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				Non-Safety Class Systems,				
				Component & Equipment that				
				are Potential Seismic				
				Interaction Hazards with				
				Safety Class SCE at the				
				CVD Facility				

16. KEY			
Approval Designator (F)	Reason for Transmittal (G)		Disposition (H) & (I)
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17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
1	1	Design Authority Proc.	JJ Irwin	6/7/99	R3-86	1	1	DA Fac. CC Pitkoff	6/7/99	6/7/99	R3-86
1	1	Design Agent	EC Ocoma	6/7/99	B4-40	1	1	DA I&C R Whitehurst	6/7/99	6/7/99	R3-86
		Cog. Eng.				3	4	T Choho	6/28/99	6/28/99	R3-86
1	1	Cog. Mgr.	CS Haller	6/19/99	R3-11	3		KA Boes	6/28/99	6/28/99	R3-86
1	1	QA	SL Mischke	6/7/99	R3-86	1		DA SC Sys. CR Miska	6/7/99	6/7/99	R3-86
1	1	Safety	JR Brehm	6/7/99	R3-26	1	1	DA Elect- SA Brisbin	6/7/99	6/7/99	R3-86
		Env.				3		R Routh			Mactec-Meier

18. Signature of EDT Originator E.C. Ocoma Date: 6/7/99		19. Authorized Representative for Receiving Organization [Signature] Date: 6/28/99		20. Design Authority/Cognizant Manager [Signature] Date: 6/7/99		21. DOE APPROVAL (if required) Ctrl No. _____ ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments	
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SEISMIC ADEQUACY REVIEW OF PC012 SCEs THAT ARE POTENTIAL SEISMIC HAZARDS WITH PC3 SCEs - CVD FACILITY

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For Numatec Hanford Company

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Abstract: This document provides seismic adequacy review of PC012 Systems, Components & Equipment anchorage that are potential seismic interaction hazards with PC3 SCEs during a Design Basis Earthquake. The PC012 items are identified in the Safety Equipment List as 3/1 SCEs.

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**SEISMIC ADEQUACY REVIEW
OF NON-SAFETY CLASS
SYSTEMS, COMPONENTS AND EQUIPMENT (SCE)
THAT ARE POTENTIAL SEISMIC INTERACTION
HAZARDS WITH SAFETY CLASS SCE
AT THE CVD FACILITY**

HNF-4291, Revision 0

May 1999

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1.0 INTRODUCTION

The Cold Vacuum Drying Facility (CVDF) is a new facility that is being constructed in the 100 Area. The CVDF systems, components, and equipment (SCEs) that are classified as Safety Class (SC) with a Performance Category 3 (PC3) seismic design requirement are all located in the process bays. There are also SCEs in the process bays, that are classified as Safety Significant (SS) and General Service (GS) with PC1 and 2 seismic design requirement respectively. Additionally, the SS and GS SCEs (hazard source) that could potentially interact with SC SCEs (hazard target) are further required to be designed for potential interaction seismic design requirements. The seismic requirements for the potential interaction (usually expressed as 3/1) SCEs are described in Reference 2. In this evaluation, the PC1 and 2 will be combined into PC12. The Performance Category designations for the SC SCEs are identified in HNF-SD-SNF-SEL-002, Rev. 6A, "Safety Equipment List for the Spent Nuclear Fuel Project CVDF" (SEL, Ref. 1). The 3/1 items are identified in the Master Equipment List for the Spent Nuclear Fuel Project CVDF" (MEL, Ref. 7).

2.0 PURPOSE

The purpose of this evaluation is to verify the seismic anchorage adequacy of the 3/1 SCEs during a PC3 Design Basis Earthquake (DBE). Potential interaction between PC3 SCEs will be evaluated also. In this evaluation, the PC3 to PC3 interaction will be expressed as 3/3. The structural integrity of a PC3 item or the performance of its safety function shall not be compromised by the structural failure of a PC12 or an adjacent PC3 during a DBE event. The 3/1 evaluation for PC12 SCE's potential seismic deficiencies or interaction modes associated with structural failure and falling, sliding, and toppling will be performed. Potential proximity interaction will also be evaluated for both PC3 and PC12 SCEs. The 3/3 evaluation for the PC3s will be performed by verifying the type of anchor bolt used (if bolted) per GC-ANCR-01, the seismic displacements, and the applied seismic demand in the structural or stress analysis documentation that are filed in the Project Library. The PC12 piping systems in the process bays will also be evaluated by verifying the structural analysis performed for seismic 3/1 loading based on the applicable piping code (ASME B31.3 or B31.9) requirements for code stress compliance. This is to assure that the valves or other components being supported by the pipe do not become potential missiles if the pipe-to-valve connections fail structurally during a DBE. The evaluation for the building structural components that are identified as seismic 3/1 in Reference 1, Table A-1, is not within the scope of this task. It is assumed that the building structural components that are used for supporting the PC3 and PC12 SCEs will remain intact during the DBE.

3.0 EVALUATION ACCEPTANCE CRITERIA

For the CVD Facility, the evaluation acceptance criteria for the seismic adequacy of the 3/1 SCEs are as follows:

1. The anchorage of equipment is acceptable if designed and analyzed for 3/1 seismic demand and applied in accordance to the guidelines of Reference 2. The design analysis shall be documented indicating the seismic magnitude considered.
2. The supports and anchorages for distribution systems and components are acceptable if designed and analyzed for 3/1 seismic demand and applied in accordance to the

guidelines of Reference 2. The design analysis shall be documented indicating the seismic magnitude considered.

3. The 3/1 piping systems are acceptable if designed and analyzed to comply with ASME piping code. The analysis shall be documented to show that the interface between the components and the piping remain intact after the DBE. The analysis shall also show that valve actuators do not fail structurally and become missiles during a DBE. The seismic displacements at mid-span between supports or hangers shall be documented also.
4. Proximity interaction is acceptable if the 3/1 SCEs weigh approximately equal to or less than the PC3 SCE.
5. Anchorage acceptability of 3/1 electrical distribution panels, light fixtures, and junction boxes that are already installed may be evaluated by field walkdown per Reference 2 guidelines if documented analyses do not exist.
6. Acceptability of unanchored 3/1 temporary equipment and specialty tools shall be evaluated by using the zone of influence plotted in Figure 4.1 and acceptance criteria #4.
7. Acceptability of proximity interaction between PC3 SCEs shall be evaluated by verifying the structural analysis for seismic displacement interferences and that the proper seismic demand was applied. Capacities of standard designed support hardware shall be verified against the seismic demand for acceptability.
8. Use of anchor bolt type and brand other than those listed in GC-ANCR-01 for PC3 SCEs is not acceptable.
9. For the SCIC GFE Panels, it is acceptable for the sheet metal enclosure to be dented and deformed but not perforated by 3/1 SCEs. The Panels shall remain standing after a PC3 DBE. Interaction with similar or larger size equipment or component is not acceptable.
10. It is acceptable for the SCHe piping to be bent, twisted and dented but not to the extent that there is no flow through the pipe. Interaction between the SCHe and the support that may produce minor cracks or loosening of threaded connections that are potential leak path are not acceptable. The connection between the piping and the flexible hoses shall remain intact.

4.0 EVALUATION METHODOLOGY

The physical arrangements of PC3 SCEs are almost identical for each process bay, therefore the evaluation of one bay applies to the rest of the bays. The process bays are bounded by column lines A through E and 3 through 7. The column lines are shown on numerous drawings (e.g. H-1-82237).

The first step is to develop a list identifying the PC3 SCEs. The PC3 SCEs along with 3/1 SCEs are listed in the Tables of Reference 1. Using the Tables of Reference 1, the PC3 SCEs were separated and tabulated in Tables A-1A, A-2A, and A-4A for Equipment and

Structures, Piping, and Instrumentation and Controls respectively. The valve listing will not be used because the valves are included in the piping systems.

The next step is to develop a list identifying all potential 3/1 SCEs. Using the Tables in Reference 1, the 3/1 SCEs were separated and tabulated in Tables A-1B, A-2B, and A-4B for Equipment and Structures, Piping, and Instrumentation and Controls respectively. The unshaded cells are new inputs to the Tables. The seismic design requirements are displayed under "Seismic" column.

A search for structural analysis documents was performed to verify the seismic loading criteria used. If structural analysis has been performed for the subject SCEs, the analysis was reviewed for proper application of the seismic loading guidelines provided in Reference 2. Since the facility is new, the evaluation will be conducted as follows:

1. Verification for anchorage adequacy by design and analysis for the 3/1 SCEs that are identified in Tables A-1B, A-2B, and A-4B.
2. Use the seismic evaluation guidelines presented in WHC-SD-GN-DGS-30006, (Reference 2) for new SCEs. The zone of influence is presented in Figure 4.1.
3. If already installed, evaluate by field walkdown the distribution systems that are to be field routed and do not have support spacing and configuration on the drawing.
4. Review the 3/1 piping systems' stress analysis to verify that the 3/1 seismic demand was considered in the analysis. Review that the worst load case was applied to the supports for proper design.
5. Review the PC3 piping systems' analysis to obtain displacements for the proximity evaluation.
6. Final field walkdown for proximity evaluation for interaction sources and targets that have been relocated or installed after this evaluation. There are equipment or systems that do not have drawings or data at all.

5.0 FINDINGS

1. There are various 3/1 SCEs in Reference 1 that are not located in the process bays and should not be designated as such since all PC3 SCEs are in the process bays.
2. The design for the Fire Protection System piping was performed in accordance with the requirements of NFPA 13 whose seismic design loading is less than Reference 2 requirement for potential 3/1 seismic design.
3. Documentation for the dynamic analysis for the SCHe piping systems and the SC supports routed under the mezzanine need to be provided. There is potential for the SCHe piping systems and supports to interact with the adjacent SC systems and supports. The SCHe piping is semi-encased in P1000 Unistrut channel. The piping is not laterally restrained during a DBE. There is also potential for shaking that may loosen or damage the fittings and become leak path.
4. The numerous piping that are routed to the PES skid are supported by trapezes with long hanger rods from the mezzanine. There is a trapeze inside a trapeze and also beside a trapeze. The pipes and the trapezes are in close proximity to the vertical run of the SCHe piping (not yet installed).
5. The enclosures for the SCHe Panel A and B are new PC3 items and are not listed in Reference 1. The structural analysis for the SCHe Panel A and B missile barrier need to be provided. The analysis should show; the allowable impact force (lbf) of the 3/1 SCE on the enclosure to prevent interaction between the enclosure and the SCHe Panel; and the allowable weight (lbs) of the 3/1 SCE to prevent perforation of the enclosure's expanded metal.
6. The stress analysis for the 3/1 piping systems to verify that the 3/1 seismic demand was considered in the analysis need to be provided. This is to ascertain that the worst load case was applied to the supports for proper design. Also, this will assure that the valves or other components being supported by the pipe do not become potential missiles if the pipe-to-valve connections fail structurally during a DBE.
7. The stair to the mezzanine, which is a building component, is restrained at the floor by two bolts and may potentially interact with the SCIC Panels (H-2-82180) located at the foot of the stair and the SCIC Seismic Sensor under the stair.
8. There are PC3 SCEs that are anchored or designed to be anchored with anchor bolts that are not approved for Hanford Site use.

6.0 CONCLUSIONS

The acceptability of the anchorage adequacy and the basis for the disposition is explained in the "Comments" column in Tables A-1B, A-2B, and A-4B. During the evaluation, there are still a few PC3 and 3/1 SCEs not shown on the drawings to indicate locations and sizes. These SCEs will be evaluated accordingly when the required data becomes available. The deficient items are listed in pages 5 through 10.

SEISMIC 3/1 EVALUATION ACTION ITEM PUNCH LIST (EQUIPMENT/STRUCTURES)

Sys. No.	Component Tag No.	Component Description / Noun	Name	Recommended Resolution	Status	Date
07-3	He MSLD and Auxiliary	Vacuum system (Sys. 07-3) No SS or SC SSCs	Provide design		Open	
07-3	He MSLD		Provide design		Open	
07-3	Aux. Vacuum Pump		Provide design		Open	
07-3	MSLD Vac. Pumps		Provide design		Open	
07-3		Pipe Supports	Provide design and analysis		Open	
07-3		Support Structure	Provide design and analysis		Open	
12	Compressed and instrument air system (Sys. 12) No SS or SC SSCs	Pipe Supports	Provide lateral bracing for trapeze supports		Open	
19	Condensate collection system (Sys. 19) No SS or SC SSCs					
19	Condensate collection tanks	Provide fall protection cable			Open	
20-2	Lighting [External/Internal/Exit/Emergency] (Sys. 20-2)					
20-2	Internal Lighting (@ Process Bay)	Provide lateral bracing or fall protection cable			Open	
24	Fire protection system (Sys. 24) No SS or SC SSCs					
24		Pipe Supports	Add more lateral bracings		Open	
25	Deionized water system (Sys. 25) No SS or SC SSCs					
25		Pipe Supports	Work with System 12 resolution		Open	
30-2	HVAC-B System [Process Bay Supply/Recirc.] (Sys. 30-2) No SS or SC SSCs					
30-2	H-1-82204	Ducting	Provide structural analysis		Open	
30-3	Process vent system (Sys. 30-3)					
30-3		Pipe Supports	Analyze piping system using M&D ISRS. Qualify supports.		Open	
30-5	Reference air system (Sys. 30-5)					
30-5		Pipe Supports	Work with System 12 resolution		Open	
47-2	Tempered water cooling system (Sys. 47-2) No SS or SC SSCs					
47-2		Pipe Supports	Revise MEL.		Open	
47-3	Chilled water system (Sys. 47-3)					
47-3		Pipe Supports	Revise MEL.		Open	
47-4	VPS Chilled water system (Sys. 47-4)					
47-4		Pipe Supports	Revise MEL.		Open	
93-1	Monitoring and control system (Sys. 93-1) No SS or SC SSCs					
93-1	Remote I/O Cabinets	Add cable restraint at top of cabinet.			Open	
93-1	Conduit supports	Provide design and analysis			Open	
100	Specialty Equipment (Sys. 100)					
100	Swipe Count Pigs		Provide Design		Open	
100	Cask Lid Storage Fixture (seal replacement and lid decon)		Provide Design		Open	
100	Cask Trailer Bumper		Provide Design		Open	

SEISMIC 3/1 EVALUATION ACTION ITEM PUNCH LIST (EQUIPMENT/STRUCTURES)

Sys. No.	Component Tag No.	Component Description / Noun Name	Recommended Resolution	Status	Date Completed
N/A		SCHe Panel A & B Enclosure for Missile Barrier	Perform dynamic analysis in accordance with HNF-PRO-097 to show structural adequacy and displacements to prevent interaction with SCHe components. Provide allowable impact force (lbf) to be imparted by a 3/1 SCE to the enclosure to prevent toppling. Provide allowable weights (lbs) for the 3/1 SCE to prevent perforation of the expanded metal.	Open	
N/A	N/A	PC3 stair and mezzanine	Perform displacement calculations for the stair to verify deflection at SCIC cabinet height for interaction evaluation. Provide justification for using Hilti HVA anchors that are not approved for Hanford Site use on PC3 components.	Open	
N/A	N/A	Mezzanine Handrail	Perform structural analysis for the handrails using the mezzanine ISRS to prevent interaction with MCO auxillary systems when the cask is in the process bay.	Open	
N/A		SCHe Panel A & B	Revise the anchor bolt design to use Hanford Site approved type and brand for PC3 installation instead of the Hilti HVA.	On-going	

SEISMIC 3/1 EVALUATION ACTION ITEM PUNCH LIST (EQUIPMENT/STRUCTURES)

Sys. No.	Component Tag No.	Component Description / Noun Name	Recommended Resolution	Status	Date Completed
100		Cask Trailer Wheel Chocks	Provide Design	Open	
100		Cask Transporter Air Supply Glad Hand	Provide Design	Open	
100		Process Hood Lift Fixture	Provide Design	Open	
100		Storage Rack/Enclosure for He Leak Test Tools	Provide Design	Open	
100		Storage Rack/Enclosure for MCO-Cask Tools	Provide Design	Open	
101	Special Tools (Sys. 101) No SS or SC SSCs				
101		MCO Temporary Vent Connector	Provide Design	Open	
101		Cask Lid Bolting Torque Calibration Tool/Standard	Provide Design	Open	
101		Cask Lid Bolting Torque Wrench (Pneumatic) and Sockets	Provide Design	Open	
101		Cask Lid Vent Port Cover Removal and Installation Tools	Provide Design	Open	
101		Cask Lower Port Cover Tool	Provide Design	Open	
101		Cask Lower Port SC Spoolpiece Installation Tool	Provide Design	Open	
101		MCO/VPS Process Port Connector Bolt Torque Wrench	Provide Design	Open	
101		MCO/VPS Process Port Connector Handling Tool (T-Handle, 2 sizes)	Provide Design	Open	
101		MCO/VPS Process Port Connector He Leak Test Tools	Provide Design	Open	
101		MCO/VPS Process Port Cover Removal and Installation Tools	Provide Design	Open	
N/A		Safety Equipment List (Ref 1)	Update SEL to resolve Finding No. 1	Open	
N/A	N/A	SCHe piping system under the mezzanine	Perform dynamic analysis using mezzanine ISRS for piping and Unistrut channel supports for Finding No. 3	Open	

SEISMIC 3/1 EVALUATION ACTION ITEM PUNCH LIST (EQUIPMENT/STRUCTURES)					
Sys. No.	Component Tag No.	Component Description / Noun Name	Recommended Resolution	Status	Date Completed
N/A		SCHe Panel A & B Enclosure for Missile Barrier	Perform dynamic analysis in accordance with HNF-PRO-097 to show structural adequacy and displacements to prevent interaction with SCHe components. Provide allowable impact force (lbf) to be imparted by a 3/1 SCE to the enclosure to prevent toppling. Provide allowable weights (lbs) for the 3/1 SCE to prevent perforation of the expanded metal.	Open	
N/A	N/A	PC3 stair and mezzanine	Perform displacement calculations for the stair to verify deflection at SCIC cabinet height for interaction evaluation. Provide justification for using Hilti HVA anchors that are not approved for Hanford Site use on PC3 components.	Open	
N/A	N/A	Mezzanine Handrail	Perform structural analysis for the handrails using the mezzanine ISRS to prevent interaction with MCO auxillary systems when the cask is in the process bay.	Open	
N/A		SCHe Panel A & B	Revise the anchor bolt design to use Hanford Site approved type and brand for PC3 installation instead of the Hilti HVA.	On-going	

SEISMIC 3/1 EVALUATION ACTION ITEMS PUNCH LIST SEISMIC 3/1 EVALUATION ACTION ITEMS PUNCH LIST (PIPING)

Sys. No.	Component Tag No.	Component Description/Noun Name	Recommended Resolution	Status	Date Complete
07-3	He MSLD and Auxiliary Vacuum system (Sys. 07-3)				
07-3	VPS-tbd	MSLD Line	Complete design	Open	
12	Compressed and instrument air system (Sys. 12)				
12	IA-*01-SS-1"	Compressed Air	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
12	IA-*01-SS-1:	Instrument Air to PES Skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
12	IA-001-SS-1/2"	Instrument Air Supply to PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
12	IA-002-SS-1/2"	Instrument Air Supply to PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
13	Helium systems (Sys. 13)				
13-1	General Service Helium system (Sys. 13-1)				
13-1	He-*01-SS-1"	General Service Helium Supply on PES Skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements		
13-1	He-*01-SS-1"	General Service Helium Supply in Bays	Provide piping code compliance stress calculation using seismic 3/1 load requirements		
13-1	He-101-SS-3/4"	General Service Helium Supply to Bays	Provide piping code compliance stress calculation using seismic 3/1 load requirements		
13-1	He-*01-SS-1/2"	General Service Helium Supply in Bays	Provide piping code compliance stress calculation using seismic 3/1 load requirements		
13-1	He-*03-SS-1"	General Service Helium Supply to PES Skid 4 Psig Service	Provide piping code compliance stress calculation using seismic 3/1 load requirements		
13-1	He-*05-SS-1/2"	GS Helium Supply to SCHe	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
13-1	He-*06-SS-1/2"	GS Helium Supply to SCHe	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
13-1	He-*07-ST-1/2"	GS Helium Supply to SCHe	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
13-1	He-*08-ST-1/2"	GS Helium Supply to SCHe	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
13-1	He-*09-ST-1/2"	GS Helium Supply to MCO DI flush line	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
13-1	He-001-SS-1"	GS Helium Supply - Balance of Plant	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
24	Fire protection system (Sys. 24)				

SEISMIC 3/1 EVALUATION ACTION ITEMS PUNCH LIST/SEISMIC 3/1 EVALUATION ACTION ITEMS PUNCH LIST (PIPING)

Sys. No.	Component Tag No.	Component Description/Noun Name	Recommended Resolution	Status	Date Complete
24	FPS	Fire Protection System	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
25	Deionized water system (Sys. 25)				
25	DI-*02-SS-1"	De-ionized Water to TW-TK-3*12	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
25	DI-012-SS-1/2"	De-ionized Water Service to PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
25	DI-013-SS-1/2"	De-ionized Water Service to PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
25	DI-014-SS-1/2"	De-ionized Water Service to PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
25	DI-014-SS-1 1/2"	De-ionized Water Service to PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
30-3	HVAC-C System [Process Bay Local Exhaust] and PVS (Sys. 30-3)				
30-3	PV-*02-SS-1"	PVS at PES skid- TW sys tank vent	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
30-5	Reference air system (Sys. 30-5)				
30-5	RA	HVAC RA System - Balance of Plant	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	Process water conditioning system (Sys. 46-1)				
46-1	PWC-*03-SS-1"	PWC at Cask/TW sys. Drain	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-001-SS-1"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-001-SS-1"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-*02-SS-1"	PWC at VPS Condenser Drain	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-*04-SS-1"	PWC at TW sys. Drain	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-002-SS-2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-003-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-004-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	

SEISMIC 3/1 EVALUATION ACTION ITEMS PUNCH LIST SEISMIC 3/1 EVALUATION ACTION ITEMS PUNCH LIST (PIPING)

Sys. No.	Component Tag No.	Component Description/Noun Name	Recommended Resolution	Status	Date Complete
46-1	PWC-005-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-006-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-007-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-008-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-009-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-010-SS-1"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-011-SS-1 1/2"	PWC at PWC skid and CVDF tank room	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-012-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-013-SS-2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-014-SS-1"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-015-SS-1 1/2"	PWC at PWC skid	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-016-SS-1 1/2"	PWC in the CVDF tank room	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-017-SS-1"	PWC in the CVDF tank room	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-018-SS-1"	PWC in the CVDF tank room	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-019-SS-2"	PWC in the CVDF tank room	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	
46-1	PWC-020-SS-1"	PWC in the CVDF tank room	Provide piping code compliance stress calculation using seismic 3/1 load requirements	On-going	

7.0 PERSONNEL QUALIFICATIONS AND TRAINING

NAME: Ernesto C. Ocoma

EDUCATION:

1964 B.S. Mechanical Engineering
National University, Manila, Philippines

SUMMARY OF EXPERIENCE:

More than 31 years of experience covering broad range of engineering activities related to design and seismic evaluation for systems and components, systems preoperational testing and development of acceptance test procedures, development of design criteria for safety class systems and components, and safety analysis. Familiar with the new Department of Energy (DOE) Orders (STD-1000 series) and DOE 6430.1A Design Criteria. Project field engineering and construction duties during construction of Fast Flux Test Facility (FFTF).

Listed are several seismic evaluation projects that Mr. Ocoma has performed:

- Performed as a team member, the Seismic Category II/I evaluation by walkdown for the SCEs at the Fast Flux Test Facility during the last stage of construction and during the pre-operational testing phase.
- Conducted Seismic Category II/I evaluation by walkdown for the SCEs at the Fuel Storage Facility (FSF) after construction and during pre-operational testing.
- Performed as a team member, the Safety Class 3/1 seismic evaluation by walkdown, the SCEs at the Plutonium Finishing Plant (PFP) Complex prior to the plant restart.
- Conducted Safety Class 3/1 seismic evaluation by walkdown, the SCEs at Buildings 324, 325, and 327 for PNNL
- Carried out as a team member, the Safety Class 3/1 seismic evaluation by walkdown, the SCEs at the 70-foot level of Fuel Cycle Plant (FCP or FMEF).
- Performed piping systems structural evaluation for the various Hanford tank farms' Waste Transfer Systems in the 200 W & E Areas to provide resolution for the flammable gas explosion concern during waste transfer activities.
- Developed for Hanford Site use, the criteria and guidelines for the seismic evaluation of safety class double encased buried waste transfer systems based on ASME code and DOE standards and requirements.
- Evaluated and developed seismic upgrades for the safety class systems and components in the PFP Complex to current DOE standards and design criteria for the Safety Analysis Report compliance.
- Conducted the seismic evaluation for the sodium transfer systems to transfer the liquid sodium from the primary and secondary heat transport systems to the new storage vessels at the FFTF.

- Directed the seismic evaluation efforts for the ventilation systems and equipment in the plutonium storage vault complex at the PFP. Developed the evaluation criteria based on DOE standards and guidelines.
- Developed for Hanford Site use, the criteria and guidelines for the seismic evaluation of new safety class piping systems and components. Developed the generic seismic evaluation procedure for existing safety class systems and components using experience data. Developed the seismic evaluation guidelines and criteria for existing non-safety class systems and components in safety class structures.

TRAINING ATTENDED:

DOE Certification Training Course on SQUG/EPRI Walkdown Screening and Seismic Evaluation on the 22 Classes of Equipment, LLNL, March 21-25, 1994

DOE Workshop on NPH Design and Evaluation Criteria for DOE Facilities, Washington D.C. April 5-8, 1993

DOE Workshop and Orientation on NPH Walkthrough Field Guide and SQUG/EPRI Seismic Evaluation, San Francisco, December 2-3, 1992

Savannah River Seismic Training on the Application of SQUG/EPRI Methodology to the Savannah River Site, March 2-6, 1992

First DOE Workshop on NPH Design and Evaluation Criteria for DOE Facilities, Albuquerque, May 9-12, 1989

SELECTED PUBLICATIONS:

- 1989, "Seismic Evaluation of Safety Class Systems and Components in Existing Non-Reactor Nuclear Facilities at Hanford Site," presented at Second DOE Natural Phenomena Hazards Mitigation Conference, Knoxville, TN. October 1989
- 1991, "Evaluation of Safety Class Systems and Components in Existing Facilities at Hanford Site," presented at ASME Pressure Vessel and Piping Conference, San Diego, June 23-27, 1991
- 1992, "Seismic Evaluation of Safety Class 3 and Non-Safety Class 4 Systems, Components, and Equipment at the Hanford Site," with D. G. Honegger, presented at ASME Pressure Vessel and Piping Conference, New Orleans, June 21-25, 1992

8.0 REFERENCES

- 1 HNF-SD-SNF-SEL-002, Rev. 6A, *Spent Nuclear Fuel Project Cold Vacuum Drying Facility Safety Equipment List*, Numatec Hanford Corporation, Richland, Washington.
- 2 HNF-SD-GN-DGS-30006, Rev. 2, *Guidelines for Assessing the Seismic Adequacy of Existing Performance Category Equipment at the Hanford Site*, Fluor Daniel Hanford, Inc., Richland, Washington.
- 3 Documented Analyses identified in Tables A-1A, A-2A, and A-4A under the column 'Seismic Calculation References'.
- 4 HNF-PRO-097, Rev. 0, *Engineering Design and Evaluation*, Fluor Daniel Hanford, Inc., Richland, Washington.
- 5 NFPA 13, 1991, *Standards for the Installation of Sprinkler System*, National Fire Protection Agency, Quincy, Massachusetts.
- 6 ICBO, 1994, *Uniform Building Code*, International Conference of Building Officials, Whittier, California.
- 7 SNF-4148, Rev. 0A, *Spent Nuclear Fuel Project Cold Vacuum Drying Facility Master Equipment List*, Numatec Hanford Corporation, Richland, Washington.

9.0 CALCULATIONS

3/1 EVALUATIONS

Client

Subject CVDF SEISMIC 3/1 EVALUATION

Location 100K

WO/Job No.

Date 6/7/99

By ELO
EC Ocoma

Evaluate pipe supports for PWC-001-SS-1: (Ref. H-1-8225, 82231)
 Supports are 2-way, Y&Z direction restraint (X-direction which is north/south is not restrained).
 Pipe is 1" sch 160 SS

For carbon steel pipe, lb./ft $w_{\text{pipe}} := 2.844 \cdot \frac{\text{lb}}{\text{ft}} \cdot (1.02)$ for SS material, increase wt of CS by 2%

$$w_{\text{pipe}} = 2.9 \frac{\text{lb}}{\text{ft}}$$

Wt. of water in 1" pipe, lb/ft $w_{\text{wtr}} := 0.2261 \cdot \frac{\text{lb}}{\text{ft}}$

Unsupported span length is 6' 6". $L := 6.5 \cdot \text{ft}$

Total weight, $W_p := (w_{\text{pipe}} + w_{\text{wtr}}) \cdot L$ $W_p = 20.33 \text{ lb}$ (Use 50 lb)

$$W_p := 50 \cdot \text{lb}$$

From WHC-SD-GN-DGS-30006, Table 2-3: $A_h := 3.12$

$$f_y := W_p \cdot A_h \cdot (0.67) \quad f_y = 104.52 \text{ lb}$$

$$f_z := W_p \cdot A_h \quad f_z = 156 \text{ lb}$$

Check U-bolt for 1" pipe. Allowable from H-4-36511, sht 231

$$F_y := 1220 \cdot \text{lb} \quad F_z := 636 \cdot \text{lb}$$

Interaction $IR_{\text{ubolt}} := \frac{f_y}{F_y} + \frac{f_z}{F_z}$ $IR_{\text{ubolt}} = 0.33$ (less than 1.0 therefore U-bolt is OK)

Check anchor bolt HKBII 1/2"x 2 1/4" embed. $f_c = 4000 \text{ psi}$

$$F_T := 1360 \cdot \text{lb} \quad \text{allowable tension capacity}$$

$$F_V := 1470 \cdot \text{lb} \quad \text{allowable shear capacity}$$

$$\text{Tension, } T \quad T := \frac{f_y \cdot (4)}{6 \cdot (2)} + \frac{f_z}{4} \quad T = 73.84 \text{ lb}$$

$$\text{Shear, } V \quad V := \frac{f_y}{4} \quad V = 26.13 \text{ lb}$$

Interaction $IR_{\text{abolt}} := \frac{T}{F_T} + \frac{V}{F_V}$ $IR_{\text{abolt}} = 0.07$ (less than 1.0 therefore anchor bolt is OK)

3/1 EVALUATIONS

Client

Subject CVDF SEISMIC 3/1 EVALUATION

Location 100K

WO/Job No.

Date 4/7/99

By GCO
EC Ocoma

Check anchorage for Fire Protection System Supports - 1st Floor

Note: The 3/1 criteria use 3.12g seismic lateral acceleration while NFPA 13 use 0.50g.

A partial model of the system for the first floor shown in H-1-82237 was analyzed (see Appendix A) to verify the structural adequacy of the supports.

Check the transverse sway brace at node A07.

Brace is assumed as type H7 per drawing H-1-82240.

The calculated tension load at node A07 from piping output is 2724 lbs.

From Grinnell catalogue, for fitting Fig. 112 and 113, the allowable load is 950 lbs < 2724 lbs (No Good)

Tension capacity of 1/2" HKBII x 2 1/4 embed. in 4000 psi concrete = 1360 lbs < 2724 lbs. (No Good)
x 3 1/2 embed. = 2250 lbs < 2724 lbs NO Good

Pipe clamp Grinnell Fig. 212 (4"dia.) capacity = 1040 lbs. < than 2724 lbs. No Good.

Add more braces to resolve the overloading.

3/1 EVALUATIONS

Client

WO/Job No.

Subject CVDF SEISMIC 3/1 EVALUATION

Date 4/7/99

By ECO
By EC Ocoma

Location 100K

Monitoring and Control System I/O Panel GFE CP *01

Check anchorage attachment of the Panel to the concrete floor to prevent potential seismic interaction with the SCHe Panel B caused by overturning or toppling. The SCHe Panel is located on the south side of the I/O panel therefore only the overturning in the +Z direction (south) will be evaluated.

WEIGHTS

Panel has 12 ga. thk. enclosure

$$\omega_{enc} := 3.80 \frac{\text{lb}}{\text{ft}^2} \quad t_{12ga} := 0.093 \cdot \text{in}$$

Area of Enclosure

$$A_{enc} := \frac{(12 \cdot \text{in} \cdot (74 \cdot \text{in}) + 74 \cdot \text{in} \cdot (72 \cdot \text{in}) + 12 \cdot \text{in} \cdot (72 \cdot \text{in}))}{144 \frac{\text{in}^2}{\text{ft}^2}} \cdot 2$$

$$A_{enc} = 98.33 \text{ ft}^2$$

Weight of Enclosure

$$W_{wt,enc} := A_{enc} \cdot \omega_{enc}$$

$$W_{wt,enc} = 373.67 \text{ lb}$$

Removable 10 ga. panel inside the enclosure

$$\text{Panel length: } L_1 := 69.7 \cdot \text{in}$$

$$\text{Panel unit wt. } \omega_{panel} := 5.02 \frac{\text{lb}}{\text{ft}^2}$$

$$\text{Panel width: } W_1 := 67.9 \cdot \text{in}$$

$$\text{Weight of Panel, } W_{wt,panel} := L_1 \cdot W_1 \cdot \omega_{panel}$$

$$W_{wt,panel} = 164.98 \text{ lb}$$

Assume cumulative weight of stiffeners, bolts, nuts, clamps, center post, and stands:

$$W_{wt,misc} := 30 \cdot \text{lb}$$

Assume weight of equipment inside the cabinet:

$$W_{wt,equip} := 30 \cdot \text{lb}$$

$$W_{wt,total} := W_{wt,enc} + W_{wt,panel} + W_{wt,misc} + W_{wt,equip}$$

$$W_{wt,total} = 598.65 \text{ lb}$$

EAST ELEVATION

ANCHOR BOLT PATTERN
3/8" HKB II, 4 1/4" Embed.
4000 psi concrete

3/1 EVALUATIONS

Client

WO/Job No.

Subject CVDF SEISMIC 3/1 EVALUATION

Date 6/7/99

By EC Ocoma

Location 100K

Cabinet is located at grade. Assume cabinet is flexible.

From Reference 8.2, Table 2-3:

$A_h := 0.78$ Horizontal seismic acceleration per SD-30006. No value was given for vertical seismic accel.

From Ref. 8.4, Table 6, the horiz. and vertical peak ground accelerations are 0.26g and 0.18g respectively.

$$\text{Ratio} := \frac{.18}{.26}$$

$A_v := \text{Ratio} \cdot A_h$ Vertical seismic acceleration

$$A_v = 0.54$$

Assume C.G. is located at mid-height $H_{c.g.} := 49\text{-in}$

LOADS

$$F_x := A_h \cdot W_{\text{wt.total}} \quad F_x = 466.95 \text{ lb} \quad F_z := A_h \cdot W_{\text{wt.total}} \quad F_z = 466.95 \text{ lb}$$

$$F_y := A_v \cdot W_{\text{wt.total}} \quad F_y = 323.27 \text{ lb}$$

ANCHOR BOLT ALLOWABLE CAPACITIES (From ICBO Report ER-4627, dated July 1, 1996)

Tension $T_A := 1350\text{-lb}$ (with special inspection during installation per ICBO)

Shear $V_A := 1111\text{-lb}$ (with special inspection during installation per ICBO)

CHECK OVERTURNING IN THE +Z DIRECTION:

In this condition, the outermost row of bolts (2) are in tension

$$D_{z1} := 6\text{-in}$$

$$D_{z2} := 9.97\text{-in}$$

Resisting Moment: RM

$$RM := W_{\text{wt.total}} \cdot D_{z1}$$

$$RM = 299.33 \text{ lb-ft}$$

Overturning Moment: OM (100%-40%-40% combination)

$$OM := F_z \cdot H_{c.g.} + F_y \cdot D_{z1} \cdot (0.40)$$

$$OM = 1.97 \cdot 10^3 \text{ lb-ft}$$

3/1 EVALUATIONS

Client

WO/Job No.

Subject CVDF SEISMIC 3/1 EVALUATION

Date 6/7/99

By EEO
EC Ocoma

Location 100K

Net Overturning Moment: OM_{net}

$$OM_{net} := OM - RM \quad OM_{net} = 1.67 \cdot 10^3 \text{ lb-ft}$$

Net Tension load on outer row bolts

$$N_{bolt.ten} := 2 \quad \text{Number of bolts under tension (outermost row) for overturning only.}$$

$$T_{overturn} := \frac{OM_{net}}{D_{z2} \cdot N_{bolt.ten}}$$

$$T_{overturn} = 1.01 \cdot 10^3 \text{ lb} \quad \text{Less than the allowable tension of 1350 lbs. The 2 bolts that are under tension will not pullout, therefore the anchor bolts are OK.}$$

Check weld between bottom of cabinet and stand.

Reference : Design of Welded Structures by Blodgett

$$\text{Area of weld, } A_{weld} := 4 \cdot \text{in} + 3 \cdot \text{in} \cdot (2)$$

$$A_{weld} = 0.83 \text{ ft} \quad \text{Use } A_{weld} := 3 \cdot \text{in}$$

Vertical load per stand, $F_{y,stand}$

$$F_{y,stand} := T_{overturn} \quad F_{y,stand} = 1.01 \cdot 10^3 \text{ lb}$$

Force on weld: f_{weld}

$$f_{weld} := \frac{F_z}{A_{weld}}$$

$$f_{weld} = 155.65 \frac{\text{lb}}{\text{in}}$$

Allowable force on the weld, F_W

$$F_W := (0.3) \cdot ULT_{basemetal} \cdot (.707) \cdot t_{12ga}$$

$$F_W = 1.14 \cdot 10^3 \frac{\text{lb}}{\text{in}}$$

Margin of Safety

$$MS_{weld} := \frac{F_W}{f_{weld}} - 1$$

$$MS_{weld} = 6.35 \quad >> \text{ than } 0.0, \text{ therefore weld is OK.}$$

Weld lengths are field data. Weld size is larger than base metal thickness. Assume leg of fillet weld is equal to base metal thickness (0.093"). Assume base metal is CS ASTM A36 Assume E60 weld rod.

$$ULT_{basemetal} := 58000 \frac{\text{lb}}{\text{in}^2}$$

$$ULT_{weldrod} := 60000 \frac{\text{lb}}{\text{in}^2}$$

3/1 EVALUATIONS

Client

WO/Job No.

Subject CVDF SEISMIC 3/1 EVALUATION

Date 6/7/99

By EC Ocoma

Location 100K

Check base plate of stand for overturning:Width of base, $b_{width} := 7.88 \cdot \text{in}$ Plate thickness, $t_{plate} := 0.093 \cdot \text{in}$

Assume plate is ASTM A36

$$F_{y,A36} := 36000 \frac{\text{lb}}{\text{in}^2}$$

$$F_{b,plate} := 0.75 \cdot F_{y,A36} \cdot (1.33) \quad (\text{Allowable bending})$$

$$F_{b,plate} = 5.17 \cdot 10^6 \frac{\text{lb}}{\text{ft}^2}$$

Calculate plate thickness required, $t_{platereqd}$

$$t_{platereqd} := \sqrt{\frac{6 \cdot (T_{overturn}) \cdot (2.03 \cdot \text{in})}{b_{width} \cdot F_{b,plate}}}$$

$$t_{platereqd} = 0.21 \cdot \text{in} > \text{than } t_{plate} = 0.09 \cdot \text{in} \quad \text{No Good}$$

Margin of Safety:

$$MS_{plate} := \frac{t_{plate}}{t_{platereqd}} - 1 \quad MS_{plate} = -0.55 \quad (\text{Negative Margin of Safety is not acceptable})$$

Calculate bending stress: f_b

$$f_b := \frac{6 \cdot T_{overturn} \cdot (2.03 \cdot \text{in})}{b_{width} \cdot (t_{plate})^2}$$

$$f_b = 1.8 \cdot 10^5 \frac{\text{lb}}{\text{in}^2} \gg \text{greater than } 36000 \text{ psi yield. No good.}$$

The base plate will yield when subjected to the seismic load in the z-direction which is towards the SCHe Panel. The I/O Panel can potentially interact with the SCHe Panel. Provide additional restraint at the top of the I/O Panel to prevent toppling. The restraint may be in the configuration of a cable threaded through the eye of the I/O Panel lifting lugs (located on top) and the ends attached to the wall using anchor bolts. The cable shall not be tight to prevent the wall displacement from being transferred to the Panel.

3/1 EVALUATIONS

Client

WO/Job No.

Subject CVDF SEISMIC 3/1 EVALUATION

Date 6/7/99

By EC Ocoma

Location 100K

CONDENSATE COLLECTION TANK

Reference : H-1-82225

The support type is a trapeze with 3/8" dia threaded rods for vertical members. The tank capacity is 15 gallons. The empty weight is 51 lbs. The weight of condensate, if tank is full equals 125 lbs. Total weight equals 176 lbs. The hanger rods are attached to the mezzanine structural members at the top and to unistrut channels at the bottom with double nuts. The rod connections are considered in Reference 2 as fixed rotation or not pinned when using double nuts. The rods are ASTM A36 all thread.

$$d_{rod} := 0.298 \cdot \text{in} \quad h_{rod} := 14 \cdot \text{in} \quad L_{uni} := 14 \cdot \text{in}$$

$$F_{y,rod} := 36000 \cdot \frac{\text{lb}}{\text{in}^2} \quad F_{allow,rod} := 0.75 \cdot (F_{y,rod}) \quad F_{allow,rod} = 2.7 \cdot 10^4 \cdot \frac{\text{lb}}{\text{in}^2}$$

$$W_p := \frac{176 \cdot \text{lb}}{2} \quad W_p = 88 \text{ lb}$$

$$A_{hnew} := 3.12 \quad A_{vnew} := \frac{2}{3} \cdot (A_{hnew}) \quad A_{vnew} = 2.08 \quad (\text{Seismic accel. per Ref. 2})$$

Support is idealized as Case 41/8 in Reference 4.

Moment of Inertia

$$J_1 := \frac{\pi \cdot d_{rod}^4}{64} \quad J_1 = 3.87 \cdot 10^{-4} \cdot \text{in}^4$$

$$J_2 := 0.185 \cdot \text{in}^4 \quad (\text{from Unistrut catalogue})$$

$$k := \frac{J_2 \cdot h_{rod}}{J_1 \cdot L_{uni}} \quad k = 477.9$$

$$N_1 := k + 2 \quad N_1 = 479.9$$

$$N_2 := 6 \cdot k + 1 \quad N_2 = 2.87 \cdot 10^3$$

Check rod bending in Z - direction

$$F_z := \frac{W_p \cdot A_{hnew}}{2}$$

$$F_z = 137.28 \text{ lb}$$

$$M_{Az} := \frac{F_z \cdot h_{rod}}{2} \cdot \left(\frac{3 \cdot k + 1}{N_2} \right)$$

$$M_{Az} = 40.05 \text{ lb} \cdot \text{ft}$$

3/1 EVALUATIONS

Client

WO/Job No.

Subject CVDF SEISMIC 3/1 EVALUATION

Date 6/7/99

ECW
By EC Ocoma

Location 100K

Bolt tensile stress area, from AISC Manual

$$A_{\text{rod}} := 0.078 \cdot \text{in}^2 \quad N := \frac{16}{\text{in}} \quad \text{thread/in.}$$

$$D_{\text{rod}} := \frac{.9743}{N} + \sqrt{\frac{A_{\text{rod}}}{.7854}} \quad D_{\text{rod}} = 0.38 \cdot \text{in}$$

Section Modulus of rod

$$S_z := .098175 \cdot D_{\text{rod}}^3 \quad S_z = 5.22 \cdot 10^{-3} \cdot \text{in}^3$$

Bending stress:

$$f_{bz} := \frac{M_{Az}}{S_z} \quad f_{bz} = 9.21 \cdot 10^4 \cdot \frac{\text{lb}}{\text{in}^2}$$

$$\text{Margin of Safety, } MS := \frac{F_{\text{allow,rod}} \cdot (1.33)}{f_{bz}} - 1$$

$$MS = -0.61 \quad \text{Negative margin of safety --- NO GOOD}$$

Provide lateral restraints or fall protection cable or relocate Condensate Tank outside the zone of influence of the SCHe tubing and Panel (approximately 4 feet horizontal distance).

3/1 EVALUATIONS

Client

Subject CVDF SEISMIC 3/1 EVALUATION

Location 100K

WO/Job No.

Date 4/7/99

By EC Ocoma

SEISMIC ZONE OF INFLUENCE

The seismic zone of influence for falling items (source) is primarily applied to items that are located above grade. The calculation to establish the zone requires the horizontal peak seismic acceleration (g) at the elevation point and the corresponding frequency from the in-structure response spectra. There are no building in-structure response spectra that are generated for various elevations up to the roof, where the peak acceleration can be obtained from. The peak horizontal acceleration that will be used, as established in Reference 2, for flexible components located above grade that are potential interaction items is 3.12g. The frequency range at the peak of the spectra for 5% damping will be taken from Table 6 of HNF-PRO-97. The frequency is 5 Hz. In this evaluation, the source will be assumed as a horizontal projectile.

From HWS - 1386, Rev. 12, velocity V_o is:

$$f_{hz} := \frac{5}{\text{sec}} \quad A_{hnew} := 3.12 \cdot g$$

$$V_o := \frac{A_{hnew}}{2 \cdot \pi \cdot f_{hz}} \quad V_o = 2.18 \frac{\text{mi}}{\text{hr}}$$

$$\text{Use } V_o := 4 \frac{\text{ft}}{\text{sec}} \quad \text{for conservatism}$$

Governing Equations:

For a horizontal projectile, the horizontal (R) and the vertical (H) distance travelled at any time (t_{sec}) is calculated as follows:

$$R := V_o \cdot t_{\text{sec}}$$

$$H := -\frac{1}{2} \cdot g \cdot t_{\text{sec}}^2$$

V_o = initial horizontal velocity
 H = Height of source from target
 R = Horizontal distance travelled by source

3/1 EVALUATIONS

Client

Subject CVDF SEISMIC 3/1 EVALUATION

Location 100K

WO/Job No.

Date 6/7/99

By EC Ocoma

Time of flight, t_{sec}

$$t_{sec} := \begin{bmatrix} 0 \\ .25 \\ .5 \\ .75 \\ 1 \\ 1.25 \\ 1.5 \\ 1.75 \\ 2. \\ 2.25 \end{bmatrix} \text{ sec}$$

Horizontal distance travelled
by the source in t_{sec}

$$R := V_o \cdot t_{sec}$$

	0
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

R = 4 ft

Vertical distance travelled by the
source in t_{sec}

$$H_{ht} := -\frac{1}{2} \cdot g \cdot (t_{sec})^2$$

	0
0	0
1	-1.01
2	-4.02
3	-9.05
4	-16.09
5	-25.14
6	-36.2
7	-49.27
8	-64.35
9	-81.44

H_{ht} = ft

Figure 4.1: SEISMIC ZONE OF INFLUENCE
CVDF PROCESS BAYS

Figure 4.1: SEISMIC ZONE OF INFLUENCE
CVDF PROCESS BAYS

Table A-1A. Cold Vacuum Drying Facility - Equipment/Structures

SC ITEMS WITH PC3 SEISMIC REQUIREMENTS AS IDENTIFIED IN SAFETY EQUIPMENT LIST						
Sys. No.	P&ID	Component Tag No.	Component Description / Noun Name	Safety Category Designation	NPH and Performance Category	Seismic ^c
13-2	Safety class helium purge system (Sys. 13-2)					
13-2	H-1-82165	SCHe-TK-5*01	Helium supply bottle	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-TK-5*02	Helium supply bottle	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-TK-5*03	Helium supply bottle	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-TK-5*04	Helium supply bottle	SC	PC-3	Seis Cond A
13-2	H-1-82161		Pipe supports	SC	PC-3	Seis Cond A
47-1	H-1-82161	TW-SE-1*13	MCO/Cask Seal Ring	SC/SS ^g	PC-3	Seis. Cond. A
100	Specialty Equipment (Sys. 100)					
100			VPS/PWC/TW/SCHe Process Hood Support Structure	SC	PC-3	Seis. Cond A
100			SCHe Helium Supply Structural Support	SC	PC-3	Seis. Cond A
^a Seismic 3/I Evaluations shall be performed on SC, SS or GS SSCs for potential impact to SS and SC SSCs						
^b Sensitive LD (Leak Detection) as specified in AMSE B31.3 Section 345.8. Component must pass leak detection test.						
^c Seismic Qualification Conditions (Refer to Hanford document HNF-PRO-097) :						
Condition A : Maintain critical function before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Confinement defined as 1x10 ⁻² atm						
Condition B : Maintain pressure boundary before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Component function or operation						
Condition C : Maintain critical function before, during and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent).						
Condition 3/1: GS, SS or SC component cannot impact a SC component during a Seismic event (Certification to WHC-SD-GN-DGS-30006)						
^d Environmental Conditions: Note: The CVDF is a mild environment as defined in IEEE-323						
Condition A: 60 °F @ 40 RH, 75° F @ 25% RH						
Condition B: 40 °F @ 60 RH, 115° F @ 22% RH						
^e GS Procurement with QC Inspection During Fabrication to Satisfy Criticality Control Dimensions						
^f Calculation Database for the CVDF project is contained in SNF-3001						
^g Some portions of assembly are SS and some portions are SC, see drawing H-1-83275 for safety category designation boundaries.						
^h Equipment item shall have OCRWM compliance in accordance with HNF-1551 HNF-SD-SNF-RPT-007.						

SC ITEMS WITH PC3 SEISMIC REQUIREMENTS AS IDENTIFIED IN SAFETY EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Description/Noun Name	Safety Category Designation	NPH and Performance Category	Seismic ^c
07	Vacuum Purge system (Sys. 07)					
07-1	H-1-82161	VPS-*01-SS-1"	Vacuum Purge System	SC	PC-3	Seis Cond A
07-1	H-1-82161	VPS-*02-SS-2"	Vacuum Purge System	SC From VPS-V-*010 to GOV-1*05	PC-3 From VPS-V-*010 to GOV-1*05	Seis Cond A
13	Helium systems (Sys. 13)					
13-1	General Service Helium system (Sys. 13-1)					
13-1	H-1-82161	He-*01-SS-1"	General Service Helium Supply to PES Skid, MCO Purge	SC from FE-1*21 to VPS-*01-SS-1"	PC-3 from FE-1*21 to VPS-*01-SS-1"	Seis Cond A
13-2	Safety class helium purge system (Sys. 13-2)					
13-2	H-1-82165	SCHe-*01-ST-1/4"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*01-ST-1/4"	Safety Class Helium System Flex Line	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*02-ST-1/4"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*02-ST-1/4"	Safety Class Helium System Flex Line	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*03-ST-1/4"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*03-ST-1/4"	Safety Class Helium System Flex Line	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*04-ST-1/4"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*04-ST-1/4"	Safety Class Helium System Flex Line	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*05-ST-1/4"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*06-ST-1/4"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*07-ST-1/4"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*08-ST-1/4"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82161	SCHe-*09-SS-1"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82165	SCHe-*10-SS-1"	Safety Class Helium System	SC	PC-3	Seis Cond A

SC ITEMS WITH PC3 SEISMIC REQUIREMENTS AS IDENTIFIED IN SAFETY EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Description/Noun Name	Safety Category Designation	NPH and Performance Category	Seismic ^c
13-2	H-1-82161 H-1-82165	SCHe-*11-SS-1"	Safety Class Helium System	SC	PC-3	Seis Cond A
13-2	H-1-82161 H-1-82165	SCHe-*12-SS-1"	Safety Class Helium System	SC	PC-3	Seis Cond A
46	Process water conditioning system (Sys. 46)					
46-1	Process water conditioning system (Sys. 46-1)					
46-1	H-1-82161	PWC-*01-SS-1"	Process Water Conditioning at MCO	SC from GOV-1*03 to VPS-V-*019"	PC-3	Seis Cond A
47	Cooling water system (Sys. 47)					
47-1	MCO-tempered water system (Sys. 47-1)					
47-1	H-1-82161	TW-*01-SS-1 1/2"	Tempered Water System	SC from Cask Conn. to SP-87	PC-3	Seis Cond A
47-1	H-1-82161	TW-*02-SS-1 1/2"	Tempered Water System	SC from Cask Conn. to SP-87	PC-3	Seis Cond A
^a Seismic 3/1 Evaluations shall be performed on SC, SS or GS SSCs for potential impact to SS and SC SSCs						
^b Sensitive LD (Leak Detection) as specified in AMSE B31.3 Section 345.8. Component must pass leak detection test.						
^c Seismic Qualification Conditions (Refer to Hanford document HNF-PRO-097) :						
Condition A : Maintain critical function before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent), Confinement defined as 1x10 ⁻² atm*ml/						
Condition B : Maintain pressure boundary before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Component function or operation is						
Condition C : Maintain critical function before, during and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent).						
Condition 3/1: GS, SS or SC component cannot impact a SC component during a Seismic event (Certification to WHC-SD-GN-DGS-30006)						
^d Environmental Conditions: Note: The CVDF is a mild environment as defined in IEEE-323						
Condition A: 60 °F @ 40 RH, 75° F @ 25% RH						
Condition B: 40 °F @ 60 RH, 115° F @ 22% RH						
^f Calculation Database for the CVDF project is contained in SNF-3001						
^g The base requirements of the B31.3 Code, for Safety Class (SC), category M piping, is augmented with the following:						
-Inspection by an Authorized Nuclear Inspector						
-Piping materials require a Certified Material Test Report (CMTR)						
-Additional 20% in-process examination in addition to code required non-destructive examination						

SC ITEMS WITH PC3 SEISMIC REQUIREMENTS AS IDENTIFIED IN SAFETY EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Noun Name	Safety Function	Safety Category Designation	NPH and Performance Category	Seismic ^c
07	Vacuum Purge system (Sys. 07)						
07-1	H-1-82161	PI-1*40	MCO-ACC-PRESS-MON	Thermal Runaway and H2 Explosion prevention	SC	PC-3	Seis Cond A
07-1	H-1-82161	PI-1*41	MCO-ACC-PRESS-MON	Thermal Runaway and H2 Explosion prevention	SC	PC-3	Seis Cond A
07-1	H-1-82161	PT-1*08 ^h	MCO-DISCH-PRESS-XMTTR-TRN-A	Thermal Runaway and H2 Explosion prevention; Pressure boundary is seismic, signal is non-seismic	SC	PC-3	Seis Cond B
07-1	H-1-82161	PT-1*10 ^h	MCO-DISCH-PRESS-XMTTR-TRN-B	Thermal Runaway and H2 Explosion prevention; Pressure boundary is seismic, signal is non-seismic	SC	PC-3	Seis Cond B
07-1	H-1-82161	PT-1*36	MCO-DISCH-PRESS-XMTTR-TRN-A	Thermal Runaway and H2 Explosion prevention; Pressure boundary is seismic, signal is non-seismic	SC	PC-3	Seis Cond B
13-1	General Service Helium system (Sys. 13-1)						
13-1	H-1-82161	PT-1*34	He-SUPPLY-MCO-PRESS	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-1	H-1-82161	PT-1*35	He-SUPPLY-MCO-PRESS	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	Safety class helium purge system (Sys. 13-2)						
13-2	H-1-82165	FI-5*10	SCHe Flow Indication to MCO	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	FI-5*29	SCHe Flow Indication to MCO	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	FI-5*49	SCHe Flow Indication to MCO	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	FI-5*69	SCHe Flow Indication to MCO	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	FI-5*76	SCHe Flow Indication to MCO	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	FI-5*77	SCHe Flow Indication to MCO	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	FI-5*78	SCHe Flow Indication to MCO	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
-8	H-1-82165	FI-5*79	SCHe Flow Indication to MCO	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PI-5*02	#REF!	Thermal Runaway and H2 Explosion prevention, accident monitoring	SC	PC-3	Seis Cond A
13-2	H-1-82165	PI-5*07	SCHe 15 25 psig Pressure Indicator	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PI-5*09	SCHe 7 14 psig Pressure Indicator	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PI-5*21	#REF!	Thermal Runaway and H2 Explosion prevention, accident monitoring	SC	PC-3	Seis Cond A
13-2	H-1-82165	PI-5*26	SCHe 15 25 psig Pressure Indicator	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B

SC ITEMS WITH PC3 SEISMIC REQUIREMENTS AS IDENTIFIED IN SAFETY EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Noun Name	Safety Function	Safety Category Designation	NPH and Performance Category	Seismic ^c
13-2	H-1-82165	PI-5*28	SCHe 7 14 psig Pressure Indicator	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PI-5*41	#REF!	Thermal Runaway and H2 Explosion prevention; accident monitoring	SC	PC-3	Seis Cond A
13-2	H-1-82165	PI-5*46	SCHe 45 25 psig Pressure Indicator	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PI-5*48	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PI-5*61	#REF!	Thermal Runaway and H2 Explosion prevention; accident monitoring	SC	PC-3	Seis Cond A
13-2	H-1-82165	PI-5*66	SCHe 45 25 psig Pressure Indicator	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PI-5*68	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PSL-5*03	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PSL-5*06	SCHe 45 25 psig Pressure Switch Low	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PSL-5*22	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PSL-5*25	SCHe 45 25 psig Pressure Switch Low	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PSL-5*42	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PSL-5*45	SCHe 45 25 psig Pressure Switch Low	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PSL-5*62	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PSL-5*65	SCHe 45 25 psig Pressure Switch Low	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PT-5*01	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PT-5*20	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PT-5*40	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
13-2	H-1-82165	PT-5*60	#REF!	Thermal Runaway and H2 Explosion prevention; pressure boundary only	SC	PC-3	Seis Cond B
47	Cooling water system (Sys. 47)						
47-1	MCO-tempered water system (Sys. 47-1)						

SC ITEMS WITH PC3 SEISMIC REQUIREMENTS AS IDENTIFIED IN SAFETY EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Noun Name	Safety Function	Safety Category Designation	NPH and Performance Category	Seismic ^c
47-1	H-1-82161	LG-1*24	TW-ANNULUS-LVL-GAGE-OUT	Accident Monitoring of Cask Annulus water level for Runaway Reaction Prevention (part of level alarm function for LSH 1*24)	SC	PC-3	Seis Cond A
47-1	H-1-82161	LG-1*25	TW-ANNULUS-LVL-GAGE-IN	Accident Monitoring of Cask Annulus water level for Runaway Reaction Prevention (part of level alarm function for LSH 1*25)	SC	PC-3	Seis Cond A
93-2	Safety class I&C system (Sys. 93-2)						
93-2	TBD	Bay 2 through 5 SCIC SYSTEM NON-PLC LOGIC panels	CP-211, 310, 411, 510	H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	Bay 2 through 5 SCIC SYSTEM PLC LOGIC panels	CP-210, 311, 410, 511	H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	SC Wiring, conduit and supports	NA	H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	ATR-5436-5235	CP-220- Seismic Recorder Bay 2	Seismic trip for H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	ATR-5335-5336	CP-320- Seismic Recorder Bay 3	Seismic trip for H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	ATR-5437-5437	CP-420- Seismic Recorder Bay 4	Seismic trip for H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	CP-120-AY-5238	CP-120- Seismic Auctioneering Panel Train A	Seismic trip for H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	CP-121-AY-5239	CP-121- Seismic Auctioneering Panel Train B	Seismic trip for H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	CP-122	Seismic Buffer Panel Train A	Seismic trip for H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	CP-123	Seismic Buffer Panel Train B	Seismic trip for H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	TW-MC-3*14-A	TW SC Pump Starter Train A	H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	TW-MC-3*14-B	TW SC Pump Starter Train B	H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	TW-MC-3*11-A	TW SC Heater Starter Train A	H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
93-2	TBD	TW-MC-3*11-B	TW SC Heater Starter Train B	H2 Explosion prevention; Runaway Reaction Prevention	SC	PC-3	Seis Cond C
^a Seismic 3/1 Evaluations shall be performed on SC, SS or GS SSCs for potential impact to SS and SC SSCs							
^c Seismic Qualification Conditions (Refer to Hanford document HNF-PRO-097) :							
Condition A : Maintain critical function before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Confinement defined as 1x10 ⁻² atm*ml/sec see/see or less.							
Condition B : Maintain pressure boundary before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Component function or operation is not required.							
Condition C : Maintain critical function before, during and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent).							
Condition 3/1: GS, SS or SC component cannot impact a SC component during a Seismic event (Certification to WHC-SD-GN-DGS-30006)							

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Description / Noun Name	Safety Category	NPH and Performance	Seismic ⁵	Support Type/ Location	Seismic Calculation	Safety Class Target	Comments
06-1	H-1-82121 to -124	Foundation and floors	Walls	GS	PC-1 ^a	3/1				Not within the scope of this evaluation
06-1	H-1-82125, 126			GS	PC-1 ^a	3/1				Not within the scope of this evaluation
06-1	H-1-82128, 110	Roof, Structural		GS	PC-1 ^a	3/1				Not within the scope of this evaluation
06-1	H-1-82129, 130	Structural framing		GS	PC-3	3/1				Not within the scope of this evaluation
06-2	H-1-82128, 110	Roof, Structural		GS	PC-3	3/1				Not within the scope of this evaluation
06-2	H-1-82125, 126	Precast wall panels		GS	PC-3	3/1				Not within the scope of this evaluation
06-2	H-1-82121 to -124	Foundation and floors	Doors, Telescoping	GS	PC-3	3/1				Not within the scope of this evaluation
06-2	H-1-82112									
06-3	Transfer corridor, mechanical equipment room and stairwell	(Sys. 06-3) No SS or SC SSCs								
06-3	H-1-82129, 130	Structural framing		GS	PC-2	3/1				Not within the scope of this evaluation
06-3	H-1-82128, 110	Roof, Structural		GS	PC-2	3/1				Not within the scope of this evaluation
06-3	H-1-82125, 126	Walls		GS	PC-2	3/1				Not within the scope of this evaluation
06-3	H-1-82121 to -124	Foundation and floors		GS	PC-2	3/1				Not within the scope of this evaluation
06-4	Process water tank room structure (Sys. 06-4) No SS or SC SSCs	(Sys. 06-4) No SS or SC SSCs								
06-4	H-1-82203	Wall Penetrations		GS	PC-2	3/1				Not within the scope of this evaluation
06-4	H-1-82129, 130	Structural framing		GS	PC-2	3/1				Not within the scope of this evaluation
06-4	H-1-82128, 110	Roof, Structural		GS	PC-2	3/1				Not within the scope of this evaluation
06-4	H-1-82121 to -124	Precast wall panels		GS	PC-2	3/1				Not within the scope of this evaluation
06-4	H-1-82121 to -124	Foundation & Floor		GS	PC-2	3/1				Not within the scope of this evaluation
07-1	Vacuum Purge system (Sys. 07-1)	(Sys. 07-1)								
07-1	H-1-82162	Condenser Tank Cooler	VPS-CLR-2*17	GS	PC-1 ^a	3/1	PES Skid	2288-S-12A	SCHe Panel A	These equipment are installed in PES skid on ground floor. No PC3 item in skid. Equipment anchored on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. Calculated average Demand/Capacity ratio for bolts is about 0.09. Margin of safety is approximately 10.0. Anchors are acceptable.
07-1	H-1-82162	Condenser	VPS-COND-2*13	GS	PC-1 ^a	3/1	PES Skid	2288-S-12A	SCHe Panel A	These equipment are installed in PES skid on ground floor. No PC3 item in skid. Equipment anchored on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. Calculated average Demand/Capacity ratio for bolts is about 0.09. Margin of safety is approximately 10.0. Anchors are acceptable.
07-1	H-1-82162	Vacuum Pump	VPS-P-2*11	GS	PC-1 ^a	3/1	PES Skid	2288-S-12A	SCHe Panel A	These equipment are installed in PES skid on ground floor. No PC3 item in skid. Equipment anchored on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. Calculated average Demand/Capacity ratio for bolts is about 0.09. Margin of safety is approximately 10.0. Anchors are acceptable.
07-1	H-1-82162	Condenser Receiver Tank	VPS-TK-2*16	GS	PC-1 ^a	3/1	PES Skid	2288-S-12A	SCHe Panel A	These equipment are installed in PES skid on ground floor. No PC3 item in skid. Equipment anchored on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. Calculated average Demand/Capacity ratio for bolts is about 0.09. Margin of safety is approximately 10.0. Anchors are acceptable.
07-1	H-1-82161	Pipe Supports @ PES skid		GS	PC-1 ^a	3/1	PES Skid	2288-S-12A	SCHe Panel A	Typ 7 places bolted to floor and 1 welded to plate embd). Anchorage is adequate and acceptable.
07-1	H-1-82161	Support Structure, PES		GS	PC-2 ^a	3/1	Boiled & welded to floor	MEI2621.EQ.6	SCHe Panel A	This equipment is installed with other equipment on the PES skid on the ground floor. No PC3 item in skid. Equipment anchored on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. Calculated average Demand/Capacity ratio for bolts is about 0.09. Margin of safety is approximately 10.0. Anchors are acceptable.
07-3										
07-3	He MSLD and Auxiliary Vacuum system (Sys. 07-3) No SS or SC SSCs	(Sys. 07-3) No SS or SC SSCs								
07-3	He MSLD			GS	PC-1 ^a	3/1				No available data. No drawing. No action as yet
07-3	Aux. Vacuum Pump			GS	PC-1 ^a	3/1				No available data. No drawing. No action as yet
07-3	MSLD Vac. Pumps			GS	PC-1 ^a	3/1				No available data. No drawing. No action as yet
07-3	Pipe Supports			GS	PC-1 ^a	3/1				No available data. No drawing. No action as yet
07-3	Support Structure			GS	PC-1 ^a	3/1				No available data. No drawing. No action as yet
12	Compressed and instrument air system (Sys. 12) No SS or SC SSCs	(Sys. 12) No SS or SC SSCs								
13-1	12									
13-1	H-1-82222									
13-1	General Service Helium system (Sys. 13-1)	(Sys. 13-1)								
			Pipe Supports	GS	PC-1 ^a	3/1	H7, Trapeze		SCHe-ST-1/4" & Panel A	Numerous pipes are supported by trapeze with long hanger rods from the mezzanine. Trapeze inside a trapeze and also beside a trapeze. Potential interaction between trapeze. The pipes are in close proximity with the vertical run of SCHe tubing (not yet installed but planned to be relocated closer to the PC12 piping). A potential interaction due to out of phase movement between the mezzanine, trapeze and the Panel A enclosure will impact the SCHe tubing and the hose and its threaded connection. Supports not acceptable. Provide lateral bracing.

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Description / Noun Name	Safety Category Designation	NPH and Performance Category	Seismic ^c	Support Type/ Location	Seismic Calculation Reference	Safety Class Target	Comments
13-1	H-1-82222		Pipe Supports - GS	GS	PC-1 ^a	3/1	H7, Trapeze		SCHe-ST-1/4" & Panel A	Pipe is 1/2" dia. The Panel has expanded metal enclosure and the SCHe tubings are partially encased in a P1000 unistrut. Accept.
14	Cranes and hoists (Sys. 14) No SS or SC SSCs									
14	H-1-82132	HOI-520,-530,-540,-550	Process Bay Overhead Crane	GS	PC-1 ^a	3/1	2288-S-02, MEL2288.ST.06		Process Hood	Designed for PC3 seismic loads. Accept.
19	Condensate collection system (Sys. 19) No SS or SC SSCs									
19	H-1-82223		Condensate collection tanks	GS	PC-1 ^a	3/1	H-1-82225, detail 1	HNF-4291	SCHe-ST-1/4" & Panel B	Calculation attached. Support not acceptable. Provide lateral bracings or fall protection cable to prevent falling on SCHe Panel B located below the tank.
20-1	Electrical power distribution system (Sys. 20-1)									
20-1	"		Distribution Panels(@ Process Bay)	GS	PC-1 ^a	3/1	DCN W-441-193, pg 5/26		SCIC Control Panel	Installation of distribution panels in one of the process bays is almost complete. Evaluated adequacy by field walkdown. Anchorage is adequate.
20-2	Lighting [External/Internal/Exit/Emergency] (Sys. 20-2)									
20-2	H-1-82241, -242, -246, -247, -248		Internal Lighting(@ Process Bay)	GS	PC-1 ^a	3/1			SCIC CP, 1/4" SCHe & Proc Hood	Evaluated by walkdown. Supports not adequate. Provide fall protection cable for suspended light fixtures.
24	Fire protection system (Sys. 24) No SS or SC SSCs									
24	H-1-82237 H-1-82240		Pipe Supports	GS	PC-2 ^a	3/1	NEPA-13		SCIC CP, 1/4" SCHe & Proc Hood	System designed per NFPA 13 criteria using 0.5g horizontal seismic loading. A partial model of the system was developed to verify support adequacy using SD 30006 seismic criteria. Results show lateral and longitudinal bracings for the mains are overloaded. Although lateral bracings are not required for small branch lines, it is recommended to provide lateral bracing at the end of a branch to prevent large displacements. Supports not acceptable. Add more lateral bracings.
25	Deionized water system (Sys. 25) No SS or SC SSCs									
25	H-1-82222		Pipe Supports	GS	PC-1 ^a	3/1	H7, Trapeze		SCHe-ST-1/4" & Panel A	Numerous pipes are supported by trapeze with long hanger rods from the mezzanine. Trapeze inside a trapeze and also beside a trapeze. Potential interaction between trapeze. The pipes are in close proximity with the vertical run of SCHe tubing (not yet installed but planned to be relocated closer to the PC12 piping). A potential interaction due to out of phase movement between the mezzanine, trapeze and the Panel A enclosure will impact the SCHe tubing and the hose and its threaded connection. Supports not acceptable. Provide lateral bracings.
30-2	HVAC-B System [Process Bay Supply/Recirc.] (Sys. 30-2) No SS or SC SSCs									
30-2	H-1-82204	HVAC-CCL-8*03	Cooling Coil	GS	PC-1 ^a	3/1	Frame	MEL2621.EQ.04	SCHe systems in Process Hood support structure at the mezzanine	Interconnected with heater, damper, filter, duct and fan. Qualified by analysis using 3/1 seismic load per SD-30006. Accept.
30-2	H-1-82204	HVAC-HTR-8*04	Electrical Heater	GS	PC-1 ^a	3/1	Frame	MEL2621.EQ.04		Cooling coil and heater share the same support structure. Anchorage is adequate.
30-2	H-1-82204	HVAC-DMP-8*01	Damper	SS	PC-2 ^a	3/1	Frame	2288-S-011		Interconnected with heater, cooling coil, filter, duct and fan. Qualified by analysis using 3/1 seismic load. Accept.
30-2	H-1-82204	HVAC-F-8*02	HEPA filter	GS	PC-1 ^a	3/1	Frame	MEL2621.EQ.03		Interconnected with heater, damper, cooling coil, duct and fan. Qualified by analysis using 3/1 seismic load. Accept.
30-2	H-1-82204		Ducting	GS	PC-1 ^a	3/1				Not yet analyzed. Provide calculations
30-2	H-1-82204		Filter Housing & Duct Supports	GS	PC-1 ^a	3/1	Frame	MEL2621.EQ.6		Qualified by analysis using 3/1 seismic load. Accept.
30-2	H-1-82204	HVAC-FAN-8*05	Fans	GS	PC-1 ^a	3/1	Frame	MEL2621.EQ.04		Interconnected with heater, damper, filter, duct and cooling coil. Qualified by analysis using 3/1 seismic load. Accept.
30-3	HVAC-C System [Process Bay Local Exhaust] and Process Vent System (Sys. 30-3)									
30-3	H-1-82206	HVAC-AMS-8044	Air Flow Measuring Station	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. No action required.
30-3	H-1-82206	HVAC-F-8040	HEPA filter	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. No action required.
30-3	H-1-82206		Ducting	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. No action required.
30-3	H-1-82206		Filter Housing & Duct Supports	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. No action required.
30-3	H-1-82192 H-1-82206	HVAC-DMP-8*03	Damper	SS	PC-2 ^a	3/1		2288-S-011	None	Designed for 3/1 loadings. Anchorage acceptable.
30-3	H-1-82192 H-1-82206	HVAC-DMP-005, -006, -007, -008	Dampers	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. No action required.
30-3			Cask Venting/Purging Equipment	SS	PC-2	3/1			None	No detail available on drawing. Evaluation incomplete.
30-3	H-1-82206	HVAC-EXHF-8045, -8047	Fans	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. No action required.
30-3	H-1-82206	CA-TK-5*21	Compressed Air Tank	SS	PC-2	3/1	mezzanine		SCIC Panels	No construction drawing available. Tank vendor will provide anchorage calculation. Review calculation when provided.
30-3	Process vent system (Sys. 30-3)									
30-3	H-1-82161	PV-HOOD-1*12	Process Hood	SS	PC-3	3/1	Frame/ Mezzanine	2288-S-09A,B,C	Process Hood & 1/4" SCHe	Process Hood support located on the mezzanine qualified by analysis as PC3. In Structure Response Spectra by Advent was used. Anchorage acceptable.
30-3	H-1-82161 to -165		Pipe Supports	SS	PC-2	3/1	Frame/ Mezzanine	2288-S-015	1/4" SCHe	Analysis did not use ISRS for the mezzanine. Some clamps are overloaded. Not acceptable.
30-4	HVAC-D System [Process General Supply] (Sys. 30-4) No SS or SC SSCs									
30-4	H-1-82205	HVAC-CCL-8004	Cooling Coil	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82205	HVAC-HTR-8003, -8010, -8011, -8012, -8013, -8014	Heater	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82205	HVAC-AMS-8007	Air Flow Measuring Station	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST										
Sys. No.	P&ID	Component Tag No.	Component Description / Noun Name	Safety Category Designation	NPH and Performance Category	Seismic ^c	Support Type/ Location	Seismic Calculation Reference	Safety Class Target	Comments
30-4	H-1-82205	HVAC-FAN-8005	Fans	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82205	HVAC-DMP-8001,-8035	Dampers	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82205	HVAC-F-8002	HEPA filter	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82205		Ducting	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82205		Filter Housing	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82205		Duct Supports	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	HVAC-D System [Process General Exhaust] (Sys. 30-4)									
30-4	H-1-82206	HVAC-AMS-8024	Air Flow Measuring Station	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82206	HVAC-F-8020	HEPA filter	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82206		Ducting	SS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82206		Filter Housing	SS	PC-2	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82206		Duct Supports	SS	PC-2	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82206	HVAC-DMP-8*02	Damper	SS	PC-2 ^a	3/1	2288S-011		None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82206	HVAC-EXHF-8025,-8027	Fans	GS	PC-1 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-4	H-1-82206	HVAC-DMP-001,-002,-003,-004,-8015,-8016,-8017,-8018,-8019,-8026,-8028,-8060	Dampers	GS	PC-2 ^a	3/1			None	Located in Mechanical Room. There are no PC3 items in the room. Should be PC 1/2. Both PC1 and PC2 use the same seismic criteria so no action required.
30-5	Reference air system (Sys. 30-5)									
30-5	H-1-82207		Pipe Supports	GS	PC-2	3/1	H7, Trapeze		SCHe-ST-1/4" & Panel A	Numerous pipes are supported by trapeze with long hanger rods from the mezzanine. Trapeze inside a trapeze and also beside a trapeze. Potential interaction between trapeze. The pipes are in close proximity with the vertical run of SCHe tubing (not yet installed but planned to be relocated closer to the PC12 piping). A potential interaction due to out of phase movement between the mezzanine, trapeze and the Panel A enclosure will impact the SCHe tubing and the hose and its threaded connection. Supports not acceptable. Provide lateral bracings.
46-1	Process water conditioning system (Sys. 46-1)									
46-1	H-1-82164 H-1-82223		Pipe Supports @ Process Bay	SS	PC-2 ^a	3/1	H5, H-1-82225	HNF-4291	SCIC Control Panels	Calculation attached in this report. All supports are acceptable.
46-1	H-1-82164 H-1-82172		Support Structure @ Tank Room	SS	PC-2	3/1	Tank Room	2288-S-013, MEI-2621.ST.10.CC	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82164	PWC-F-4042	Filter	SC/GS ^c	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82164	PWC-IXM-4037	Ion Exchange Module	SC/GS ^c	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82164	PWC-IXM-4038	Ion Exchange Module	SC/GS ^c	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82164	PWC-TK-4032	Receiver Tank	SC/GS ^c	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82164	PWC-TK-4033	Receiver Tank	SC/GS ^c	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82164	PWC-EJR-4031	Water Jet Ejector	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82223	PWC-P-001	PWC Transporter Transfer Pump	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82164	PWC-P-4035	Circulation Water Pump A	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82164	PWC-P-4036	Circulation Water Pump B	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82223	PWC-TK-4001	Storage tank	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-1	H-1-82223	PWC-F-4043	Storage tank HEPA Filter	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST										
Sys. No.	P&ID	Component Tag No.	Component Description / Noun Name	Safety Category Designation	NPH and Performance Category	Seismic ^c	Support Type/ Location	Seismic Calculation Reference	Safety Class Target	Comments
46-1	H-1-82164 H-1-82223		Pipe Supports @ Tank Room	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-2	Conditioned Water Shipping System (Sys. 46-2) No SS or SC SSCs									
46-2			PWC Sample Bottle Cask	GS	PC-1 ^a	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-3	Contaminated Water Sampling and Analysis (Sys. 46-3) No SS or SC SSCs									
46-3	H-1-82164	PWC-SMP-4039	Automatic Sampler	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-3	H-1-82164	PWC-SMP-4040	Automatic Sampler	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-3	H-1-82164	PWC-SMP-4041	Automatic Sampler	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
46-3	H-1-82164		Automatic Sampler Bottle	GS	PC-2	3/1	Tank Room	2288-S-013	None	Located in the Tank Room. Analyzed as PC2. There are no PC3 items in the room at present so no potential 3/1 concern. No further action required.
47-1	MCO-tempered water system (Sys. 47-1)									
47-1	H-1-82163	TW-CLR-3*10	Cooler	GS	PC-1 ^a	3/1	Process Bay	2288-S-12, 12A	SCHe Panel A	This equipment is installed with other equipment in PES skid located on the ground floor. There are no PC3 items on the skid. Equipment anchorage on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. The calculated average Demand/Capacity ratio for the bolts is about 0.09. Margin of safety is approximately 10.0. The PES skid anchorage is adequate.
47-1	H-1-82163	TW-HTR-3*11	Heater	GS	PC-1 ^a	3/1	Process Bay	2288-S-12, 12A	SCHe Panel A	This equipment is installed with other equipment in PES skid located on the ground floor. There are no PC3 items on the skid. Equipment anchorage on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. The calculated average Demand/Capacity ratio for the bolts is about 0.09. Margin of safety is approximately 10.0. The PES skid anchorage is adequate.
47-1	H-1-82163	TW-P-3*14	Pump	GS	PC-1 ^a	3/1	Process Bay	2288-S-12, 12A	SCHe Panel A	This equipment is installed with other equipment in PES skid located on the ground floor. There are no PC3 items on the skid. Equipment anchorage on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. The calculated average Demand/Capacity ratio for the bolts is about 0.09. Margin of safety is approximately 10.0. The PES skid anchorage is adequate.
47-1	H-1-82163	TW-TK-3*12	Expansion Tank	GS	PC-1 ^a	3/1	Process Bay	2288-S-12, 12A	SCHe Panel A	This equipment is installed with other equipment in PES skid located on the ground floor. There are no PC3 items on the skid. Equipment anchorage on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. The calculated average Demand/Capacity ratio for the bolts is about 0.09. Margin of safety is approximately 10.0. The PES skid anchorage is adequate.
47-1	H-1-82241, -242, -246, -247, -248		TW Heater SCR's (@ Process Bay)	GS	PC-1 ^a	3/1	Process Bay	2288-S-12, 12A	SCHe Panel A	This recorder is installed on the wall away from the SCHe Panel. Acceptable.
47-1	H-1-82161 & -163		Pipe Supports @ PES skid	GS	PC-1 ^a	3/1	Process Bay	2288-S-12, 12A	SCHe Panel A	This equipment is installed with other equipment in PES skid located on the ground floor. There are no PC3 items on the skid. Equipment anchorage on the skid are qualified by analysis using PC2 load instead of 3/1 load which is larger. Anchors are machine bolts. The calculated average Demand/Capacity ratio for the bolts is about 0.09. Margin of safety is approximately 10.0. The PES skid anchorage is adequate.
47-2	Tempered water cooling system (Sys. 47-2) No SS or SC SSCs									
47-2	H-1-82224		Pipe Supports	GS	PC-1	3/1				All of the 47-2 piping systems in the MEL piping section are not 3/1 therefore pipe supports should not be 3/1 item. Revise MEL to agree.
47-3	Chilled water system (Sys. 47-3) No SS or SC SSCs									
47-3	H-1-82208		Pipe Supports	GS	PC-1 ^a	3/1	Mezzanine	MEI-2621.EQ.01	None	All of the 47-3 piping systems in the MEL piping section are not 3/1 therefore pipe supports should not be 3/1 item. Revise MEL to agree. The CHW system is supported from the wall on column lines 3, 4, 5 & 6 above the mezzanine level. No PC3 items in proximity. Anchorage qualified by analysis using 3/1 seismic loadings. Accept
47-4	VPS chilled water system (Sys. 47-4) No SS or SC SSCs									
47-4	H-1-82224		Pipe Supports	GS	PC-1 ^a	3/1			None	The VPSCWS is supported from the wall along column lines 3, 4, 5, & 6 above the mezzanine level. There are no PC3 SCEs along the wall and in the area between the wall and the HEPA filter bank, duct, heater, fan and motor. At present, the CHW system is not a potential 3/1 concern. Anchorage qualified by analysis using 3/1 loads. Accept.
93-1	Monitoring and control system (Sys. 93-1) No SS or SC SSCs									
93-1	H-1-82291		Remote I/O Cabinets	GS	PC-1 ^a	3/1	Process Bay	HNF-4291	SCHe Panel B	Anchorage evaluation attached herein. Anchorage not adequate. Provide additional lateral restraint.
93-1	H-1-82291		Conduit supports	GS	PC-1 ^a	3/1				The conduits and conduit supports are now PC3 per DCN-222. Provide support calculations using the mezzanine ISRS for PC3 DBE.
100	Specialty Equipment (Sys. 100)									
100			Swipe Count Pigs	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
100			Cask Lid Storage Fixture (seal replacement and lid decon)	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
100			Cask Trailer Bumper	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
100			Cask Trailer Wheel Chocks	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST										
Sys. No.	P&ID	Component Tag No.	Component Description / Noun Name	Safety Category Designation	NPH and Performance Category	Seismic ^c	Support Type/ Location	Seismic Calculation Reference	Safety Class Target	Comments
100			Cask Transporter Air Supply Glad Hand	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
100			Process Hood Lift Fixture	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
100			Storage Rack/Enclosure for He Leak Test Tools	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
100			Storage Rack/Enclosure for MCO-Cask Tools	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101	Special Tools (Sys. 101)									
101			MCO Temporary Vent Connector	SS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			Cask Lid Bolting Torque Calibration Tool/Standard	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			Cask Lid Bolting Torque Wrench (Pneumatic) and Sockets	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			Cask Lid Vent Port Cover Removal and Installation Tools	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			Cask Lower Port Cover Tool	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			Cask Lower Port SC Spoolpiece Installation Tool	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			MCO/VPS Process Port Connector Bolt Torque Wrench	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			MCO/VPS Process Port Connector Handling Tool (T-Handle, 2 sizes)	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			MCO/VPS Process Port Connector He Leak Test Tools	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
101			MCO/VPS Process Port Cover Removal and Installation Tools	GS	PC-1 ^a	3/1				GFE item. No detail drawing for location. Evaluate at later date.
			^a Seismic 3/1 Evaluations shall be performed on SC, SS or GS SSCs for potential impact to SS and SC SSCs							
			^b Sensitive LD (Leak Detection) as specified in AMSE B31.3 Section 345.8. Component must pass leak detection test.							
			^c Seismic Qualification Conditions (Refer to Hanford document HNF-PRO-097):							
			Condition A : Maintain critical function before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent), Confinement defined as 1x10 ⁻² atm*ml/sec sec/sec or less.							
			Condition B : Maintain pressure boundary before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Component function or operation is not required.							
			Condition C : Maintain critical function before, during and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent).							
			Condition 3/1: GS, SS or SC component cannot impact a SC component during a Seismic event (Certification to WHC-SD-GN-DGS-30006)							
			^f Calculation Database for the CVDF project is contained in SNF-3001							
			^g Some portions of assembly are SS and some portions are SC, see drawing H-1-83275 for safety category designation boundaries.							
			^h Equipment item shall have OCRWM compliance in accordance with HNF-1534 HNF-SD-SNF-RPT-007.							

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Description/Noun Name	Safety Category Designation	NPI and Performance Category	Seismic ^c	Safety Class Target	Seismic Calculation Reference	Comments
07	Vacuum Purge system (Sys. 07)								
07-1	H-1-82161								
07-1	H-1-82162	VPS-*02-SS-2"	Vacuum Purge System	GS from GOV-1*05	PC-1 ^a from GOV-1*05	3/1	SCHe system	2288-S-12	Installed in PES skid. SC target not within zone of influence.
07-1	H-1-82162	VPS-*03-SS-2"	Vacuum Purge System	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Installed in PES skid. SC target not within zone of influence.
07-1	H-1-82162	VPS-*04-SS-1"	Vacuum Purge System	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Installed in PES skid. SC target not within zone of influence.
07-1	H-1-82162	VPS-*07-SS-1"	Vacuum Purge System	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Installed in PES skid. SC target not within zone of influence.
07-1	H-1-82162	VPS-*08-SS-2"	Vacuum Purge System	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Installed in PES skid. SC target not within zone of influence.
07-1	H-1-82162	VPS-*09-SS-1"	Vacuum Purge System	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Installed in PES skid. SC target not within zone of influence.
07-1	H-1-82162	VPS-*10-SS-2"	Vacuum Purge System	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Installed in PES skid. SC target not within zone of influence.
07-1	H-1-82162	VPS-*11-SS-1"	Vacuum Purge System	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Installed in PES skid. SC target not within zone of influence.
07-2	RGM system (Sys. 07-2)								
07-2	H-1-82162	VPS-*12-ST-1/4"	Vacuum Purge System - RGA Inlet	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Source is small. Accept
07-2	H-1-82162	VPS-*13-ST-1/4"	Vacuum Purge System - RGA Outlet	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Source is small. Accept
07-3	He MSLD and Auxiliary Vacuum system (Sys. 07-3)								
07-3		VPS-tbd	MSLD Line	GS	PC-1 ^a	3/1			No data. Evaluate at later date.
12	Compressed and instrument air system (Sys. 12)								
12	H-1-82161, 165	IA-CA-*01-SS-1"	Compressed Air	GS	PC-1 ^a	3/1	SCHe system	No Calc.	See comment in Table A-1A for Sys. No. 12.
12	H-1-82161	IA-*01-SS-1"	Instrument Air to PES Skid	GS	PC-1 ^a	3/1	SCHe system	No Calc.	See comment in Table A-1A for Sys. No. 12.
12	H-1-82161	IA-*02-ST-1/4"	Instrument Air to Seal Ring	GS	PC-1 ^a	3/1	MCO Hood	No Calc.	Source is small. Accept
12	H-1-82161	IA-*03-SS-1"	Instrument Air from PES Skid to Hood Assy.	GS	PC-1 ^a	3/1	SCHe system	N/A	Flex hose. Accept
12	H-1-82164	IA-001-SS-1/2"	Instrument Air Supply to PWC skid	GS	PC-1 ^a	3/1	SCIC Panel	No Calc.	Source is small. Accept
12	H-1-82164	IA-002-SS-1/2"	Instrument Air Supply to PWC skid	GS	PC-1 ^a	3/1	SCIC Panel	No Calc.	Source is small. Accept
13	Helium systems (Sys. 13)								
13-1	General Service Helium system (Sys. 13-1)								
13-1	H-1-82161	He-*01-SS-1"	General Service Helium Supply on PES Skid	GS to FE-1*21	PC-1 ^a	3/1	SCHe system	2288-S-12	Segment installed in process hood support is OK. Portion Installed in PES skid is OK. Accept.
13-1	H-1-82222	He-*01-SS-1"	General Service Helium Supply in Bays	GS	PC-1 ^a	3/1	SCHe system	No Calc.	See comment in Table A-1A for System No. 13-1
13-1	H-1-82222 H-1-82161	He-101-SS-3/4"	General Service Helium Supply to Bays	GS	PC-1 ^a	3/1	SCHe system	No Calc.	Not in process bay. Accept.
13-1	H-1-82222	He-*01-SS-1/2"	General Service Helium Supply in Bays	GS	PC-1 ^a	3/1	SCHe system	No Calc.	See comment in Table A-1A for System No. 13-1
13-1	H-1-82161	He-*02-ST-1/4"	General Service Helium Supply for Cask Purge	GS	PC-1 ^a	3/1	SCHe system	2288-12	Source is small. Accept
13-1	H-1-82161	He-*03-SS-1"	General Service Helium Supply to PES Skid 4 Psig Service	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Installed in PES skid. Accept.
13-1	H-1-82161	He-*04-ST-1/4"	General Service Helium Supply to PES Skid Vacuum Pump Ballast	GS	PC-1 ^a	3/1	SCHe system	2288-S-12	Source is small. Accept
13-1	H-1-82161 H-1-82165	He-*05-SS-1/2"	General Service Helium Supply to SCHe	GS	PC-1 ^a	3/1	SCHe system	No Calc.	Source is small. Accept
13-1	H-1-82161 H-1-82165	He-*06-SS-1/2"	General Service Helium Supply to SCHe	GS	PC-1 ^a	3/1	SCHe system	No Calc.	Source is small. Accept
13-1	H-1-82165	He-*07-ST-1/2"	General Service Helium Supply to SCHe	GS	PC-1 ^a	3/1	SCHe system	No Calc.	Source is small. Accept
13-1	H-1-82165	He-*08-ST-1/2"	General Service Helium Supply to SCHe	GS	PC-1 ^a	3/1	SCHe system	No Calc.	Source is small. Accept
13-1	H-1-82165	He-*09-ST-1/2"	General Service Helium Supply to MCO DI flush line	GS	PC-1 ^a	3/1	SCHe system	No Calc.	Source is small. Accept
13-1	H-1-82222	He-001-SS-1"	General Service Helium Supply - Balance of Plant	GS	PC-1 ^a	3/1	SCHe system	No Calc.	See comment in Table A-1A for System No. 13-1
19	Condensate collection system (Sys. 19)								

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Description/Noun Name	Safety Category Designation	NPII and Performance Category	Seismic	Safety Class Target	Seismic Calculation Reference	Comments
19	H-1-82201 H-1-82223	CCS	Condensate Collection System	GS	PC-1 ^a	3/1	None	N/A	Short spool piece from mezzanine floor penetration to tank nozzle. Piping is acceptable.
24	Fire protection system (Sys. 24)								
24	H-1-82237 H-1-82838	FPS	Fire Protection System	GS	PC-1 ^a	3/1	SCHe system and MCO	No Calc.	Partial model analyzed for support loads only. Analysis attached. Also see comments in Table A-1A for sys no. 24.
25	Deionized water system (Sys. 25)								
25	H-1-82161 H-1-82165	DI/He-*01-SS-3/4"	Deionized Water to MCO	GS	PC-1 ^a	3/1	MCO Hood	N/A	Flex hose. Accept.
25	H-1-82161	DI-*01-SS-1"	Deionized Water to MCO	GS	PC-1 ^a	3/1	MCO Hood	N/A	Flex hose. Accept.
25	H-1-82161 H-1-82163	DI-*02-SS-1"	De-ionized Water to TW-TK-3*12	GS	PC-1 ^a	3/1	SCHe system	No Calc.	See comment in Table A-1A for Sys. No. 25.
25	H-1-82161 H-1-82165	DI-*03-ST-3/4"	De-ionized Water to MCO	GS	PC-1 ^a	3/1	MCO Hood	N/A	Flex hose. Accept.
25	H-1-82222 H-1-82223	DI-001-SS-1"	De-ionized Water in PWC tank room to tank 4001	GS	PC-1 ^a	3/1	None	No Calc.	Located in the Tank Room. Accept.
25	H-1-82223	DI-001-SS-1/2"	De-ionized Water in PWC tank room to tank 4001	GS	PC-1 ^a	3/1	None	No Calc.	Source is small. Accept
25	H-1-82223	DI-004-SS-1/2"	De-ionized Water in PWC on skid	GS	PC-1 ^a	3/1	None	No Calc.	Source is small. Accept
25	H-1-82223	DI-005-SS-1/2"	De-ionized Water in PWC tank room to tank 4001	GS	PC-1 ^a	3/1	None	No Calc.	Source is small. Accept
25	H-1-82223	DI-006-SS-1/2"	De-ionized Water in PWC tank room to tank 4001	GS	PC-1 ^a	3/1	None	No Calc.	Source is small. Accept
25	H-1-82164	DI-012-SS-1/2"	De-ionized Water Service to PWC skid	GS	PC-1 ^a	3/1	None	No Calc.	Source is small. Accept
25	H-1-82164	DI-013-SS-1/2"	De-ionized Water Service to PWC skid	GS	PC-1 ^a	3/1	None	No Calc.	Source is small. Accept
25	H-1-82164	DI-014-SS-1/2"	De-ionized Water Service to PWC skid	GS	PC-2 from DI-V-007 to PWC-006-SS-1 1/2"	3/1	None	No Calc.	Source is small. Accept
25	H-1-82164	DI-014-SS-1/2"	De-ionized Water Service to PWC skid	GS	PC-1 ^a	3/1	None	No Calc.	Source is small. Accept
25	H-1-82164	DI-014-SS-1 1/2"	De-ionized Water Service to PWC skid	GS	PC-1 ^a	3/1	None	No Calc.	Located in the Tank Room. Accept.
30-3	HVAC-C System [Process Bay Local Exhaust] and Process Vent System (Sys. 30-3)								
30-3	H-1-82163 H-1-82162	PV-*01-SS-1"	Process Vent System at PES skid - VPS vent	SS from PV-CKV-*031	PC-2	3/1	SCHe system	2288-S-12	Installed in PES skid. Accept.
30-3	H-1-82163	PV-*02-SS-1"	Process Vent System at PES skid- TW sys tank vent	SS from PV-CKV-*106	PC-2	3/1	SCHe system	2288-S-12	Installed in PES skid. Accept.
30-3	H-1-82351	PV-*03-SS-1"	Process Vent System at PES Skid	SS	PC-2	3/1	SCHe system	2288-S-12	Installed in PES skid. Accept.
30-3	H-1-82163	PV-*03-SS-2"	Process Vent System - Main vent header	SS	PC-2	3/1	SCHe system	2288-S-12	Installed in PES skid. Accept.
30-3	H-1-82161	PV-*04-ST-1/4"	Process Vent System at PES skid- Cask vent	SS	PC-2	3/1	SCHe system	2288-S-12	Source is small. Accept
30-3	H-1-82165	PV-*05-ST-1/4"	Process Vent System at SCHe vent	SS	PC-2	3/1	SCHe system	No Calc.	Source is small. Accept
30-3	H-1-82165	PV-*06-ST-1/4"	Process Vent System at SCHe vent	SS	PC-2	3/1	SCHe system	No Calc.	Source is small. Accept
30-3	H-1-83964	PV-*10-ST-1/2"	Process Vent System	SS	PC-2	3/1	SCHe system	No Calc.	Source is small. Accept
30-3	H-1-82163 H-1-82162	PV-*01-SS-1"	Process Vent System at PES skid - VPS vent	GS to PV-CKV-*031	PC-1	3/1	SCHe system	2288-S-12	Installed in PES skid. Accept.
30-3	H-1-82163	PV-*02-SS-1"	Process Vent System at PES skid- TW sys tank vent	GS to PV-CKV-*106	PC-1	3/1	SCHe system	2288-S-12	Installed in PES skid. Accept.
30-5	Reference air system (Sys. 30-5)								
30-5	H-1-82207	RA	HVAC Reference Air System - Balance of Plant	SS	PC-2	3/1	None	No Calc.	Not within PC3 proximity. Accept
46-1	Process water conditioning system (Sys. 46-1)								

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST

Sys. No.	P&ID	Component Tag No.	Component Description/Noun Name	Safety Category Designation	NPH and Performance Category	Seismic ¹	Safety Class Target	Seismic Calculation Reference	Comments
46-1	H-1-82223	PWC-*01-SS-1"	Process Water Conditioning at TW sys. Drain MCO	SS from GOV-1*03 to PWC-001-SS-1"	PC-2 ^a	3/1	SCHe system	2288-S-015	Installed in process hood support. Qualified by analysis. Accept.
46-1	H-1-82161 H-1-82163	PWC-*03-SS-1"	Process Water Conditioning at Cask/TW sys. Drain	SS from PWC-CKV-*030 to PWC-001-SS-1"	PC-2 ^a	3/1	SCHe system	No Calc.	Hard pipe in PES skid is acceptable. 108" long flex hose to cask is acceptable.
46-1	H-1-82223	PWC-001-SS-1"	Process Water Conditioning in Facility to PWC Skid	SS to PWC Skid	PC-2 ^a	3/1	SCIC Panel	No Calc.	Pipe supports analyzed per HNF-4291. Supports are acceptable.
46-1	H-1-82164	PWC-001-SS-1"	Process Water Conditioning at PWC skid	GS on PWC Skid	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82162 H-1-82163	PWC-*02-SS-1"	Process Water Conditioning at VPS Condenser Drain	GS	PC-2 ^a	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82163	PWC-*04-SS-1"	Process Water Conditioning at TW sys. Drain	GS	PC-2 ^a	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-002-SS-2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-003-SS-1 1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-004-SS-1 1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-005-SS-1 1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-006-SS-1 1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-007-SS-1 1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-008-SS-1 1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-009-SS-1 1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-010-SS-1"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-011-SS-1 1/2"	Process Water Conditioning at PWC skid and CVDF tank room	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-012-SS-1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-013-SS-2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-014-SS-1"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-015-SS-1 1/2"	Process Water Conditioning at PWC skid	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-83766	PWC-016-SS-1 1/2"	Process Water Conditioning in the CVDF tank room	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-83766	PWC-017-SS-1"	Process Water Conditioning in the CVDF tank room	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-83766	PWC-018-SS-1"	Process Water Conditioning in the CVDF tank room	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-83766	PWC-019-SS-2"	Process Water Conditioning in the CVDF tank room	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
46-1	H-1-82164	PWC-020-SS-1"	Process Water Conditioning in the CVDF tank room	GS	PC-2	3/1	None	No Calc.	Located in the Tank Room. Accept
47-1	MCO-tempered water system (Sys. 47-1)								
47-1	H-1-82161 H-1-82163	TW-*01-SS-1 1/2"	Tempered Water System	GS	PC-2 ^a	3/1	SCHe system	2288-S-12, -015	Pipe portion installed in PES skid is OK. Other pipe segment installed in process hood support is OK. Accept.
¹ Seismic 3/1 Evaluations shall be performed on SC, SS or GS SSCs for potential impact to SS and SC SSCs ² Sensitive LD (Leak Detection) as specified in AMSE B31.3 Section 345.8. Component must pass leak detection test. ³ Seismic Qualification Conditions (Refer to Hanford document HNF-PRO-097) : Condition A : Maintain critical function before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Confinement defined as 1x10 ⁻² atm*ml/sec see/see or less. Condition B : Maintain pressure boundary before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Component function or operation is not required. Condition C : Maintain critical function before, during and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Condition 3/1: GS, SS or SC component cannot impact a SC component during a Seismic event (Certification to WHC-SD-GN-DGS-30006) ⁴ Environmental Conditions: Note: The CVDF is a mild environment as defined in IEEE-323									

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST									
Sys. No.	P&ID	Component Tag No.	Component Description/Noun Name	Safety Category Designation	NPH and Performance Category	Seismic	Safety Class Target	Seismic Calculation Reference	Comments
Condition A: 60 °F @ 40 RH, 75° F @ 25% RH Condition B: 40 °F @ 60 RH, 115° F @ 22% RH f Calculation Database for the CVDF project is contained in SNF-3001			The base requirements of the B31.1 Code, for Safety Class (SC), category M piping, is augmented with the following:						
			Inspection by an Authorized Nuclear Inspector						
			Piping materials require a Certified Material Test Report (CMTR)						
			Additional 20% fit process examination in addition to code required non-destructive examination						

SEISMIC 3/1 ITEMS IDENTIFIED IN MASTER EQUIPMENT LIST									
Sys. No.	P&ID	Component Tag No.	Component Noun Name	Safety Category Designation	NPH and Performance Category	Seismic	Safety Class Target	Seismic Calculation References	Comments
07-1	H-1-82161	TIT-1*07	MCO-SHT-TB-TEMP-XMITR	GS	PC-1	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
07-1	H-1-82162	TIT-2*14	VPS-COND-OUTLET-TEMP-XMITR	GS	PC-1	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
07-1	H-1-82162	TIT-2*15	VPS-VAC-PUMP-DISCH-TEMP-XMITR	GS	PC-1	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
07-2	Residual Gas Monitoring system (Sys. 07-2)								
07-2	H-1-82162	AE-2*13	VPS-RGA-ANAL-ELE	GS	PC-1 ^a	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
07-2	H-1-82162	AT-2*13	VPS-RGA-ANAL-XMITR	GS	PC-1 ^a	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
12	Compressed and instrument air system (Sys. 12)								
12	H-1-82161	PIT-1*04	CASK-SEAL-RING-IA-PRES-XMITR	GS	PC-1	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
30-5	Reference air system (Sys. 30-5)								
30-5	H-1-82207	PDI-8080		SS	PC-2	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
30-5	H-1-82207	PDI-8220 8*20	BAY 2 PRESSURE	SS	PC-2	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
30-5	H-1-82207	PDIT-8080	TANK RM PRESSURE (NEGATIVE)	SS	PC-2	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
30-5	H-1-82207	PDIT-8220 8*20	BAY 2 PRESSURE (NEGATIVE)	SS	PC-2	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
47-4	VPS chilled water system (Sys. 47-4)								
47-4	H-1-82162	TIT-2*35	VPSCHW-COND-TK-DISCH-TEMP-XMITR	GS	PC-1	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
47-4	H-1-82162	TIT-2*36	VPSCHW Condenser Outlet Temperature Indicator/Transmitter	GS	PC-1	3/1	SCHe system	None	Source is small or no PC3 within zone of influence. Accept
^a Seismic 3/1 Evaluations shall be performed on SC, SS or GS SSCs for potential impact to SS and SC SSCs									
^b Sensitive LD (Leak Detection) as specified in AMSE B31.3 Section 345.8. Component must pass leak detection test.									
^c Seismic Qualification Conditions (Refer to Hanford document HNF-PRO-097):									
Condition A: Maintain critical function before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Confinement defined as 1x10 ⁻² atm*ml/sec see/see or less.									
Condition B: Maintain pressure boundary before and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent). Component function or operation is not required.									
Condition C: Maintain critical function before, during and after Seismic event (Certification to DOE-STD-1020-94 or IEEE 344-1987 or equivalent).									
Condition 3/1: GS, SS or SC component cannot impact a SC component during a Seismic event (Certification to WHC-SD-GN-DGS-30006)									
^d Environmental Conditions: Note: The CVDF is a mild environment as defined in IEEE-323									
Condition A: 60 °F @ 40 RH, 75° F @ 25% RH									
Condition B: 40 °F @ 60 RH, 115° F @ 22% RH									
^f Calculation Database for the CVDF project is contained in SNF-3001									
^h Equipment item shall have OCRWM compliance in accordance with HNF-1554 HNF-SD-SNF-RPT-007.									

APPENDIX A

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**                                                    **
**              AUTOPIPE SYSTEM DATA LISTING          **
**                                                    **
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MODEL REVISION NUMBER : 3

POINT DATA LISTING

POINT NAME	TYPE	-----OFFSETS (ft)----- X	Y	Z	PIPE ID	DESCRIPTION
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*** SEGMENT A

A00	Run	0	0	0	4"	
A01	Tee	1.00	0	0		
A02	Run	1.00	0	0		
A03	Run	4.00	0	0		
A03A	Run	9.00	0	0		
A04	Tee	4.60	0	0		
A05	Run	4.50	0	0		
A06	Tee	4.50	0	0		
A07	Run	7.00	0	0		
A07A	Run	8.00	0	0		
A08	Tee	6.00	0	0		
A09	Tee	9.00	0	0	3"	
A10	Run	7.00	0	0		
A11	Run	7.00	0	0		
A11A	Run	1.00	0	0		
A12	Tee	6.00	0	0		
A13	Run	4.50	0	0		
A13A	Run	4.00	0	0		
A14	Run	0.50	0	0		
A14A	Run	14.50	0	0		
A15	Run	6.50	0	0		
A16	Run	2.00	0	0		

*** SEGMENT B

A01	Tee	1.00	0	0	1.5"	
B01	Run	0	0	15.00	1.25"	
B02	Run	0	0	12.00	1"	
B03	Run	0	0	12.00		
B04	Run	0	0	12.00		

*** SEGMENT C

A04	Tee	19.60	0	0	1.5"	
C01	Run	0	0	7.75		
C02	Tee	0	0	2.75		
C03	Run	0	0	6.50	1.25"	
C04	Run	0	0	12.00	1"	
C05	Run	0	0	12.00		
C06	Run	0	0	12.00		

*** SEGMENT D

C02	Tee	19.60	0	10.50	1"	
D01	Run	-13.00	0	0		

*** SEGMENT E

A06	Tee	28.60	0	0	1.5"	
E01	Run	0	0	15.00	1.25"	
E02	Run	0	0	12.00	1"	
E03	Run	0	0	12.00		

POINT DATA LISTING

POINT NAME	TYPE	-----OFFSETS (ft)----- X	Y	Z	PIPE ID	DESCRIPTION
------------	------	-----------------------------	---	---	---------	-------------

E04	Run	0	0	12.00		
-----	-----	---	---	-------	--	--

*** SEGMENT F

A08	Tee	49.60	0	0	1.5"	
F01	Run	0	0	7.75		
F02	Tee	0	0	2.75		
F03	Run	0	0	6.50	1.25"	
F04	Run	0	0	12.00	1"	
F05	Run	0	0	12.00		
F06	Run	0	0	12.00		

*** SEGMENT G

F02	Tee	49.60	0	10.50	1"	
G01	Run	-13.00	0	0		

*** SEGMENT H

A09	Tee	58.60	0	0	1.5"	
H01	Run	0	0	15.00	1.25"	
H02	Run	0	0	12.00	1"	
H03	Run	0	0	12.00		
H04	Run	0	0	12.00		

*** SEGMENT I

A12	Tee	79.60	0	0	1.5"	
I01	Run	0	0	7.75		
I02	Tee	0	0	2.75		
I03	Run	0	0	6.50	1.25"	
I04	Run	0	0	12.00	1"	
I05	Run	0	0	12.00		
I06	Run	0	0	12.00		

*** SEGMENT J

I02	Tee	79.60	0	10.50	1"	
J01	Run	-13.00	0	0		

Total weight of empty pipes : 1289 lb

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
*** SEGMENT A					
A00	0.00	0.00	0.00	ANCHOR	Translational stiffness lb/in X= FREE Y= RIGID Z= FREE Rotational stiffness ft-lb/deg X= FREE Y= FREE Z= FREE Thermal movements : None
A01	1.00	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
A02	2.00	0.00	0.00	INCLIN	ID : A02 1, Connected to Ground Along global Z direction Stiffness = RIGID
				Y-STOP	ID : A02 2, Connected to Ground
A03	6.00	0.00	0.00		
A03A	15.00	0.00	0.00	Y-STOP	ID : A03A 1, Connected to Ground
A04	19.60	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
A05	24.10	0.00	0.00	INCLIN	ID : A05 1, Connected to Ground Along global X direction Stiffness = RIGID
A06	28.60	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
				Y-STOP	ID : A06 1, Connected to Ground
A07	35.60	0.00	0.00	INCLIN	ID : A07 1, Connected to Ground Along global Z direction Stiffness = RIGID Gap-Minus = 0.50, Plus = 0.50 inch Friction = 0.00 Gaps set Weightless
A07A	43.60	0.00	0.00	Y-STOP	ID : A07A 1, Connected to Ground
A08	49.60	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
A09	58.60	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
				Y-STOP	ID : A09 1, Connected to Ground
A10	65.60	0.00	0.00		
A11	72.60	0.00	0.00	INCLIN	ID : A11 1, Connected to Ground Along global Z direction Stiffness = RIGID Gap-Minus = 0.50, Plus = 0.50 inch Friction = 0.00 Gaps set Weightless
A11A	73.60	0.00	0.00	Y-STOP	ID : A11A 1, Connected to Ground
A12	79.60	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.37, Out = 2.37
A13	84.10	0.00	0.00	INCLIN	ID : A13 1, Connected to Ground Along global X direction Stiffness = RIGID
A13A	88.10	0.00	0.00	Y-STOP	ID : A13A 1, Connected to Ground
A14	88.60	0.00	0.00		

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
A14A	103.10	0.00	0.00	GUIDE	ID : A14A 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
A15	109.60	0.00	0.00		
A16	111.60	0.00	0.00	ANCHOR	Translational stiffness lb/in X= FREE Y= RIGID Z= RIGID Rotational stiffness ft-lb/deg X= FREE Y= FREE Z= FREE Thermal movements : None
*** SEGMENT B					
A01	1.00	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
B01	1.00	0.00	15.00	GUIDE	ID : B01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
B02	1.00	0.00	27.00	GUIDE	ID : B02 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
B03	1.00	0.00	39.00	GUIDE	ID : B03 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
B04	1.00	0.00	51.00	GUIDE	ID : B04 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
*** SEGMENT C					
A04	19.60	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
C01	19.60	0.00	7.75	GUIDE	ID : C01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
C02	19.60	0.00	10.50	TEE	Gaps set Weightless Welded-on fitting SIF - In = 1.35, Out = 1.35
C03	19.60	0.00	17.00	GUIDE	ID : C03 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
C04	19.60	0.00	29.00	GUIDE	Gaps set Weightless ID : C04 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
C05	19.60	0.00	41.00	GUIDE	Gaps set Weightless ID : C05 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
C06	19.60	0.00	53.00	GUIDE	Gaps set Weightless ID : C06 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
*** SEGMENT D					
C02	19.60	0.00	10.50	TEE	Welded-on fitting SIF - In = 1.35, Out = 1.35
D01	6.60	0.00	10.50	GUIDE	ID : D01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
*** SEGMENT E					
A06	28.60	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
E01	28.60	0.00	15.00	GUIDE	ID : E01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
E02	28.60	0.00	27.00	GUIDE	Gaps set Weightless ID : E02 1, Connected to Ground Stiffness = RIGID

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
E03	28.60	0.00	39.00	GUIDE	Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless ID : E03 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
E04	28.60	0.00	51.00	GUIDE	Gaps set Weightless ID : E04 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
*** SEGMENT F					
A08	49.60	0.00	0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
F01	49.60	0.00	7.75	GUIDE	ID : F01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
F02	49.60	0.00	10.50	TEE	Gaps set Weightless Welded-on fitting SIF - In = 1.35, Out = 1.35
F03	49.60	0.00	17.00	GUIDE	ID : F03 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
F04	49.60	0.00	29.00	GUIDE	Gaps set Weightless ID : F04 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
F05	49.60	0.00	41.00	GUIDE	Gaps set Weightless ID : F05 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00
F06	49.60	0.00	53.00	GUIDE	Gaps set Weightless ID : F06 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft) X Y Z	DATA TYPE	DESCRIPTION
			Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
*** SEGMENT G			
F02	49.60 0.00 10.50	TEE	Welded-on fitting SIF - In = 1.35, Out = 1.35
G01	36.60 0.00 10.50	GUIDE	ID : G01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
*** SEGMENT H			
A09	58.60 0.00 0.00	TEE	Welded-on fitting SIF - In = 2.81, Out = 2.81
H01	58.60 0.00 15.00	GUIDE	ID : H01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
H02	58.60 0.00 27.00	GUIDE	ID : H02 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
H03	58.60 0.00 39.00	GUIDE	ID : H03 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
H04	58.60 0.00 51.00	GUIDE	ID : H04 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
*** SEGMENT I			
A12	79.60 0.00 0.00	TEE	Welded-on fitting SIF - In = 2.37, Out = 2.37
I01	79.60 0.00 7.75	GUIDE	ID : I01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft) X Y Z	DATA TYPE	DESCRIPTION
			Friction = 0.00 Gaps set Weightless
102	79.60 0.00 10.50	TEE	Welded-on fitting SIF - In = 1.35, Out = 1.35
103	79.60 0.00 17.00	GUIDE	ID : 103 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
104	79.60 0.00 29.00	GUIDE	ID : 104 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
105	79.60 0.00 41.00	GUIDE	ID : 105 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
106	79.60 0.00 53.00	GUIDE	ID : 106 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless
*** SEGMENT J			
J02	79.60 0.00 10.50	TEE	Welded-on fitting SIF - In = 1.35, Out = 1.35
J01	66.60 0.00 10.50	GUIDE	ID : J01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 6.00, Right = 6.00 inch Friction = 0.00 Gaps set Weightless

Number of points in the system : 64

PIPE DATA LISTING

Pipe ID/ Material	Nom/ Sch	O.D. inch	W.Th. inch	Thickness(inch)----- Corr Mill Insu Ling	Spec Grav	Weight(lb/ft) Pipe Other Total
4" A53-B	4 10S	4.500	0.120	0 0.01 0 0	1.00	5.61 0 11.78
3" A53-B	3.000 10S	3.500	0.120	0 0.01 0 0	1.00	4.33 0 7.94
1.5" A53-B	1.500 40	1.900	0.145	0 0.02 0 0	1.00	2.71 0 3.60
1.25" A53-B	1.250 40	1.660	0.140	0 0.02 0 0	1.00	2.27 0 2.92
1" A53-B	1.000 40	1.315	0.133	0 0.02 0 0	1.00	1.68 0 2.05

MATERIAL DATA LISTING

Material Name	Pipe ID	Density lb/cu.ft	Pois. Ratio	Temper. deg F	Modulus E6 psi	Expans. in/100ft	Allow. psi
A53-B	4"	489.0	0.30	70.0	29.50		20000.0
A53-B	3"	489.0	0.30	70.0	29.50		20000.0
A53-B	1.5"	489.0	0.30	70.0	29.50		20000.0
A53-B	1.25"	489.0	0.30	70.0	29.50		20000.0
A53-B	1"	489.0	0.30	70.0	29.50		20000.0

TEMPERATURE AND PRESSURE DATA

-----C A S E 1-----				-----C A S E 2-----			-----C A S E 3-----		
POINT NAME	PRESS. psi	TEMPER. deg F	EXPAN. in/100ft	PRESS. psi	TEMPER. deg F	EXPAN. in/100ft	PRESS. psi	TEMPER. deg F	EXPAN. in/100ft

*** SEGMENT A

A00	150	70.00	0.000
A09	150	70.00	0.000
A16	150	70.00	0.000

*** SEGMENT B

A01	150	70.00	0.000
B02	150	70.00	0.000
B04	150	70.00	0.000

*** SEGMENT C

A04	150	70.00	0.000
C04	150	70.00	0.000
C06	150	70.00	0.000

*** SEGMENT D

C02	150	70.00	0.000
D01	150	70.00	0.000

*** SEGMENT E

A06	150	70.00	0.000
E02	150	70.00	0.000
E04	150	70.00	0.000

*** SEGMENT F

A08	150	70.00	0.000
F04	150	70.00	0.000
F06	150	70.00	0.000

*** SEGMENT G

F02	150	70.00	0.000
G01	150	70.00	0.000

*** SEGMENT H

A09	150	70.00	0.000
H02	150	70.00	0.000
H04	150	70.00	0.000

*** SEGMENT I

A12	150	70.00	0.000
I04	150	70.00	0.000
I06	150	70.00	0.000

*** SEGMENT J

I02	150	70.00	0.000
J01	150	70.00	0.000

RESTRAINT REACTIONS

Point name	Load combination	X	FORCES (lb)			Result	X	MOMENTS (ft-lb)			Result
			Y	Z				Y	Z		
A00	Anchor										
	GR	0	46	0	46	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0	0	0
	E2	0	-96	0	96	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0	0	0
	E1+E2+E3	0	96	0	96	0	0	0	0	0	0
A02	Inclined										
	GR	0	0	0	0	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	69	69	0	0	0	0	0	0
	E2	0	0	0	0	0	0	0	0	0	0
	E3	0	0	1176	1176	0	0	0	0	0	0
	E1+E2+E3	0	0	1178	1178	0	0	0	0	0	0
A02	Y - Stop										
	GR	0	-168	0	168	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0	0	0
	E2	0	350	0	350	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0	0	0
	E1+E2+E3	0	350	0	350	0	0	0	0	0	0
A03A	Y - Stop										
	GR	0	-160	0	160	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0	0	0
	E2	0	333	0	333	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0	0	0
	E1+E2+E3	0	333	0	333	0	0	0	0	0	0
A05	Inclined										
	GR	0	0	0	0	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	2650	0	0	2650	0	0	0	0	0	0
	E2	0	0	0	0	0	0	0	0	0	0
	E3	-21	0	0	21	0	0	0	0	0	0
	E1+E2+E3	2650	0	0	2650	0	0	0	0	0	0
A06	Y - Stop										
	GR	0	-191	0	191	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0	0	0
	E2	0	398	0	398	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0	0	0
	E1+E2+E3	0	398	0	398	0	0	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	X	FORCES (lb)			Result	X	MOMENTS (ft-lb)			Result
			Y	Z				Y	Z		
A07	Inclined										
	GR	0	0	0	0	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	-9	9	0	0	0	0	0	0
	E2	0	0	0	0	0	0	0	0	0	0
	E3	0	0	2724	2724	0	0	0	0	0	0
	E1+E2+E3	0	0	2724	2724	0	0	0	0	0	0
A07A	Y - Stop										
	GR	0	-187	0	187	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0	0	0
	E2	0	389	0	389	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0	0	0
	E1+E2+E3	0	389	0	389	0	0	0	0	0	0
A09	Y - Stop										
	GR	0	-170	0	170	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0	0	0
	E2	0	354	0	354	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0	0	0
	E1+E2+E3	0	354	0	354	0	0	0	0	0	0
A11	Inclined										
	GR	0	0	0	0	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	-48	48	0	0	0	0	0	0
	E2	0	0	0	0	0	0	0	0	0	0
	E3	0	0	1929	1929	0	0	0	0	0	0
	E1+E2+E3	0	0	1929	1929	0	0	0	0	0	0
A11A	Y - Stop										
	GR	0	-119	0	119	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0	0	0
	E2	0	248	0	248	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0	0	0
	E1+E2+E3	0	248	0	248	0	0	0	0	0	0
A13	Inclined										
	GR	0	0	0	0	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0	0	0
	E1	1798	0	0	1798	0	0	0	0	0	0
	E2	0	0	0	0	0	0	0	0	0	0
	E3	13	0	0	13	0	0	0	0	0	0
	E1+E2+E3	1798	0	0	1798	0	0	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb)				MOMENTS (ft-lb)			
		X	Y	Z	Result	X	Y	Z	Result
A13A	Y - Stop								
	GR	0	-121	0	121	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	252	0	252	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	0	252	0	252	0	0	0	0
A14A	Guide								
	GR	0	-105	0	105	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	218	0	218	0	0	0	0
	E3	0	0	225	225	0	0	0	0
	E1+E2+E3	0	218	225	313	0	0	0	0
A16	Anchor								
	GR	0	-20	0	20	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	-12	12	0	0	0	0
	E2	0	41	0	41	0	0	0	0
	E3	0	0	229	229	0	0	0	0
	E1+E2+E3	0	41	229	233	0	0	0	0
B01	Guide								
	GR	0	-50	0	50	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	57	0	0	57	0	0	0	0
	E2	0	103	0	103	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	57	103	0	118	0	0	0	0
B02	Guide								
	GR	0	-26	0	26	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	119	0	0	119	0	0	0	0
	E2	0	53	0	53	0	0	0	0
	E3	-9	0	0	9	0	0	0	0
	E1+E2+E3	120	53	0	131	0	0	0	0
B03	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	80	0	0	80	0	0	0	0
	E2	0	58	0	58	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	80	58	0	99	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb)				MOMENTS (ft-lb)			
		X	Y	Z	Result	X	Y	Z	Result
B04	Guide								
	GR	0	-10	0	10	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	31	0	0	31	0	0	0	0
	E2	0	20	0	20	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	31	20	0	37	0	0	0	0
C01	Guide								
	GR	0	-56	0	56	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	116	0	116	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	0	116	0	116	0	0	0	0
C03	Guide								
	GR	0	-38	0	38	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	139	0	0	139	0	0	0	0
	E2	0	80	0	80	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	139	80	0	160	0	0	0	0
C04	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	102	0	0	102	0	0	0	0
	E2	0	59	0	59	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	102	59	0	117	0	0	0	0
C05	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	84	0	0	84	0	0	0	0
	E2	0	57	0	57	0	0	0	0
	E3	-9	0	0	9	0	0	0	0
	E1+E2+E3	84	57	0	102	0	0	0	0
C06	Guide								
	GR	0	-10	0	10	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	31	0	0	31	0	0	0	0
	E2	0	20	0	20	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	31	20	0	37	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb)				MOMENTS (ft-lb)			
		X	Y	Z	Result	X	Y	Z	Result
D01	Guide								
	GR	0	-12	0	12	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	24	0	24	0	0	0	0
	E3	0	0	30	30	0	0	0	0
	E1+E2+E3	0	24	30	38	0	0	0	0
E01	Guide								
	GR	0	-49	0	49	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	49	0	0	49	0	0	0	0
	E2	0	101	0	101	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	49	101	0	113	0	0	0	0
E02	Guide								
	GR	0	-26	0	26	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	121	0	0	121	0	0	0	0
	E2	0	54	0	54	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	121	54	0	133	0	0	0	0
E03	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	80	0	0	80	0	0	0	0
	E2	0	58	0	58	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	80	58	0	99	0	0	0	0
E04	Guide								
	GR	0	-10	0	10	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	31	0	0	31	0	0	0	0
	E2	0	20	0	20	0	0	0	0
	E3	-7	0	0	7	0	0	0	0
	E1+E2+E3	32	20	0	38	0	0	0	0
F01	Guide								
	GR	0	-55	0	55	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	115	0	115	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	0	115	0	115	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb)				MOMENTS (ft-lb)			
		X	Y	Z	Result	X	Y	Z	Result
F03	Guide								
	GR	0	-38	0	38	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	139	0	0	139	0	0	0	0
	E2	0	79	0	79	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	139	79	0	160	0	0	0	0
F04	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	102	0	0	102	0	0	0	0
	E2	0	59	0	59	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	102	59	0	117	0	0	0	0
F05	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	84	0	0	84	0	0	0	0
	E2	0	57	0	57	0	0	0	0
	E3	-4	0	0	4	0	0	0	0
	E1+E2+E3	84	57	0	102	0	0	0	0
F06	Guide								
	GR	0	-10	0	10	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	31	0	0	31	0	0	0	0
	E2	0	20	0	20	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	31	20	0	37	0	0	0	0
G01	Guide								
	GR	0	-12	0	12	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	24	0	24	0	0	0	0
	E3	0	0	27	27	0	0	0	0
	E1+E2+E3	0	24	27	36	0	0	0	0
H01	Guide								
	GR	0	-48	0	48	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	52	0	0	52	0	0	0	0
	E2	0	100	0	100	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	52	100	0	113	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb)				MOMENTS (ft-lb)			
		X	Y	Z	Result	X	Y	Z	Result
H02	Guide								
	GR	0	-26	0	26	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	121	0	0	121	0	0	0	0
	E2	0	54	0	54	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	121	54	0	132	0	0	0	0
H03	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	80	0	0	80	0	0	0	0
	E2	0	58	0	58	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	80	58	0	99	0	0	0	0
H04	Guide								
	GR	0	-10	0	10	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	31	0	0	31	0	0	0	0
	E2	0	20	0	20	0	0	0	0
	E3	-4	0	0	4	0	0	0	0
	E1+E2+E3	32	20	0	38	0	0	0	0
I01	Guide								
	GR	0	-50	0	50	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	104	0	104	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	0	104	0	104	0	0	0	0
I03	Guide								
	GR	0	-39	0	39	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	147	0	0	147	0	0	0	0
	E2	0	81	0	81	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	147	81	0	168	0	0	0	0
I04	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	99	0	0	99	0	0	0	0
	E2	0	59	0	59	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	99	59	0	115	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb)				MOMENTS (ft-lb)			
		X	Y	Z	Result	X	Y	Z	Result
I05	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	84	0	0	84	0	0	0	0
	E2	0	57	0	57	0	0	0	0
	E3	11	0	0	11	0	0	0	0
	E1+E2+E3	85	57	0	102	0	0	0	0
I06	Guide								
	GR	0	-10	0	10	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	31	0	0	31	0	0	0	0
	E2	0	20	0	20	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	E1+E2+E3	31	20	0	37	0	0	0	0
J01	Guide								
	GR	0	-12	0	12	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	24	0	24	0	0	0	0
	E3	0	0	33	33	0	0	0	0
	E1+E2+E3	0	24	33	41	0	0	0	0

CORRESPONDENCE DISTRIBUTION COVERSHEET

Author
EC Ocoma
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T Choho

Correspondence No.
EDT 615963

Subject: COLD VACUUM DRYING FACILITY SEISMIC 3/1 EVALUATION

DISTRIBUTION

Approval	Date	Name	Location	w/att
		Correspondence Control	A3-01	
		KA Boes	R3-86	X(3)
		JR Brehm	R3-26	X
		SA Brisbin	R3-86	X
		T Choho	R3-86	X
		CS Haller	R3-11	X
		JJ Irwin	R3-86	X
		SL Mischke	R3-86	X
		CR Miska	R3-86	X
		EC Ocoma	B4-40	X
		CC Pitkoff	R3-86	X
		R Whitehurst	R3-86	X
		R Routh	Mactec Meier	X