

APPENDIX 3.9C

DESCRIPTION OF SEISMIC ANALYSIS AND SUMMARY OF
RESULTS FOR NON-NSSS SUPPLIED ACTIVE VALVES

Seismic qualification of Code Class 1, 2 and 3 active valves consists of determination of rigidity, verification of structural adequacy and conclusion of operability of valve-actuator assemblies under seismic conditions. Check valve are considered adequate for seismic loading on the basis of the following considerations:

- a) Lack of external actuator and topworks
- b) Absence of actuator loads
- c) Simplicity of the hinge mechanism
- d) Low seismic accelerations
- e) Small hinge pin deflections
- f) Clearance tolerance for rotating parts less critical than for parts requiring linear motion (i.e. valve stems)

Seismic loads are considered in Class 1 Design Reports for Code Class 1 check valves with nominal inlet sizes greater than 4 inches. These valves and the Class 1 Design Reports are listed in Table 3.9C-2. Although not required, TRW Mission performed analysis and submitted seismic reports for Code Class 2 and 3 wafer type check valves. These are listed in Table 3.9C-3.

Valve and actuator assemblies are determined to be acceptable for service under earthquake load by meeting the following criteria:

- a) Determination of lowest natural frequency to confirm rigidity of the assembly. Rigidity is defined as the lowest natural frequency of the topworks to be 33 Hertz. This ensures that the valve-actuator assemblies are more rigid than the piping system which is designed not to exceed a period of 0.20. Rigid valve-actuator assemblies are modeled as simple eccentric loads on the piping in the system seismic analysis. This ensures that the seismic load on the valves is not amplified by the flexibility of the topworks structure to exceed 1.0g in the horizontal and 0.67g in the vertical directions, and permits the use of a static analysis of the topworks to confirm structural adequacy. Valve-actuator assemblies that are non-rigid are dynamically tested to prove structural adequacy and are dynamically modeled in the system seismic analysis.
- b) Confirmation of structural adequacy of the valve topworks and connecting bolting under seismic loads and other applicable loads such as actuator thrust or discharge reaction forces.

- c) Proof of operability by either implicit conclusion based on past experience and demonstration of very low stress levels in critical parts, deflection analysis, or testing.

Valves with actuators and topworks are determined to be acceptable for service under earthquake loadings without loss of function by one of the four methods described below. The qualification consists of either mathematical modeling and analysis, actual testing, or a combination of both. These methods are outlined below and referenced in Table 3.9C-1.

Method 1:

- a. Analytical determination of natural frequency.
- b. Analytical verification of structural integrity.
- c. Analytical conclusion of operability.

Method 2:

- a. Analytical determination of natural frequency.
- b. Analytical verification of structural integrity.
- c. Static deflection test for confirmation of operability.

Method 3: (Performed on complete valve-actuator assembly)

- a. Testing for determination of natural frequency.
- b. Analytical verification of structural integrity.
- c. Dynamic testing to confirm operability.

Method 4: (Performed on topworks and actuator only)

- a. Testing for determination of natural frequency.
- b. Analytical verification of structural integrity.
- c. Dynamic operability testing of topworkers/actuator only.

This method is used on large bore valves with large actuators that are either too complicated to model accurately, where testing of the complete valve-actuator assembly is impractical, or when the structure has been analytically determined to be non-rigid. It is assumed that the valve body is massive enough to not be significantly distorted by the eccentric loading of the topworks during seismic loads and that motion of internal moving parts will not be impeded.

In all of the above qualification methods, structural adequacy of the non-pressure retaining parts is verified by calculating the stresses in the yoke structures and attachment bolts and confirming that they are below the yield stress for the material.

The stresses for pressure retaining materials are calculated to be below the S values of Tables 1.7-1 and 1.7-2 (as applicable) of the applicable ASME Code and Addenda.

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TABLE 3.9C-1 (Sheet 1 of 12)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
1SI-V1501B V1593A	Lunkenheimer	1	Anamet Lab No. 78.042, 3/27/78
1SI-V1502B V1504A	Lunkenheimer	1	Anamet Lab No. 227.14 Rev A, 3/13/78
1SI-V1505TK1A V1506TK1B V1507TK2A V1508TK2B	Lunkenheimer	1	Anamet Lab No. 227I.15 Rev A, 3/13/78
2SI-L101A L102B L103A	Fisher Controls	1	Seismic Analysis of 4", 12", 20" and 24" Butterfly Valve Assemblies Rev 2, 1/30/80
2SI-FM318AA FM349B	Fisher Controls	1	Seismic Analysis of 4", 10", and 12" Butterfly Valve Assemblies Rev 2, 1/30/80
3CC-TM291B	Fisher Controls	1	Seismic Analysis of 4", 10", and 12" Butterfly Valve Assemblies Rev 2, 4/23/80
3CC-TM290A	Fisher Controls	1	Seismic Analysis of 12" and 16" Butterfly Valve Assemblies, 11/17/78
3CC-F109A/B F110A/B F111A/B F112A/B F114A/B F115A/B F116A/B	Fisher Controls	3	Dynamic Test Program on Bettis T312-SR3-M3 and 722C-SR80-M3 Actuator, 6/5/79
3FW-V607A V610B	Pacific	1	Seismic Analysis Report FA-5267, 8/26/77
2MS-V697 V698	Velan	1	Seismic Analysis of 1"-1500 lb Forged Carbon Steel Bonnetless Globe Valve SR-6208, 11/7/82

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TABLE 3.9C-1 (Sheet 2 of 12)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
3CC-TM148A TM149B	Fisher Controls	1	Seismic Analysis of 6", 8" and 30" Butterfly Valve Assemblies, 1/11/78
3CC-F120A F121B F122A F123B	Fisher Controls	1	Seismic Analysis 1", 16" and 24" Butterfly Valve Assemblies, 11/17/80
3CC-F132A/B F133A/B	Fisher Controls	3	Dynamic Test Program on Bettis T312-SR3 M3 and 722C- SR-80-M3- Actuators, 6/5/79
2HV-B150B B151A B152A B153B B154B B155A	Fisher Controls	3	Dynamic Test Program on Bettis T420-SR3 M3 and 722C-SR80-M3 Actuators, 9/18/78. Operability study in accordance with NUREG-0737, Action Item II.E.4.2. Documented via LP&L letter W3P81-1835, D.L. Aswell to R.L. Tedesco, dated August 19, 1981.
2HV-B156A B157B	Fisher Controls	1	Seismic Analysis of 6", 16" and 24" Butterfly Valve Assemblies, 11/17/80
3HV-B175A B176B	Fisher Controls	1	Seismic Analysis of 6", 16" and 24" Butterfly Valve Assemblies, 11/17/80
3HV-B196A B197B B198A B199B B200B B201A B202B B203A	Fisher Controls	1	Seismic Analysis of 8", 18" and 20" Butterfly Valve Assemblies Rev 2, 2/13/80
3HV-B169A B170B	Fisher Controls	1	Seismic Analysis of 12" and 16" Butterfly Valve Assemblies, 11/17/78

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TABLE 3.9C-1 (Sheet 3 of 12)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
3HV-B171A B172B B177A B178B	Fisher Controls	1	Seismic Analysis of 12" and 16" Butterfly Valve Assemblies, 11/17/78
3HV-B206A B207B B208A B209B	Fisher Controls	1	Seismic Analysis of 8", 18" and 20" Butterfly Valve Assemblies Rev 2, 3/13/80
3HV-B226A B227B	Fisher Controls	4	Dynamic Test Program on Bettis T420-SR1-M3 Actuator Rev 1, 9/18/78
2MS-V611A V612B	Anchor Darling	1	Anamet Lab No. 79.097, 7/30/79 Note: Meets intent of Reg. Guide 1.48
2SI-V801B V802B V809A V810A V811B	Anchor Darling	1	A/DV Seismic Calculation No. 1980-1 Rev A, 7/18/80
2SI-V305B V306A V307A V308B	Anchor Darling	1	A/DV Seismic Calculation No. 1982-1, 9/1/76
2SI-V1534 V1557 V1558	Anchor Darling	1	Anamet Lab No. 78.102, 7/14/78
2SI-V1556 V1559	Anchor Darling	1	Anamet Lab No. 78.101, Rev A, 3/28/80
2FW-V823A V824B	Anchor Darling	1	A/DV Static Seismic Analysis Report No. E-6326-1, 4/26/78

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TABLE 3.9C-1 (Sheet 4 of 12) Revision 11-B (06/02)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
2SI-V326B V327A	Anchor Darling	1	A/DV Seismic Calculation No. 1984-1, 9/1/76
2CS-V301A V302B V303A V304B	Anchor Darling	1	A/DV Seismic Analysis Calculation 1985-1, 9/1/76
→(DRN 02-387) ←(DRN 02-387)			
2BD-F603 (BD-102A) 2BD-F605 (BD-102B)	Anchor Darling	1	A/DV Calculation Order EZ901, 3/11/97 (Valve) & Hiller Seismic and EQ Report ER-ST-2400 3/21/97 (Actuator)
2BD-F604 (BD-103A) F606 (BD-103B)	Masoneilan	1	Masoneilan Report No. 9614-01, 2/24/97
3CC-F268A F269B	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
3CC-B201A B203B	Jamesbury	1	John Henry Associates Report No. JHA-77-84, 11/23/77
3CC-B262B B265A	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
3CC-F154A1 F155A2 F156B1 F157B2	Jamesbury	1	John Henry Associates Report No. JHA-76-5, 4/19/77
3CC-F158A1 F159A2 F160B1 F161B2	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
2CC-F147A/B F243A/B	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77

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SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
3CC-F276A F277B	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
3CC-F278A F279B	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
3CC-F130A F131B	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
3CC-F272A F272B	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
3CC-F274A F273B	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
2CC-F146A/B	Jamesbury	1	John Henry Associates Report No. JHA-76-51, 4/19/77
3AC-F142A F143B F149A F150B	Fisher Controls	1	Dynamic Test Program on Bettis T312-SR3-M# and 722C-SR80-M# Actuators, 6/5/79
3AC-F144A F135B F136A F151B	Jamesbury	1	John Henry Associates Report No. JHA 77-86, 11/23/77
3CC-F240A F241B	Masoneilan	3	Seismic Qualification Report No. 1065, 1/4/80
2FW-V853A V850B V854B V849A V847B V848A V851B V852A	Masoneilan	3	Seismic Qualification Report No. 1063, 12/13/79

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TABLE 3.9C-1 (Sheet 6 of 12) Revision 9 (12/97)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
→			
3AC-TM163A TM172B	Masoneilan	3	Seismic Qualification Report No. 1064, 12/14/79
←			
3AC-TM680A TM684B	Masoneilan	3	Seismic Qualification Report No. 1062, 12/13/79
3AC-TM646A TM649A	Masoneilan	3	Seismic Qualification Report No. 1062, 12/13/79
2CS-F305A F306B	W-K-M	2	National Frequency Determina- tion and Seismic Analysis 15-0074-11 Rev N929, 2/21/80 Seismic Operability Qualification Test Report 15-0074-09 Rev N974, 8/15/79
1CH-F2501A/B	W-K-M	2	National Frequency Calculation ASK 274557 Rev N790 Seismic Operability Qualification Test Report 15-0076-02 Rev N888
1CH-F1518A/B	W-K-M	2	Natural Frequency Calculation ASK 274557 Rev N790
2MS-V602A V604B	W-K-M	2	Natural Frequency Determination and Seismic Analysis ASK 274891 Rev N791, 3/2/79 Seismic Operability Qualification Test Report 15-0068-04 Rev N944, 19/17/79 Seismic Simulation Test Within Pump Module 15-0068-05 Rev N968, 11/8/79

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TABLE 3.9C-1 (Sheet 7 of 12) Revision 8 (5/96)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
2IA-F601A/B	W-K-M	1	Natural Frequency Calculation ASK 272968 Rev N717, 11/13/78 Static Seismic Calculation ASK 272668 Rev N715, 11/8/78
2FP-F127 F129	W-K-M	2	Natural Frequency Calculation ASK 272158 Rev N710, 9/29/78 Static Seismic Calculation ASK 272151 Rev N710, 9/27/78 Natural Frequency Calculation Verification Report ASK 272157 Rev N689, 9/27/78 Proof of Operability Test ASK 272156 Rev N689, 9/27/78
3CC-V251A V252B	Pacific	1	Seismic Analysis Report FA-5262, 8/26/77
2BM-F108A/B F109A/B	ITT Grinnell	1	Seismic Report W-146, Rev 1, 7/79
2MS-V663 V664 V670 V671 →	Velan	1	Seismic Analysis B62-1500, G-100 SR-6209, 8/13/74
1SI-V2504 V2505 ←	Anchor Darling	1	Report No. R95.040, Rev. A 5/22/95
2MS-PM629A PM630B	Control Components International	1	Seismic Analysis Report 17285-11, 11/9/78
2HV-V180A V181B	GPE Controls	1	Stress Analysis for Seismic and Operating Conditions LA-240-384 Rev A, 3/15/78 Static and Dynamic Analysis LA-240-431 Rev 0, 5/31/78
1CH-F2503A F2504B F2505A F2505B	Target Rock	1	Seismic and Design Report No. 3096 Rev A, 8/19/82

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TABLE 3.9C-1 (Sheet 8 of 12) Revision 10 (10/99)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
→			
2RC-E2557	Target Rock	1	No. 6090, Rev. A with
E2558			Att. C, Rev. A, 2/25/97
←			
E2559			
E2560			
E2561			
E2562			
KSV-72-10	Cooper Engine Co.		Qualified with Diesel
58-4			Generator, Refer to Sub- section 8.3.1.1.2.13
7FS-V129	ITT Grinnell	1	Seismic Analysis Report
V130			No. W-146, Rev 1,
V131			3/22/79
7CC-V258	Anchor Darling	1	Anamet Lab No. 80-278, 11/7/80
2HV-V182A	GPE Controls	1	Stress Analysis for Seismic
V183B			and Operating Conditions, LA-240-385, 3/7/77
2HV-V184A	GPE Controls	1	Stress Analysis for Seismic
V185B			and Operating Conditions, LA-240386, 3/7/77
2SI-E1587A	Target Rock	1	Seismic Analysis Certification
E1588B			Submitted by Target Rock letter dated 6/24/82 and Design and Seismic Report 3096, Rev A, 10/8/81
2SI-V1561A/B	Anchor Darling	1	Design and Analysis Report
			No. R95.040, Rev. A 5/22/95

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SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
2SI-E632 E633 E634 E635 E636 E637 E638 E639	Valcor	1	Stress Analysis Report on Valve, Solenoid 1 in, Sch 80, Position Indication P/N 104146001, Document No. Mr 526-5295-7-1, 7/17/80
3CC-FM138A/B	Fisher Controls	1	Seismic Analysis of 4", 12", 20" and 24" Butterfly Valve Assemblies, Rev 2, 1/30/80
3CC-E640A E641B	Valcor	1	Stress Analysis Report on Valve, Solenoid, 1 in, Sch 80, Position Indication, Nuclear Service, DC, P/N14321001, Document No. Mr 526-6131-5-1, 8/29/80
3AC-E611A E612B E613A/B	Valcor	1	Stress Analysis Report on Valve, Solenoid, 1 in, Sch 80, Position Indication, Nuclear Service, AC, P/N 101170001, Document No. Mr 526-5295-6-1 7/17/80
3HV-B210A	Jamesbury	1	John Henry Associates Report No. JHA-77-84, 11/23/77
3HV-B215B B216A	Jamesbury	1	John Henry Associates Report No. JHA-77-84, 11/23/77
3HV-B217B B218A	Fisher Controls	3	Dynamic Test Program on Bettis T420-SR3-M3 and 722-SR-80-M3 Actuators, 9/18/78
3HV-B223B B224A	Fisher Controls	3	Dynamic Test Program on Bettis T420-SR3-M3 and 722-SR-80-M3 Actuators, 9/18/78

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TABLE 3.9C-1 (Sheet 10 of 12)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
3HV-B225B	Fisher Controls	3	Dynamic Test Program on Bettis T312-SR3-M3 and 722C-SR-80-M3 Actuators, 6/5/79
3MS-V684 V685	Velan	1	Seismic Analysis of 2" Carbon Steel Valve Report No. SR6209, Rev 1, 8/13/74
2MS-F714 F715	Velan	1	Seismic Analysis 1" Bonnetless Vertical Globe Valve SR-6622, 6/4/81
2HV-F253A F254B	Fisher Controls	1	Seismic Analysis of 4", 10" and 12" Butterfly Valve Assemblies, Rev 2, 1/30/80
2HV-B167A B168B	Fisher Controls	1	Seismic Analysis of 4", 12" 20" and 24" Butterfly Valve Assemblies, Rev 2, 1/30/80
2HV-B164A B165B	Fisher Controls	1	Seismic Analysis of 6", 8" and 30" Butterfly Valve Assemblies, 1/11/78
2HV-B158A B159B B160A B161B B162QA B163B	Fisher Controls	1	Seismic Analysis of 6", 8" and 30" Butterfly Valve Assemblies, 1/11/78
2HV-B173A B174B	Fisher Controls	1	Seismic Analysis of 4", 12", 20" and 24" Butterfly Valve Assemblies, Rev 2, 1/30/80
2WM-F104A/B F105A/B	ITT Grinnell	1	Seismic Report W-146, Rev 1, 7/79, App L
2WM-F157A/B	ITT Grinnell	1	Seismic Report W-146, Rev 1, 7/79, App I

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SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
2SL-V601 V602 V603 V604	Velan	1	Seismic Analysis 1/2" Bonnetless Vertical Globe Valve 6576, 4/23/81
2SL-F1501A/B F1502A/B F1503A/B F1504A/B F1505A/B F1506A/B	W-K-M	1	Natural Frequency Calculation ASK 272970, Rev N717 Static Seismic Calculation ASK 272667, Rev N715, 11/8/78
3NG-E671-1 E671-2 E671-3 E671-4 E671-5 E671-6 E671-7 E671-8	Target Rock	3	1" Solenoid Valve, Model 7CC-001, Report No 2375B, 9/26/79
3NG-P670-1 P670-2 P670-3 P670-4 P670-5 P670-6 P670-7 P670-8	Target Rock	1	Seismic Analysis and Design Report No. 3052, Rev A, 8/5/82
2HA-E601A E602A E603A E604A E605A E606A E607A E608A E609A E610A	Valcor	1	Stress Analysis Report on Valve, Solenoid, 3/8 in, Tube .065 THK, Position Indication Nuclear Service, AC, P/N 103220002 Document No. Mr 526-6002-5-1, 7/17/80; P/N 103140002 Document No. Mr 526-5295-9-1, 7/17/80; P/N 103170002 Document No. Mr 526-05295-15-1, 7/17/80

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TABLE 3.9C-1 (Sheet 12 of 12)

Revision 309 (06/16)

SEISMIC QUALIFICATION REPORTS FOR
NON-NSSS SUPPLIED ACTIVE VALVE OTHER THAN CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
2HA-E621B	Valcor (Cont'd)		
E622B			
E623B			
E624B			
E625B			
E626B			
E627B			
E628B			
E629B			
E630B			
E633A			
E634B			
→(LBDCR 15-013, R309)			
3CC-TM169A/B	Valtek	1	Seismic Analysis of 6" Globe Valve Valtek Qualification Report 108220.001 Rev 0 09/22/95
←(LBDCR 15-013, R309)			
3CC-B187A/B	Jamesbury	1	John Henry Associates Report N, JHA-76-51, 4/19/77
2CH-F1512A/B F1513A/B	WKM	1	Natural Frequency Calculation, ASK 272970, Rev N717, 11/10/80 Static Seismic Calculations, ASK 272667, Rev N715, 11/8/78
2CH-F1529A/B	WKM	1	Natural Frequency Determination and Seismic Analysis 15-0074-15, Rev P274, 1/10/81
2CH-F1543	Masoneilan	1 and 4	Seismic Qualification N-00214, No. 1131, 3/11/82
2CH-F175A/B	WKM	1	Natural Frequency Calculation, ASK 272657, Rev N720, 10/2/78 Static Seismic Calculation ASK 272656, Rev N710, 10/24/78
3CC-B288A 3CC-B289B	Jamesbury	1	Neles - Jamesbury Report No. SWLA - DS98698 Rev. A 12/3/96
→(EC-14765, R305)			
SIMVAAA4052A	Valcor	1	Valcor Report
SIMVAAA4052B	Valcor	1	MR 526-6040-22-1 dated 12/17/00
←(EC-14765, R305)			

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TABLE 3.9C-2

Revision 304 (06/10)

SEISMIC QUALIFICATION REPORTS
FOR NON-NSSS SUPPLIED CLASS 1 CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
→(EC-13981, R304) 1SI-V1509RL1A V1511RL1B V1513RL2A →(DRN 06-882, R15) V1515RL2B ←(DRN 06-882, R15; EC-13981, R304)	Anchor Darling / Flowserve	1	Anamet Lab No. 676.4, 6/30/76 Flowserve-RAL No. 20343 R-0 Dated 6-25-09 (SQ-MN-13) 1SI-V1513 (SI 336A) Only
1SI-V1510TK1A V1512TK1B V1516TK2B →(DRN 06-882, R15) V1514TK2A ←(DRN 06-882, R15)	Anchor Darling Anchor Darling	1 1	Anamet Lab No. 78.178 Rev. A, 9/10/79 Anamet Lab No. 676.4, 6/30/76
→(DRN 06-882, R15) 1SI-V1522RL1A ←(DRN 06-882, R15) V1523RL1B →(DRN 06-882, R15) V1524RL2A ←(DRN 06-882, R15) V1525RL2B	Anchor Darling	Not Required	Valves Smaller than 4" in diameter. No extended topworks.
→(DRN 00-1077) 1SI-V2506 V2507 V2508 V2509 ←(DRN 00-1077)	Flowserve	1	Design and Seismic Analysis Report for 3" -2500# Tilt Disc Check Valve; Report No. TR00.067
1CH-V2502-1 V2502-2 V2502-3 V2502-4	Velan	1	Extension of Seismic Analysis SR-6686, 12/10/81, Seismic Analysis SR-6553, 3/2/81
→(DRN 02-387, R11-B) 1SI-V1517RL1A V1518RL1B V1519RL2A V1520RL2B ←(DRN 02-387, R11-B)	Anchor Darling or Flowserve	1	Anamet Lab No. 676.3 (For Flowserve – Log No. TR01.091)

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Revision 304 (06/10)

SEISMIC QUALIFICATION REPORTS
FOR NON-NSSS SUPPLIED CLASS 1 CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
3CC-V229A V231B	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
→(DRN 98-1951, R11) 3CC-V286A V287B	TRW Mission/ Atwood & Morrill	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
←(DRN 98-1951, R11) 3CC-V101A V102B V103A/B	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
3CC-V204B V202A	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
3CC-V280A V281B	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
3CC-V282A V283A	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
3CC-V176A V177B V178A V179B	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
2CC-V242A/B	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
3FW-V601A V602B	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
→(DRN 99-0691; EC-19716, R304) 3FW-V603A/B	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
←(DRN 99-0691; EC-19716, R304) 3MS-V676A V677A	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
2FP-V128 V130	TRW Mission	1	Seismic Stress Analysis MVP 3374 Revision 3/18/77
2SI-V331A V332B	TRW Mission	1	Seismic Stress Analysis MVP 4212 and 39132 Revision 3/3/77

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Revision 13 (04/04)

SEISMIC QUALIFICATION REPORTS
FOR NON-NSSS SUPPLIED CLASS 1 CHECK VALVES

<u>Valve Tag No.</u>	<u>Manufacturer</u>	<u>Qualification Method</u>	<u>Report No. and Date</u>
2SI-V315A V316B	TRW Mission	1	Seismic Stress Analysis MVP 4212 and 39132 Revision 3/3/77
2SI-V105A V106B V107A V108B	TRW Mission	1	Seismic Stress Analysis MVP 4212 and 39132 Revision 3/3/77
3SI-V117B V118A	TRW Mission	1	Seismic Stress Analysis MVP 4212 and 39132 Revision 3/3/77
→(DRN 02-1196, R13) ACC-1045A 1045B ←(DRN 02-1196, R13)	BNL Industries	1	Seismic Analysis Report No. SA-A020504, Rev. 0
ACC-1951A 1051B	BNL Industries	1	Seismic Analysis Report No. SA-A960904-6 Rev. 0