T-00016001) 11
N08	1.5" NPS	1.5	40S	Reagent Inlet (5M NaOH)
Deleted				
Deleted				
N11	2" OD	1	40S	Sample Recirculation Return (See Detail 6, Dwg 24590-WTP-MV-M59T-00016001)
N12	6" NPS	6	10S	Scrubber Sump Vessel Overflow 11
N13	6" NPS	1	40S	Bubbler Type Level Indicator (See Detail 19, Dwg. 24590-WTP-MV-M59T-00016002)
N14	3" NPS			Spare (with welded cap)
N15	2" OD	0.75	40S	Pressure Transmitter Leg (See Detail 6, Dwg 24590-WTP-MV-M59T-00016001)
N16	2" OD	0.75	40S	Pressure Transmitter Leg (See Detail 6, Dwg 24590-WTP-MV-M59T-00016001)
N17	2" OD	0.75	40S	Pressure Transmitter Leg (See Detail 6, Dwg 24590-WTP-MV-M59T-00016001)
N18	2" OD	0.75	40S	Pressure Transmitter Leg (See Detail 6, Dwg 24590-WTP-MV-M59T-00016001)
Deleted				
Deleted				

NPS - Nominal Pipe Size (inch)
OD - Outside Diameter (inch)

BECHTEL	**Mechanical Data Sheet:** **PTF Vessel Vent Caustic Scrubber**	Plant Item Number 24590-PTF-MK-PVP-SCB-00002 Data Sheet Number 24590-PTF-MKD-PVP-00002, Rev 11



Outline Profile of the PTF Vessel Vent Caustic Scrubber

BECHTEL	**Mechanical Data Sheet:** **PTF Vessel Vent Caustic Scrubber**	Plant Item Number 24590-PTF-MK-PVP-SCB-00002 Data Sheet Number 24590-PTF-MKD-PVP-00002, Rev 11

PROCESS DATA

Description		Instrument Tag	Unit	Operating Lo	Operating Normal	Operating Hi			Remarks
Inlet Offgas	Pressure	PC-0404	W.G.	-40.0"	-35.0"	-10"			
Inlet Offgas	Temperature	TI-0401	°F	113	120	138			
Inlet Offgas	Volume Flow Rate		SCFM	(Note 2)	3600	*	11		Deleted 11
Inlet Offgas	Rel. Humidity		%		100	100			
Inlet Offgas	NO_2		ppm vol		130	200	11		Dry basis concentration
Inlet Offgas	NO		ppm vol		70				Dry basis concentration
Inlet Offgas	CO_2		ppm vol		330				Dry basis concentration
Inlet Offgas 11	Mass Flow Rate		kg/hr	See	Attachment	2 & 3			
Scrubber Sump Vessel	Pressure	PI-0408	W.G.	-40.0"	-35.0"	-10"			
Scrubber Sump Vessel	Liquid Temperature	TC-0405	°F		95				
Scrubber Sump Vessel 11	Liquid Level	LI-0409		22"	22 59"	59"			Overflow is at 65" (Note 4) 11
Scrubbing Liquid 11	pH		pH	7*	7.0 - 7.5*	7.5*			
Scrubbing Liquid	11 Density	DI-1704	lbs/ft^3	*	62.3*	*			
Recirc. to sump - mixing 11	Flow Rate	FI-0461	GPM		60*				
Recirc. to sump - mixing	Temperature		°F		70				
Recirc. to packing - scrubbing	Flow Rate	FI-0444	GPM		60*				
Recirc. to packing - scrubbing	Temperature		°F		70				
Deleted									
Deleted									
Deleted									
Deleted									
Deleted									
Packed Section	Pressure Drop	PDI-0406	W.G.		3.0**	6.0**	11		Max. allowable (Note 1)
Demineralized Water Inlet at Nozzle N06	Flow Rate		GPM	N.A.	22.5*	N.A.	11		
Dry Packing	Pressure Drop	PDI-0407	W.G.		0.2*	1.0**	11		Max. allowable (Note 1)
Demineralized Water Inlet at Nozzle N07	Flow Rate		GPM	N.A.	22.5*	N.A.	11		Mfr. Suggests a periodic flush of 1 GPM/sq. ft. min.
Outlet Offgas	Pressure		W.G.	-47.0"	-42.0"	-17"			
Outlet Offgas	Temperature		°F	77	77	77			
Outlet Offgas	Mass Flow Rate		kg/hr	*	*	*	11		
Outlet Offgas	Flow Rate		SCFM		3600	3600			
Outlet Offgas	Rel. Humidity		%		100	100			
Outlet Offgas	NO_2		ppm vol		41*		11		Dry basis concentration
Outlet Offgas	NO		ppm vol		70*		11		Dry basis concentration
Outlet Offgas	CO_2		ppm vol		329*	11			Dry basis concentration
DF (minimum) for Nitrogen Oxides			DF		1.8*	11			
DF (minimum) for Solid Particulates			DF		3.5*	11			2.0 micron particulates

Notes for Process Data

* - Seller to verify/provide data considering aerosol loading against existing design specifications and provide recommended process changes/EQPT changes as necessary 11
1 - Maximum differential pressure across scrubber in clean condition shall not exceed 8 in-WG. Seller to provide data.
2 - Standard conditions of flow are 77 deg F and 1 atmosphere as dry air (density = 0.074 lb/ft3) - humidity accounts for additional volume and mass flow
3 - Deleted
4- Dimension is measured from inside bottom of vessel sump to bottom of nozzle N12.
5- Deleted 11

BECHTEL	**Mechanical Data Sheet:** **PTF Vessel Vent Caustic Scrubber**	Plant Item Number 24590-PTF-MK-PVP-SCB-00002 Data Sheet Number 24590-PTF-MKD-PVP-00002, Rev 11

Equipment Cyclic Data Sheet

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

Design Life	*40 Years*
Component Function and Life Cycle Description	*See Specification 24590-PTF-3PS-MKAS-T0001*

Load Type		Min	Max	Number of Cycles	Comments
Design Pressure	PSIG	-5	+15	10	*WTP Calculation 24590-PTF-MVC-10-00003*
Operating Pressure 1	PSIG	-1.5	0	7,000,000	*WTP Calculation 24590-PTF-MVC-10-00003*
Operating Pressure 2	PSIG	0	+2.8	40	*WTP Calculation 24590-PTF-MVC-10-00003*
Operating Temperature	°F	59	140	40	*WTP Calculation 24590-PTF-MVC-10-00003*
Contents Spcific Gravity		1.0	1.04	2,080	*WTP Calculation 24590-PTF-MVC-10-00003*
Contents Level	inch	23	63	29,200	*WTP Calculation 24590-PTF-MVC-10-00003*
Localized Features					
Nozzles		*N/A*		*WTP Calculation 24590-PTF-MVC-10-00003*	
Deleted		*Deleted*		*Deleted*	

Equipment Cyclic Data Sheet Notes

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

Nozzle Loads

Nozzle Number	Nozzle Size (in)	Design Nozzle Pressure (psig) (Note E)	Design Nozzle Temp (°F) (Note E)	Orientation (V* / H**)	Load Case	Design Loads (Force in lbs, Moment in ft-lb) Fx	Fy	Fz	Mx	My	Mz
N01	24	15	200	H	Weight	1200	2195	1200	8250	5153	8982
					Seismic	8325	5573	8325	72075	108000	108000
					Thermal	6300	8336	5801	33900	67800	67800
N02	24	15	150	V	Weight	1200	1928	1200	8250	5153	5153
					Seismic	8325	5573	8325	72075	108000	108000
					Thermal	3930	3495	5243	33900	67800	67800
N03	2	117	150	V	Weight	50	60	50	75	75	75
					Seismic	244	162	244	398	597	597
					Thermal	104	92	138	169	337	337
N04	2	117	150	H	Weight	50	60	50	75	75	75
					Seismic	244	162	244	398	597	597
					Thermal	104	92	138	169	337	337
N05	4	124	150	V	Weight	90	144	90	257	161	161
					Seismic	626	418	626	2220	3330	3330
					Thermal	359	238	493	945	1890	1890
N06	2" (OD)	124	100	H	Weight	35	35	35	40	40	40
					Seismic	138	92	138	228	342	342
					Thermal	58	52	78	96	192	192
N07	2" (OD)	124	100	H	Weight	35	41	35	40	40	60
					Seismic	138	92	138	228	342	342
					Thermal	58	52	78	96	192	192
N08	1.5	167	120	V	Weight	35	67	35	40	40	40
					Seismic	138	92	138	228	342	364
					Thermal	58	52	78	96	192	192
N11	2" (OD)	119	150	V	Weight	35	35	35	40	40	40
					Seismic	138	92	138	228	342	342
					Thermal	58	52	78	96	192	192
N12	6	15	150	H	Weight	218	347	218	714	447	447
					Seismic	1519	1013	1519	6218	9300	9300
					Thermal	657	1541	878	2685	5370	5370
N13	6	15	150	Parent	Weight	N13 is parent nozzle, nozzle loads are applied via N13A, N13B, N13C					
					Seismic						
					Thermal						
N13A (Note C)	1	15	150	V	Weight	15	20	15	20	20	20
					Seismic	66	44	66	92	137	137
					Thermal	28	24	38	38	77	77
N13B (Note C)	1	15	150	V	Weight	15	20	15	20	20	20
					Seismic	66	44	66	92	137	137
					Thermal	28	24	38	38	77	77
N13C (Note C)	1	15	150	V	Weight	15	20	15	20	20	20
					Seismic	66	44	66	92	137	137
					Thermal	28	24	38	38	77	77
N14 Spare	3	15	150	V	Weight	54	85	54	135	84	84
					Seismic	369	246	369	1178	1763	1763
					Thermal	157	139	209	498	998	998
N15	2" (OD)	15	150	V	Weight	35	35	35	40	40	40
					Seismic	138	92	138	228	342	342
					Thermal	58	52	78	96	192	192

BECHTEL	**Mechanical Data Sheet:** **PTF Vessel Vent Caustic Scrubber**	Plant Item Number **24590-PTF-MK-PVP-SCB-00002** Data Sheet Number **24590-PTF-MKD-PVP-00002, Rev 11**

Nozzle Number	Nozzle Size (in)	Design Nozzle Pressure (psig) (Note E) 11	Design Nozzle Temp (°F) (Note E) 11	Orientation (V* / H**)	Load Case	Design Loads (Force in lbs, Moment in ft-lb)					
						Fx	Fy	Fz	Mx	My	Mz
N16	2" (OD) 11	15	150	H	Weight	35	35	35	40	40	40
					Seismic	138	92	138	228	342	342
					Thermal	58	52	78	96	192	192
N17	2" (OD) 11	15	150	H	Weight	35	35	35	40	40	40
					Seismic	138	92	138	228	342	342
					Thermal	58	52	78	96	192	192
N18	2" (OD) 11	15	150	H	Weight	35	35	35	40	40	40
					Seismic	138	92	138	228	342	342
					Thermal	58	52	78	96	192	192

Notes for Nozzle Loads 11

A. Direction of load application for shell nozzles 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 - 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 any thermal reduction factors.
E. Design Pressures and Temperatures for qualification of nozzles only.
F. All Pretreatment RGM Seismic Piping Nozzles loads from Plant design shall have a 1.75 load factor applied to all 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.

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification		
Full Component Tag Number or BNI Stock Code Number	24590-PTF-MK-PVP-SCB-00002	Safety Classification ☒ SC ☐ SS ☐ APC-PAM
Equipment Datasheet Number	24590-PTF-MKD-PVP-00002	
Description	Vessel Vent Caustic Scrubber for the Pretreatment Vessel Vent Process System (PVP)	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-0104, Elev. 0'-00", column lines K/16	
Safety Function(s)	Provide confinement of PVP exhaust during normal and upset conditions. Reference: 24590-WTP-PSAR-ESH-01-002-02, Preliminary Documented Safety Analysis to Support Construction Authorization; PT Facility Specific Information.	
Equipment Safety Function Type	☒ Passive Mechanical	☐ Active Mechanical See E-Note 6 ☐ 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
See E-Note 7

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 3)	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 QUALIFICATION DATASHEET (EQD)

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 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)	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	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 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 Types / Concentrations	Process Rad Condensate Nitric Acid (2M) Sodium Hydroxide (2M) Sodium Permanganate (1M) Strontium Nitrate (1M)

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DBE Chemical Exposure Details	
	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, see 24590-PTF-P1-P23T-00105
Mounting Method (bolts, welds, etc.)	Welded, see 24590-QL-POA-MKAS-00002-02-00011 and 24590-PTF-DD-S13T-00028
Auxiliary Devices	N/A

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 2	N/A
Specified Seismic Load Parameters	Seismic Analysis of Pretreatment Building - WSGM In-Structure Response Spectra (ISRS)	24590-PTF-S0C-S15T-00057	A	CCN: 214812; WSGM ISRS Curves: Figures 37, 38, 39, 67, 68, and 69.

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.

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Qualification Notes and Additional Information

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: 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.

E-Note 6: Seller to provide input for internals/sprays.

E-Note 7: Seller to provide input for design life.

E-Note 8: Seller to provide Equipment Seismic Qualification (ESQ).

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	Reviewed / MET	E&NS	Approved	Date
0	Issued for Bid	A Molina/ J Dave	K W Chin	U Sen/ J Julyk	N/A	N/A	M Hoffmann	12/18/02
1	Issued for Purchase	T A Lix	N Sentanu/ C Morley	A Molina	N/A	N/A	J Julyk	10/22/03
2	Reissued for Purchase	T A Lix	K W Chin/ C Morley	A Molina	N/A	N/A	J Julyk	11/12/03
3	Added Black Cell Requirements	E Strieper	K W Chin/ C Morley	A Molina/ J Julyk	N/A	N/A	M Hoffmann	04/15/04
4	Deleted scrubber cooling jacket. Revised scrubber heat duty, inlet and outlet temperatures, and vent gas flow rate.	J Dave	K W Chin/ C Morley	A Molina	N/A	N/A	J Julyk/ M Hoffmann	08/04/04
5	Seismic category and design revised. Environmental qualification added. Connecting pipes details	J Dave	B Donigan/ C Morley	A Molina	N/A	N/A	J Julyk/ M Hoffmann	03/29/05
6	Revised to comply with CODE 1 vendor submittal 24590-QL-POA-MKAS-00002-03-00001, in accordance with 24590-WTP-CAR-QA-05-120. Added liquid density.	J Dave	D Pease	D Rickettson/ C Morley	N/A	N/A	J Julyk	11/27/05
7	QL-2 revised to Q, per simplified quality system. Revised data sheet to add fatigue and cyclic blocks. Added note 10 DWP Affected. Fixed typo in Note 4. Revised Note 5 of "notes for Outline Profile of the PTF Vessel Vent Caustic Scrubber" to include: Ring Beam design details and NDE requirements from ANSI/AISC N690 for ring beam. Added note to N03 "Dip Pipe". Noz N13 on scrubber outline moved to correct location.	J Dave	D J Rickettson	N Johnson	N/A	N/A	J Julyk	03/18/06
8	Rev scrubber dims D, E and F to agree with fab dims. Add vessel drawing number.Add signature column for E&NS. Deleted fatigue and cyclic blocks from page one. Add Equip Cyclic data page 6.Cyclic data on hold. Added Ref Calc. Rev pres on page 5.Rev overflow pg 5 based on fab dim.Incorp 24590-WTP-SDDR-M-06-00132 Rev n/a	J Dave/ C Sarka	D J Rickettson	L Donovan	N/A	G Hendricks	J Julyk	07/24/06
9	Deleted Rev for P&ID on page 1. Added ref # for applicable data. Deleted Seismic Base Moment and hydro test pres on page 1. Moved matl of const to page 2. Revised note 10 wording page 2. Added note 11 on page 2. Added ref Table on page 2. Deleted hold on cyclic data on page 6. Deleted support note on cyclic data page 6.	J Dave/ C Sarka	D J Rickettson	R P Hills	N/A	J Cook	J Julyk	07/24/06

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Rev	Description	System Engineer	Vessel Engineer	Checked	Reviewed / MET	E&NS	Approved	Date
10	Added Environmental Qualification Data (EQD) and DOE disclaimer (pages 7-11). Moved E&NS statement and revision history table to pages 10-11. Added nozzle loads and notes for nozzle loads. Added note 17 per 24590-WTP-GPP-SANA-001. Revised cyclic loads data and process data pages 4-5. Incorporated 24590-WTP-M6N-M80T-00002.	C R Zook	J Czarnecki	C Chung	N/A	J Brown	J Julyk	12/03/08
11	Revised as noted by revision triangles. Revised Equipment Qualification data, implemented new EQ form and renumbered/revised EQ additional notes section (e.g., E-Note 1). Added design pressures and temperatures for Nozzle Loads and revised notes for Nozzle Loads. Revised Seismic Category to SC-I. Incorporated CCN 222995. Supersedes 24590-PTF-MKD-PVP-P0002, Rev 3.	Ryan Wilson	Kuldip Singh 11/24/10	Mike Seed	Debbie Adler	John Hinckley	John Julyk	1/4/11

REFERENCES for Data Sheet: 24590-PTF-MKD-PVP-00002, Rev 11

Plant Item No: 24590-PTF-MK-PVP-SCB-00002

(For BNI Use Only)

Data	Document No	Rev	Document Title
Quality Level	24590-PTF-M6-PVP-00017001	0	*P&ID - PTF Pretreatment Vessel Vent Process System Caustic Scrubber PVP-SCB-00002.* (24590-PTF-M6N-PVP-00062)
Seismic Category	24590-PTF-M6-PVP-00017001	0	*P&ID - PTF Pretreatment Vessel Vent Process System Caustic Scrubber PVP-SCB-00002.* (24590-PTF-M6N-PVP-00062)
PTF Room No	24590-PTF-U0D-W16T-00001	2	*PTF Room Environment Data Sheet.* (P-0104)
Contamination Class	24590-PTF-U0D-W16T-00001	2	*PTF Room Environment Data Sheet.* (C5, P-0104)
Radiation Class	24590-PTF-U0D-W16T-00001	2	*PTF Room Environment Data Sheet.* (R5, P-0104)
Service/Contents	24590-PTF-3YD-PVP-00001	1	*System Description For Pretreatment Vessel Vent Process System. PVP.* (Radioactive Liquid [Substances], Sections 4.1 and 4.3)
Design (Maximum) Specific Gravity	24590-PTF-MVC-10-00003 24590-QL-POA-MKAS-00002-02-00011	C F	*PTF Vessel Cyclic Data Sheet Inputs.* (Sheet A-5) *Drawing - PTF Vessel Vent Caustic Scrubber - Assembly & Sections*
Maximum Operating Volume	24590-QL-POA-MKAS-00002-05-00003	C	*Pretreatment Facility Vessel Vent Caustic Scrubber Operating Instructions*
Total Volume	24590-QL-POA-MKAS-00002-05-00003	C	*Pretreatment Facility Vessel Vent Caustic Scrubber Operating Instructions*
Packed Column Inside Diameter	24590-QL-POA-MKAS-00002-03-00001 24590-QL-POA-MKAS-00002-02-00011	E F	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber* *Drawing - PTF Vessel Vent Caustic Scrubber - Assembly & Sections*
Sump Vessel Inside Diameter	24590-QL-POA-MKAS-00002-03-00001 24590-QL-POA-MKAS-00002-02-00011	E F	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber* *Drawing - PTF Vessel Vent Caustic Scrubber - Assembly & Sections*
Dimension "D" Total Height	24590-QL-POA-MKAS-00002-02-00011	F	*Drawing - PTF Vessel Vent Caustic Scrubber - Assembly & Sections*
Dimension "E" Floor To Bottom Of Sump	24590-QL-POA-MKAS-00002-02-00011	F	*Drawing - PTF Vessel Vent Caustic Scrubber - Assembly & Sections*
Dimension "F" Floor To Top Of Scrubber	24590-QL-POA-MKAS-00002-02-00011	F	*Drawing - PTF Vessel Vent Caustic Scrubber - Assembly & Sections*
Dimension "G" Ring Beam Height	24590-QL-POA-MKAS-00002-02-00011	F	*Drawing - PTF Vessel Vent Caustic Scrubber - Assembly & Sections*
Dimension "H" Ring Beam Center To Center Diameter	24590-QL-POA-MKAS-00002-03-00001 24590-QL-POA-MKAS-00002-02-00011	E F	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber.* (Based On Sump Vessel Inside Diameter) *Drawing - PTF Vessel Vent Caustic Scrubber - Assembly & Sections*

11

Corrosion Allowance	24590-PTF-N1D-PVP-00001	6	*PVP-SCB-00002 PTF Vessel Vent Caustic Scrubber,* (0.04 Inch (0.024 Corrosion + 0.004 Erosion)
Minimum Design Temperature For Metal	24590-WTP-DB-ENG-01-001	1P	*Basis Of Design,* Table 4-4, -20F (Minus 20F Degrees), See Note 1
Vessel Internal Operating Pressure	24590-PTF-M6C-PVP-00017	A	*HADCRT Analysis Of PTF PVP System At Various Operating Scenarios, Section 8.2.1(-35" WG converts to -1.3 psig. Use 1.5 psig conservative)*
Vessel Internal Design Pressure	24590-PTF-M6C-PVP-00017	A	*HADCRT Analysis Of PTF PVP System At Various Operating Scenarios, Section 8.2.1(-135" WG fan suction equivalent to -.50 psig conservative)*
Vessel Operating Temperature	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Data Sheet Inputs,* Sheet A-5
Vessel Design Temperature	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Data Sheet Inputs,* Sheet A-5
Materials of Construction	24590-PTF-N1D-PVP-00001	6	*PVP-SCB-00002 PTF Vessel Vent Caustic Scrubber*
Scrubber Dry Weight	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Scrubber Dry CG (Inches X,Y,Z)	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Scrubber Operating Weight	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Scrubber Operating CG (Inches X,Y,Z)	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Packing Column Dry Weight	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Packing Column Dry CG (Inches X,Y,Z)	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Packing Column Operating Weight	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Packing Column Operating CG (Inches X,Y,Z)	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Sump Vessel Dry Weight	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*

11

REFERENCES for Data Sheet: 24590-PTF-MKD-PVP-00002, Rev 11
Plant Item No: 24590-PTF-MK-PVP-SCB-00002

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Sump Vessel Dry CG (Inches X,Y,Z)	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Sump Vessel Operating Weight	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Sump Vessel Operating CG (Inches X,Y,Z)	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Scrubber Testing Weight	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Scrubber Shipping Weight	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Scrubber Orientation	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Support Design	24590-QL-POA-MKAS-00002-03-00001	E	*Data Sheet - Mechanical Data Sheet PTF Vessel Vent Caustic Scrubber*
Containment Classification	WTP 24590-3PS-MV00-T0001, KS 1/4/11	3	Pressure Vessel Design And Fabrication, Section 1.2.6
Design Life	24590-PTF-3YD-PVP-00001	I	*System Description For Pretreatment Vessel Vent Process System. PVP.* Section 4.3
Dangerous Waste	24590-PTF-3YD-PVP-00001	I	*System Description For Pretreatment Vessel Vent Process System. PVP.* Section 4.3 And Section 9.1.2
Nozzle Data (e.g., Nozzle No, Nozzle Size, Connecting Pipe, Connecting Pipe Schedule (Pipe Wall Thickness)	24590-QL-POA-MKAS-00002-02-00012 24590-QL-POA-MKAS-00002-02-00020	F E	*Drawing - PTF Vessel Vent Caustic Scrubber - Column Assembly & Details* *Drawing - PTF Vessel Vent Caustic Scrubber - Sump Assembly & Details*
		Load Type	
Design Pressure	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Data Sheet Inputs.* Sheet A-5
Operating Pressure 1	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Data Sheet Inputs.* Sheet A-5
Operating Pressure 2	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Data Sheet Inputs.* Sheet A-5
Operating Temperature	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Data Sheet Inputs.* Sheet A-5
Content Specific Gravity	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Data Sheet Inputs.* Sheet A-5
Content Level	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Data Sheet Inputs.* Sheet A-5
Nozzle Loads	123005	N/A	*Nozzle Design Loads for PVP-SCB-00002*
Nozzle Design Pressure and Temperature	24590-PTF-M6X-PVP-00047	0	*MS Line List For P&ID 24590-PTF-M6-PVP-00017001*

11

(For BNI Use Only)

Notes:

Note 1: Per discussions between the previous Responsible Engineer (RE) Dennis Rickettson and current Responsible Engineer (RE) Kuldip Singh the "Minimum Design Temperature For Metal of -20F (Minus 20F Degrees)" is most likely based on Hanford Site Climatological Data in 24590-WTP-DB-ENG-01-001, Table 4-4 as follows: 11

Ambient Air Temperature Minimum -23F (Minus 23F Degrees) and Maximum 113F

R11087306

ISSUED BY
RPP-WTP PDC

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

PTF Vessel Vent Caustic Scrubber

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

Content applicable to ALARA? ☒ **Yes** ☐ **No**

ADR No.
24590-PTF-ADR-M-02-057

Rev
1

Quality Level
Q
DOE Contract No. DE-AC27-01RV14136

NOTE: Contents of this document are Dangerous Waste Permit affecting.

REV	DATE	BY	CHECK	REVIEW	E&NS	QA	DPEM
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SPECIFICATION No.
24590-PTF-3PS-MKAS-T0001

Rev
2

Revision History

Revision	Reason for Revision
0	Issued for Purchase
1	Incorporated SCN's, 24590-PTF-3PN-MKAS-00001, 24590-PTF-3PN-MKAS-00002, & 24590-PTF-3PN-MKAS-00003. Added ANSI / AISC N690 NDE for ring beam, specifications for lateral restraint and Seismic Anchor Motions (SAM). Added Specification for Pressure Vessel Fatigue Analysis.
2	Administrative update to source document to incorporate outstanding changes and supersede permit document no longer required by Project. Incorporated 24590-PTF-3PN-MKAS-00004. Supersedes 24590-PTF-3PS-MKAS-TP001, Rev 1.

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9.1 The equipment covered by this specification is identified with the plant item number shown in the MDS. The equipment shall be identified in accordance with section 7.2, Tagging, of this specification. 15

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1 Scope

1.1 Project Description and Location

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is a complex of waste treatment facilities where the US Department of Energy (DOE) Hanford Site tank waste will be pretreated and immobilized into a stable glass form via vitrification. The WTP contractor will design, build, and start up the WTP pretreatment and vitrification facilities for the DOE Office of River Protection (ORP).

The Hanford Site occupies an area of about 560 square miles along the Columbia River, north of Richland, WA in the USA. The WTP facilities will be constructed at the 200 East Area of the Hanford Site. The site elevation varies from 662 feet to 684 feet above mean sea level.

1.2 Equipment, Material, and Services Required

This specification establishes the minimum requirements for the performance, design, analysis, materials, fabrication, testing, inspection, quality assurance (QA), qualification, documentation, and preparation for shipment of the Vessel Vent Caustic Scrubber, plant item number 24590-PTF-MK-PVP-SCB-00002, for use in the WTP Pretreatment Facility (PTF).

The scope of work for the Seller includes all work specifically defined in this specification and its addenda and attachments. Work shall include, but shall not be limited to the following:

1.2.1 Provide design, materials, fabrication, testing, inspection, preparation for shipment, documentation, and submittals of a Vessel Vent Caustic Scrubber, plant item number 24590-PTF-MK-PVP-SCB-00002 in accordance with this specification, its addenda and attachments, material requisition # 24590-QL-MRA-MKAS-00002, and referenced codes, standards and Buyer documents.

1.2.2 Provide written (process, mechanical and hydraulic) guarantee that all equipment and components supplied by the Seller shall perform to the requirements of this specification, material requisition # 24590-QL-MRA-MKAS-00002, and referenced codes, standards and Buyer documents.

1.2.3 Perform the NDE for the ring beam as specified on the Mechanical Data Sheet, 24590-PTF-MKD-PVP-00002.

1.2.4 Provide design, materials, fabrication, testing, inspection, preparation for shipping, documentation, and submittals for the Vessel Vent Caustic Scrubber lateral restraint.

1.2.5 Provide Seismic Anchor Motion (SAM) for each vessel nozzle.

1.3 Work by Others

Any item not specifically listed as being supplied by the Buyer shall be provided by the Seller. The Buyer shall supply the following:

1.3.1 Shipping of the Vessel Vent Caustic Scrubber.

1.3.2 Unloading, storage and installation labor of all materials and equipment at the Buyer's job-site.

1.3.3 Supply and installation of instrumentation and controls.

1.3.4 The Buyer is responsible for the design of the ring beam for the vessel support.

1.3.5 Embeds will be provided at elevation 41'-6" for the lateral restraint.

1.3.6 Field welding of the lateral restraint to the embed plates at elevation 41'-6".

1.4 Acronyms, Abbreviations and Definitions

1.4.1 Acronyms and Abbreviations

APC	Additional Protection Class
ASME	American Society of Mechanical Engineers
DBE	Design Basis Earthquake
DF	Decontamination Factor
DOE	US Department of Energy
HEME	High Efficiency Mist Eliminator
ITS	Important to Safety
MDS	Mechanical Data Sheet
MR	Material Requisition
MSDS	Material Safety Data Sheet
NO_X	Nitrogen Oxides
ORP	Office of River Protection
PTF	Pretreatment Facility
PVP	Pretreatment Vessel Vent Process System
QA	Quality Assurance
QAP	Quality Assurance Program
QL	Quality Level
SC	Safety Class
SDC	Safety Design Class
SDS	Safety Design Significant
SS	Safety Significant
SSC	System, Structure, and Component
WG	Water Gauge
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.4.2 Quality Level (Q)

The quality level identifies the quality requirements to be applied to the equipment. The identified quality levels are Q, and CM (Commercial). Quality requirements are specifically defined on the associated mechanical data sheets (MDSs) and supplier quality assurance program (QAP) requirements data sheets.

1.4.3 Seismic Category (SC)

Specific requirements for each seismic category are defined in reference documents listed in section 2.3 of this specification.

1.4.4 Other Definitions

Black Cell (R5-C5): Is a sealed concrete structure containing very high radiation and contamination where human access is normally prohibited during the normal operating lifetime of the cell and maintenance is generally not performed in the cell.

C5: Contamination classification for plant areas that are considered high contamination areas. Access to C5 areas is not normally permitted.

Decontamination Factor (DF): Equals the ratio of the concentration of a component in the inlet gas versus the concentration of the same component in the outlet gas.

Design Basis Earthquake (DBE): A specification of the ground motion at the site. For the WTP site, the DBE is defined by horizontal and vertical acceleration response spectra; refer to section 2 of the MR for the attached In-Structure Acceleration Response Spectra.

Important to Safety (ITS): Systems, structures, and components (SSCs) that serve to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the workers and the public. ITS encompasses the broad class of facility features addressed (not necessarily explicitly) in the top-level radiological, nuclear, and process safety standards and principles that contribute to the safe operation and protection of workers and the public during all phases and aspects of facility operations (i.e., normal operation as well as accident mitigation). ITS includes SSCs designated as Safety Design Class (SDC) / Safety Class (SC), Safety Design Significant (SDS) / Safety Significant (SS), and Risk Reduction Class (RRC) / Additional Protection Class (APC).

MDS: Refers to the mechanical data sheet for the Vessel Vent Caustic Scrubber, Buyer document number 24590-PTF-MKD-PVP-00002.

MR: Refers to the material requisition for the Vessel Vent Caustic Scrubber, Buyer document number 24590-QL-MRA-MKAS-00002.

R5: Radiation classification for areas considered to be high or very high radiation areas.

Scrubber: Refers to the PTF Vessel Vent Caustic Scrubber, plant item number 24590-PTF-MK-PVP-SCB-00002.

1.5 Safety/Quality Classifications

Refer to the MDS for the quality level and seismic category designations of the Scrubber.

2 Applicable Documents

2.1 General

2.1.1 Work shall be done in accordance with the referenced codes, standards, and documents listed below, which are an integral part of this specification.

2.1.2 When specific chapters, sections, parts, or paragraphs are listed following a code, industry standard, or reference document, only those chapters, sections, parts, or paragraphs of the document are applicable and shall be applied. If a date or revision is not listed in section 2, the latest issue, including addenda, at the time of Request for Quote shall apply. The dates and revisions listed in section 2 shall apply to subsequent references to codes and standards within this specification. When more than one code, standard, or referenced document covers the same topic, the requirements for all must be met with the most stringent governing.

2.2 Codes and Standards

2.2.1 ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, *Rules for Construction of Pressure Vessels.*

2.2.2 ASME AG-1-1997 Article AA, *Code on Nuclear Air and Gas Treatment.*

2.2.3 ASME-NQA-1-1989, *Quality Assurance Program Requirements for Nuclear Facilities.*

2.2.4 10 CFR 835, *Occupational Radiation Protection.*

2.2.5 ANSI/AISC N690-1994* *Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities.*
* This standard is tailored in Appendix C of the Safety Requirements Document (SRD) (2.3.22). Engineering Specification is in accordance with the tailoring in Appendix C.

2.3 Reference Documents/Drawings

2.3.1 24590-PTF-MKD-PVP-00002, *Mechanical Data Sheet for the PTF Vessel Vent Caustic Scrubber.*

2.3.2 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

2.3.3 24590-WTP-3PS-G000-T0002, Engineering *Specification for Positive Material Identification (PMI) for Shop Fabrication.*

2.3.4 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling and Storage Requirements.*

2.3.5 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication.*

2.3.6 24590-WTP-3PS-MV00-T0002, *Engineering Specification for Seismic Qualification Criteria for Pressure Vessels.*

2.3.7 24590-WTP-3PS-MVB2-T0001, *Specification for Welding of Pressure Vessels, Heat Exchangers and Boilers.*

2.3.8 24590-WTP-3PS-SS00-T0002, *Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel.*

2.3.9 24590-WTP-MV-M59T-00001, *Pressure Vessel Tolerances Standard Details.*

2.3.10 24590-WTP-MV-M59T-00007, *Thermowell Connection Standard Details.*

2.3.11 24590-WTP-MV-M59T-00009, *Lifting Lugs Standard Details.*

2.3.12 24590-WTP-MV-M59T-00010, *Tailing Lug Standard Details.*

2.3.13 24590-WTP-MV-M59T-00012, *Grounding Lug Standard Details.*

2.3.14 24590-WTP-MV-M59T-00016001, *Vessel Connections Standard Details Sheet 1 of 3.*

2.3.15 24590-WTP-MV-M59T-00016002, *Vessel Connections Standard Details Sheet 2 of 3.*

2.3.16 Deleted

2.3.17 24590-WTP-MV-M59T-00018, *Vessel Name Plate Standard Details.*

2.3.18 24590-WTP-PW-P30T-00001, *WTP End Prep Detail for Field Butt Welds.*

2.3.19 24590-WTP-3PS-SS90-T0001, Engineering Specification for Seismic Qualification of Seismic Category I/ II Equipment and tanks.

2.3.20 24590-WTP-DC-ST-01-001, Structural Design Criteria.

2.3.21 24590-WTP-DC-ST-04-001, Seismic Analysis and Design Criteria.

2.3.22 24590-WTP-SRD-ESH-01-001-02, Safety Requirements Document, Volume II

2.3.23 24590-WTP-3PS-MV00-T0003, ***Engineering Specification for Pressure Vessel Fatigue Analysis.***

3 Design Requirements

3.1 General

3.1.1 As Low As Reasonably Achievable (ALARA) principles shall be applied to the design of the Scrubber per 10 CFR 835, *Occupational Radiation Protection.*

3.1.2 Seller shall design the Scrubber to the requirements of

- this specification
- applicable codes, standards and documents in section 2 of this specification
- Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*
- ASME AG-1-1997 Article AA-4000, *Code on Nuclear Air and Gas Treatment*
- the MDS (mechanical data sheet # 24590-PTF-MKD-PVP-00002)
- the MR (material requisition # 24590-QL-MRA-MKAS-00002)

3.1.3 The Scrubber, including the packed section and dry packing section, shall be designed to operate continuously for a minimum service life of 40 years without access for maintenance. Seller shall provide documentation, including but not limited to calculations and analyses, to support their design and performance of the equipment.

3.1.4 Seller shall provide a written performance guarantee for the Scrubber which shall include, but shall not be limited to, process and design calculations.

3.1.5 The main components of the Scrubber shall include, but shall not be limited to, the following:

- A ring beam for vessel support
- A vertical cylindrical scrubber sump vessel with a vessel skirt and associated nozzles
- A cylindrical column above the scrubber sump vessel. The column consists of the following:
  - A packed section (which may have one or more packed beds) filled with Raschig Rings, Intalox Saddles, or other similar packing, random or structured, for offgas scrubbing
  - A distribution system for the scrubbing solution above the packed section (irrigation and recirculation)
  - A dry packing section above the packed section for the removal of fine mists
  - Wash system for the dry packing and the packed section
  - Associated nozzles

- Lateral Restraint

3.1.6 Deleted

3.1.7 Seller shall identify all interfaces and requirements for external connections supplied by the Buyer. The type and location of interfaces shall be reviewed and approved by the Buyer prior to fabrication.

3.1.8 Seller shall design the Scrubber and its internals, particularly the packed sections, to meet the requirements of testing, packaging, shipping (in the vertical and horizontal positions), handling, storage, installation, and operation of the Scrubber.

3.1.9 Corrosion allowance is specified in the MDS and shall be applied to all surfaces exposed to process vapor or liquid.

3.1.10 Deleted.

3.1.11 Seller shall provide a report containing equipment reliability figures for all major components and sub-components of the Scrubber. The report shall be submitted to the Buyer for review per Form G-321-E of the MR. The reliability figures shall include, as a minimum, the following:

- Failure rate, or mean time between failure (whichever is available).
- Estimated modes of failure (example, vessel failure, packing failure, nozzle failure, etc.). This may be delineated in a Failure Mode and Effect Analysis (FMEA). The method used to perform the FMEA (example, MIL-STD-1629) and the year shall be specified. All assumptions used to perform the FMEA shall be clearly stated.
- Recommended maintenance and frequency, as applicable.
- Estimated time to perform the recommended maintenance, as applicable.

The data above shall be based on the physical and environmental conditions delineated in this specification. Where possible, the Seller shall compare the figures for the equipment in this specification to similar equipment sold and serviced by the Seller. The source for

all estimates and any underlying assumptions shall be stated. If software is used to perform the FMEA, the Seller shall specify the software and the version used (example software, Relex, Isogen, Reliasoft, etc.).

3.2 Basic Description

The Scrubber treats the combined vent offgas collected from process vessels located in the PTF primarily to absorb Nitrogen Oxides (NO_X) gases and other acidic gases and removes large particulates from the feed gases.

The vent offgas flows up through the packed section of the Scrubber. The packed section shall be filled with either Raschig Rings, Intalox Saddles, or other similar random or structured packing, to provide efficient contact between the vent offgas and the alkaline scrubbing solution flowing down through the packed section. Part of the NO_X gases and other acidic gases, i.e. carbon dioxide, present in the vent offgas react with the alkaline scrubbing solution to form sodium salts. The scrubbing solution is collected in the scrubber sump vessel below the packed section. The pH level of the scrubbing solution shall be monitored and maintained within the operating pH limits by intermittent addition of fresh 5 molar caustic solution to the scrubber sump vessel.

The Scrubber shall remove some radioactive aerosols and reduce the radioactive particulate loading on the vessel vent High Efficiency Mist Eliminators (HEMEs) located downstream of the Scrubber. The Scrubber must achieve a decontamination factor (DF) of at least 1.8 for the removal of NO_X gases and a DF of at least 3.5 for the removal of large particulates for particulate sizes of 2 μm and larger.

The scrubber sump vessel batch volume shall be based on the sump vessel dimensions specified in the MDS and the total addition of caustic, the maximum condensate collected from contacting with the scrubber inlet offgases, and the runback volume of scrubbing solution in the event of stoppage of the vessel vent scrubber recirculation pumps. Total number of transfers per day, corresponding volume, and operating time shall be determined by Seller.

The vessel vent scrubber recirculation pumps, PVP-PMP-00001A/B (one operating, one standby), shall supply part of the scrubbing solution to the top of the packed section. The rest of the scrubber solution is recirculated back to the scrubber sump vessel to provide adequate mixing. A heat exchanger designed and provided by the Buyer will maintain the temperature of the solution recirculated to the packed section at 70 degrees F. The Buyer will provide the pumps per the Seller's confirmation of scrubbing solution flow rates and supply pressure specified on the MDS.

Demineralized water shall be added intermittently to the Scrubber, via the wash system, either to clean and reduce the operating pressure drop across the packings, or to supply makeup requirements for maintaining liquid level in the scrubber sump vessel.

The vessel vent scrubber recirculation pumps also transfer scrubbing solution to the receipt vessel, PWD-VSL-00044. This is currently planned once a day (or upon a high level condition in the scrubber sump vessel) to maintain the liquid level of the scrubber sump vessel within the operating limits. An overflow line shall be provided to accommodate overflow of the scrubber sump vessel to the plant overflow vessel, PWD-VSL-00033.

Paragraph deleted.

Outlet offgases from the Scrubber flow to the vessel vent HEMEs. The Scrubber is located upstream of the HEMEs to saturate the offgas, thus avoiding any damage to the HEME elements

from dry operation. The Scrubber shall provide for the removal of condensate and cool the offgas stream during the upset event of loss of chilled water supply.

3.3 Performance

3.3.1 Refer to the MDS for performance requirements and amount of NO_2 (Nitrogen Dioxide), NO (Nitric Oxide) and CO_2 (Carbon Dioxide) in the offgas inlet. Seller shall update the MDS per Form G-321-E of the MR with the required information for review by the Buyer.

3.3.2 Seller shall recommend additional operating parameters that must be monitored for the Scrubber to achieve the required performance.

3.3.3 Seller shall provide the optimum operating pH range for the scrubbing solution to achieve the required performance.

3.3.4 Seller shall provide the optimum operating and maximum rates of recirculation and delivery pressures of scrubbing solution for scrubbing and mixing purposes.

3.3.5 The Scrubber shall achieve a minimum DF of 1.8 for the removal of NO_X.

3.3.6 The Scrubber shall achieve a minimum DF of 3.5 for the removal of large particulates for particulate sizes of 2 μm and larger. Seller shall provide the DF for particle sizes of 1 μm and above as well as the DF for particle sizes of 0.5 μm and above.

3.3.7 Seller shall provide detailed operating instructions, in the form of a manual or similar, describing how to operate the Scrubber for all conditions (startup, normal, abnormal, shutdown) to achieve the required performance.

3.3.8 Seller shall provide the required flow rates and supply pressures of the demineralized water for wet packing and dry packing flushing.

3.3.9 Refer to the MDS for the maximum allowable pressure drop across the Scrubber,

3.4 Scrubber Design and Standard Details

3.4.1 Refer to the MDS for the dimensional constraints and design conditions of the Scrubber. Seller shall provide the outline dimensions, dry weight, test weight, and operating weight for the Scrubber in the form of a drawing or similar per Form G-321-E of the MR.

3.4.2 Ring beam design and fabrication shall comply with the ring beam detail in the MDS.

3.4.3 Nozzle design shall be in accordance with section 3.6 of Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*.

3.4.4 Nozzle loading and reinforcement requirements shall be in accordance with sections 3.7 and 3.8 of Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*.

3.4.5 Lifting lug design shall be in accordance with Buyer document # 24590-WTP-MV-M59T-00009, *Lifting Lugs Standard Details*.

3.4.6 Tailing lug design shall be in accordance with Buyer document # 24590-WTP-MV-M59T-00010, *Tailing Lug Standard Details*.

3.4.7 Grounding lug design shall be in accordance with Buyer document # 24590-WTP-MV-M59T-00012, *Grounding Lug Standard Details*.

3.4.8 Deleted

3.4.9 Seller shall provide a nameplate for the Scrubber in accordance with Buyer document # 24590-WTP-MV-M59T-00018, *Vessel Name Plate Standard Details*. General note 6 of 24590-WTP-MV-M59T-00018 does not apply.

3.4.10 Match mark the ring beam and the vessel skirt, using a line of welding bead, relative to north orientation after best fit.

3.5 Environmental Conditions

3.5.1 The Scrubber shall be stored outdoors prior to installation at ambient temperature ranging from –23°F to 113°F with relative humidity ranging from 5% to 100%.

3.5.2 The Scrubber will be located in room number P-0104, a Black Cell (R5·C5), at 0'-0" elevation of the pretreatment facility. The room will be maintained between 59°F dry bulb and 113°F dry bulb with an average relative humidity of 10.7%. The pressure in the room is between -1.0"WG and -1.4 "WG. Radiation dose rate is expected to be 100,000 mRad/hr.

3.5.3 Environment Qualification is not applicable to the PTF Vessel Vent Caustic Scrubber. The scrubber and scrubber internals are constructed from metal.

3.6 Loading

3.6.1 Seller shall design the Scrubber to be capable of handling the loads and stresses imposed on the Scrubber during testing, packaging, shipping (in the vertical and horizontal positions), handling, storage, installation, operation, and a Design Basis Earthquake (DBE).

3.6.2 Seller shall perform seismic analysis per the requirements of Buyer document # 24590-WTP-3PS-MV00-T0002, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels and 24590-WTP-3PS-SS90-T0001, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks. Refer to Section 2 of the MR for the attached In-Structure Acceleration Response Spectra.

3.6.3 Seller shall provide the dead weight, operating weight, and center of gravity for the column section, sump vessel, and the entire Scrubber per Form G-321-E of the MR.

3.6.4 Seller shall provide the base reaction (with seismic load combinations) of the Scrubber per Form G-321-E of the MR.

3.7 Instrumentation and Control Requirements

3.7.1 Seller shall recommend instrumentation and controls required for the Scrubber to achieve its required performance.

3.7.2 Seller shall provide functional test set points and recommended operating set points for the Scrubber.

3.7.3 Seller shall design, fabricate and install the necessary components for Buyer supplied and installed instrumentation. The components include, but are not limited to, thermowells, dip legs, dip pipes, and nozzles.

3.7.4 Thermowell design shall be in accordance with Buyer document # 24590-WTP-MV-M59T-00007, *Thermowell Connection Standard Details*.

3.7.5 Scrubber connection design shall be in accordance with Buyer document numbers 24590-WTP-MV-M59T-00016001, *Vessel Connections Standard Details Sheet 1 of 3*, and 24590-WTP-MV-M59T-00016002, *Vessel Connections Standard Details Sheet 2 of 3*.

3.8 Accessibility and Maintenance

3.8.1 The Scrubber will not be accessible for maintenance once it is put in operational service. Seller shall consider and recommend all necessary features to ensure the Scrubber does not fail for a minimum service life of 40 years.

3.8.2 Seller shall design and install a wash system to clean the dry packing and packed section as and when required. Seller shall recommend the frequency and period of cleaning as preventive maintenance for the given duty conditions. The wash system will be supplied with demineralized water.

3.9 Lateral Restraint for scrubber at elevation 41'-6"

3.9.1 The Buyer will provide embeds at 41'-6" elevation to support the use of a lateral restraint to reduce the bending moments in the upper column, to lower vessel junction and to reduce moments at the base. The seller shall design, fabricate, and inspect the lateral restraint.

3.9.2 The lateral restraint shall be designed in accordance with 24590-WTP-DC-ST-01-001, Structural Design Criteria and 24590-WTP-DC-ST-04-001, Seismic Analysis and Design Criteria.

3.9.3 This specification section takes precedence over section 1.3, "Analysis and design of equipment/ tank supports to be furnished by the Buyer", 24590-WTP-3PS-SS90-T0001, Engineering Specification for Seismic Qualification of Seismic Category I / II Equipment and Tanks.

3.9.4 The seller shall provide a calculation for the lateral restraint including: loads on the embed plate, size of field weld at the embed plate, and sizing of the lateral restraint support members.

3.9.5 The lateral restraint design shall take in to account the Relative Displacement values specified in attachment 5 of the Material Requisition.

3.9.6 The lateral restraint design shall include field trim or adjustability to account for the vessel elevation and wall construction tolerances.

- Vessel construction elevation tolerance is; plus 0 inches, minus 1/4 inches
- Vessel location with respect to the black cell walls is; plus or minus 1 inch

Seismic Anchor Motion (SAM).

3.9.7 Provide the following information in the seismic report for the Vessel Vent Caustic Scrubber:

- For nozzles which are currently modeled in the finite element model the x, y and z displacements at the nozzle / shell / head intersection. The coordinates x, y and z are to be aligned with or referenced to the plant coordinate system identified on your fabrication drawings.
- For nozzles not currently modeled in the finite element model the same information is required as above.
- Stiffness coefficients for each nozzle currently modeled in the finite element model. Stiffness coefficients shall be reported as follows:
  - <u>Cylindrical shell mounted nozzles</u>
    - In plane shall be presented as longitudinal plane
    - Out plane shall be represented as circumferential plane
    - Torsional
  - <u>Spherical shell (head) mounted nozzles</u>
    - In plane shall be presented as meridional plane
    - Out plane shall be presented as latitudinal plane
    - Torsional

4 Materials

4.1 General

4.1.1 All materials of construction for the Scrubber shall conform to the requirements of:

- this specification
- Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*
- Buyer document # 24590-WTP-3PS-G000-T0002, *Specification for Positive Material Identification*
- the MDS
- the MR
- ASME AG-1-1997 Article AA-3000, *Code on Nuclear Air and Gas Treatment*

4.1.2 Seller shall provide Material Safety Data Sheets (MSDSs) for all applicable materials used in the construction of the Scrubber.

4.1.3 All materials used in the construction of the Scrubber shall be resistant to the radiation dose rate indicated in section 3.5 of this specification.

4.1.4 The lateral restraint shall be stainless steel in accordance with section 7.1.2, 24590-WTP-DC-ST-01-001, Structural Design Criteria.

4.2 Prohibited Materials

4.2.1 Mercury and other low melting point metals, their alloys, or materials containing such metals as their basic constituents shall not be used in the construction of the Scrubber.

4.2.2 Sulfides and halides shall not be used in direct contact with stainless steel.

4.2.3 Asbestos shall not be included in any component of the Scrubber.

4.2.4 Carbon steel shall not be included in any component in contact with fluid and the vessel.

4.2.5 Halide containing materials shall not be used in any component of the Scrubber.

5 Fabrication

5.1 General

5.1.1 Fabrication of the Scrubber shall conform to the requirements of:

- this specification
- Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*
- the MR
- ASME AG-1-1997 Article AA-6000, *Code on Nuclear Air and Gas Treatment*

5.1.2 Fabrication tolerances shall conform to the requirements of ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, *Rules for Construction of Pressure Vessels*, and Buyer document # 24590-WTP-MV-M59T-00001, *Pressure Vessel Tolerances Standard Details*.

5.1.3 End preparations of field butt welds shall be in accordance with Buyer document # 24590-WTP-PW-P30T-00001, *WTP End Prep Detail for Field Butt Welds*.

5.2 Welding

5.2.1 Welding of the Scrubber shall conform to the requirements of the documents listed in section 5.1.1 of this specification and Buyer document # 24590-WTP-3PS-MVB2-T0001, *Specification for Welding of Pressure Vessels, Heat Exchangers and Boilers*.

5.2.2 Welding of structural steel shall conform to the requirements of Buyer document # 24590-WTP-3PS-SS00-T0002, *Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*.

6 Tests and Inspections

6.1 General

6.1.1 Seller shall conduct and be responsible for all testing and inspections of the Scrubber per the requirements of:

- this specification
- ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, *Rules for Construction of Pressure Vessels*
- Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*
- the MR
- ASME AG-1-1997 Article AA-5000, *Code on Nuclear Air and Gas Treatment*

6.1.2 Nondestructive Examination requirements shall be in accordance with sections 6.1, 6.2, and 7.2 of Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication.*

6.1.3 Seller shall develop and submit detailed test and inspection procedures for conducting all testing and inspections required per this specification, applicable codes, standards, and reference documents for review by the Buyer prior to fabrication of the Scrubber.

6.1.4 Seller shall complete and submit reports of all testing and inspections. Reports shall identify the component tested or inspected, date performed, applicable procedures, acceptance criteria, person performing the test or inspection, results, and conclusions. Drawings of test setups shall be included. All testing and inspection results shall be certified.

6.1.5 Control and calibration of measuring and test equipment shall be in accordance with ASME AG-1-1997 Article AA-5130, *Code on Nuclear Air and Gas Treatment.*

6.1.6 Nondestructive Examination for the ring beam shall meet the additional requirements of ANSI/AISC N690, section 11, 24590-WTP-3PS-SS00-T0002, Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel. All ring beam welds are considered critical welds. Section 11 is mandatory even if the web to flange weld NDE is not indicated on a drawing.

6.1.7 Nondestructive Examination for the lateral restraint shall meet the additional requirements of ANSI/AISC N690, section 11, 24590-WTP-3PS-SS00-T0002, Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel.

7 Preparation for Shipment

7.1 General

7.1.1 The Scrubber shall be prepared for shipment in accordance with:

- Buyer document # 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*

- Buyer document # 24590-WTP-3PS-G000-T0003, *General Specification for Packaging, Shipping, Handling and Storage Requirements*
- ASME AG-1-1997 Article AA-7000, *Code on Nuclear Air and Gas Treatment*

7.1.2 All results of shop tests and inspections for the Scrubber shall be reviewed by the Buyer prior to preparing and packaging it for shipment.

7.1.3 Seller shall verify, by calculation, that the Scrubber and its internals will withstand loads occurring during shipping, handling and installation.

7.2 Tagging

7.2.1 All packages shall be clearly and suitably tagged to at least show the Seller's name, Buyer's name, plant item number, purchase order number, package contents, parts list (for each package), and handling instructions.

7.2.2 The Scrubber shall be identified using a nameplate as specified in section 3.4.9 of this specification.

7.3 Shipping, Handling and Storage Instructions

Seller shall submit shipping weights as well as detailed shipping, handling, and storage instructions for the Scrubber prior to its shipment per Form G-321-E of the MR.

8 Quality Assurance

8.1 General Requirements

8.1.1 Seller's Quality Assurance Program (QAP) requirements are specified in Buyer document # 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.1.2 Seller's QAP manual shall be submitted to the Buyer for review in accordance with Buyer document # 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.1.3 Seller's QAP, as a minimum, shall contain the requirements detailed in the Supplier Quality Assurance Program Requirements data sheet listed in section 2 of the MR.

8.2 Quality Related Components

8.2.1 Seller shall have in place a QAP meeting the requirements of ASME-NQA-1-1989, marked as applicable in Supplier Quality Assurance Program Requirements Data Sheet attached to the MR, and Buyer document # 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

8.2.2 The successful bidder must pass a pre-award survey by the Buyer. Seller shall demonstrate that its quality program is in compliance with the procurement quality

requirements listed in the Supplier Quality Assurance Program Requirements Data Sheet. Seller shall allow the Buyer, its agents, and DOE access to their facility and records pertaining to this purchase order for the purpose of QA audits and surveillance at mutually agreed times.

8.2.3 All items shall be manufactured in accordance with Seller's QAP that meets the requirements of ASME NQA-1-1989, and has been previously evaluated and accepted by the WTP Quality Assurance Organization.

8.2.4 Seller shall submit their QAP and work plan to the Buyer for review prior to commencement of work. The plan shall include documents and procedures to implement the work and include a matrix of essential QA elements cross referenced with the documents or procedures.

9 Configuration Management

9.1 The equipment covered by this specification is identified with the plant item number shown in the MDS. The equipment shall be identified in accordance with section 7.2, Tagging, of this specification.

9.2 Substitutions and deviations shall be in accordance with section 2.6 of the MR.

10 Documentation and Submittals

10.1 General

10.1.1 Seller shall submit to Buyer all detailed designs, documentation, procedures, instructions, calculations, analyses, manufacturer data, inspection reports, test reports, certifications, certificates, manuals, MSDSs, and drawings required per this specification, its addenda and attachments, the MR, and referenced codes, standards and Buyer documents.

10.1.2 Seller shall submit to Buyer the Engineering and Quality Verification documents in the forms, quantities, and timing shown in Form G-321-E, *Engineering Document Requirements*, and Form G-321-V, *Quality Verification Document Requirements*, in section 3 of the MR.

10.1.3 Section 2.6 of the MR applies for substitutions and deviations.

10.1.4 Each documentation transmittal package shall have a documentation inventory sheet attached listing all documents and the number of pages in each.

10.1.5 The seller shall submit to the buyer all detail designs, documentation, calculations, analysis, inspection reports, test reports, certifications, certificates, and shop detail drawings for the lateral restraint.

10.2 Calculations

All calculations to be provided to the Buyer shall be orderly, complete, and sufficiently clear to permit verification. The body of the calculations shall include:

- a concise statement of the purpose of the calculation
- input data, applicable criteria, and stated assumptions
- a list of references used, including drawings, codes, standards, and computer programs (indicate the version or issue date)
- a discussion of rationale used for design assumption basis
- equations used for all computations
- numerical calculations including identification of units used
- a concise statement addressing the calculation results and/or recommendations
- a table of contents for complex calculations

10.3 Schedules

10.3.1 A detailed schedule of engineering, document submittals, material purchases, fabrication, shop tests, and shipment shall be submitted using Form 15EX in section 3 of the MR.

10.3.2 Deleted