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PROJECT NAME:

Environmental Fatigue Analysis of VYNPS

CONTRACT NO.:

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CLIENT:	**PLANT:**
Entergy Nuclear Operations, Inc.	Vermont Yankee Nuclear Power Station

CALCULATION TITLE:

Feedwater Class 1 Piping Fatigue Analysis

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1.0 OBJECTIVE

The purpose of this calculation is to perform an ASME Section III, NB-3600 fatigue calculation (Including environmental fatigue) of the Vermont Yankee (VY) Class 1 feedwater piping located inside the drywell (originally analyzed to B31.1 requirements). This section of piping was originally identified in the Recommendation Report [6] for installing a fatigue monitoring system at VY.

The fatigue calculation performed herein is not a certified ASME Code NB-3600 stress and fatigue analysis. Rather, it is an evaluation for the purposes of establishing fatigue usage to accommodate fatigue monitoring of the subject B31.1 piping. Although the PIPESTRESS program implements all ASME Code NB-3600 equations, only the fatigue usage results are utilized. All stress limit checks, although calculated by the program, are ignored since satisfactory stress limit checks were performed as a part of the already existing governing B31.1 stress analyses for all piping systems.

2.0 METHODOLOGY

The Class 1 Loop A feedwater piping system line extending from anchor HD-36 to reactor pressure vessel (RPV) nozzles N-4A and N-4B was evaluated. This includes a portion of the HPCI line to support HPCI-HD35A [7], so that the appropriate stiffness affects of this line on the feedwater piping are included. This evaluation is also considered valid for the Loop B line extending from anchor HD-39 to RPV nozzles N-4C and N-4D for the following reasons:

1. The Class 1 sections of Loop A and Loop B are mirror images of each other. This evaluation includes piping beyond the Class 1 boundary check valve so that its influence on the Class 1 piping is taken into account. The final fatigue analysis will only consider points on the Class 1 portion of the piping.
2. A 14" HPCI line tees into Loop A and a 4" RCIC line tees into Loop B. The HPCI line is more than three times the size of the RCIC line and will therefore have a greater influence on the feedwater piping.
3. The transients defined in this calculation are the bounding set for the two loops.

The operating conditions for the Class 1 portion of the feedwater line were defined based on References [11 and 12]. The resulting piping transient definitions are specified in Table 1. For each thermal cycle, the operating temperatures for Regions I through V define the conditions to be applied to the model.

Region boundaries are defined at branches, transitions, or locations where temperature and flow conditions change. These boundary locations are also shown in Figure 1. A listing of the PIPESTRESS input file "FWHPCI.FRE" is given in Appendix A and is also included in the project computer files.

Table 1: Thermal Cycle Definitions for Feedwater Line

Transient Cycle	Description (1)	Piping Region (3)	Thermal Conditions (2)									Pressure Conditions		No. of Cycles (1)
			Oper. Temp. (°F)	T_{init} (°F)	T_{final} (°F)	Time (sec.)	Rate (°F/hr)	T_{avg} (°F)	Flow (%)	Ratio	(gpm)(4)	Pinit (psig)	Pfinal (psig)	
1	Design Hydrotest (Leak Test) (+)	I	100	70	100	1800	60	85	0	1	200.0	0.0	1100	120
		IIa	100	70	100	1800	60	85	0	1	150.0	0.0	1100	
		IIb	100	70	100	1800	60	85	0	1	150.0	0.0	1100	
		II	100	70	100	1800	60	85	0	1	150.0	0.0	50	
		III	100	70	100	1800	60	85	0	1	200.0	0.0	1100	
		IV	100	70	100	1800	60	85	0	1/2	100.0	0.0	1100	
		IVa	100	70	100	1800	60	85	0	1/2	100.0	0.0	1100	
		IVb	100	70	100	1800	60	85	0	1/2	100.0	0.0	1100	
		V	100	70	100	1800	60	85	0	1/2	100.0	0.0	1100	
2	Design Hydrotest (Leak Test) (-)	I	100	100	100	0	0	100	0	1	200.0	1100.0	50	120
		IIa	100	100	100	0	0	100	0	1	150.0	1100.0	50	
		IIb	100	100	100	0	0	100	0	1	150.0	1100.0	50	
		II	100	100	100	0	0	100	0	1	150.0	50.0	50	
		III	100	100	100	0	0	100	0	1	200.0	1100.0	50	
		IV	100	100	100	0	0	100	0	1/2	100.0	1100.0	50	
		IVa	100	100	100	0	0	100	0	1/2	100.0	1100.0	50	
		IVb	100	100	100	0	0	100	0	1/2	100.0	1100.0	50	
		V	100	100	100	0	0	100	0	1/2	100.0	1100.0	50	
3	Startup (+)	I	150	100	150	16164	11.1	125	0	1	200.0	50.0	1010	300
		IIa	150	100	150	16164	11.1	125	0	1	150.0	50.0	1010	
		IIb	125	100	125	16164	5.6	113	0	1	150.0	50.0	1010	
		II	100	100	100	16164	0.0	100	0	1	150.0	50.0	50	
		III	150	100	150	16164	11.1	125	0	1	200.0	50.0	1010	
		IV	150	100	150	16164	11.1	125	0	1/2	100.0	50.0	1010	
		IVa	283	100	283	16164	40.8	192	0	1/2	100.0	50.0	1010	
		IVb	416	100	416	16164	70.4	258	0	1/2	100.0	50.0	1010	
		V	549	100	549	16164	100	325	0	1/2	100.0	50.0	1010	
4	Turbine Roll & Increase to Rated Power 1 (-) (Includes 10 SCRAM, Loss of Feedwater Pumps and 300 Hot Standby - Feedwater Cycling)	I	100	150	100	0	STEP	125	15	1	1377.0	1010.0	1010	610
		IIa	100	150	100	0	STEP	125	0	1	150.0	1010.0	1010	
		IIb	100	125	100	0	STEP	113	0	1	150.0	1010.0	1010	
		II	100	100	100	0	STEP	100	0	1	150.0	50.0	50	
		III	100	150	100	0	STEP	125	15	1	1377.0	1010.0	1010	
		IV	100	150	100	0	STEP	125	15	1/2	688.5	1010.0	1010	
		IVa	100	283	100	0	STEP	192	15	1/2	688.5	1010.0	1010	
		IVb	100	416	100	0	STEP	258	15	1/2	688.5	1010.0	1010	
		V	100	549	100	0	STEP	325	15	1/2	688.5	1010.0	1010	
5	Turbine Roll & Increase to Rated Power 2 (+) (Includes 10 SCRAM, Loss of Feedwater Pumps, 1 Reactor Overpressure, 228 Other SCRAMS and 60 Turbine Generator Trip)	I	260	100	260	0	STEP	180	15	1	1377.0	1010.0	1010	599
		IIa	260	100	260	0	STEP	180	0	1	150.0	1010.0	1010	
		IIb	180	100	180	0	STEP	140	0	1	150.0	1010.0	1010	
		II	100	100	100	0	STEP	100	0	1	150.0	50.0	50	
		III	260	100	260	0	STEP	180	15	1	1377.0	1010.0	1010	
		IV	260	100	260	0	STEP	180	15	1/2	688.5	1010.0	1010	
		IVa	260	100	260	0	STEP	180	15	1/2	688.5	1010.0	1010	
		IVb	260	100	260	0	STEP	180	15	1/2	688.5	1010.0	1010	
		V	260	100	260	0	STEP	180	15	1/2	688.5	1010.0	1010	
6	Turbine Roll & Increase to Rated Power 3 (+) (Includes 10 SCRAM, Loss of Feedwater Pumps, 1 Reactor Overpressure, 228 Other SCRAMS and 60 Turbine Generator Trip)	I	392	260	392	1800	264	326	100	1	9180.0	1010.0	1010	599
		IIa	392	260	392	1800	264	326	0	1	150.0	1010.0	1010	
		IIb	246	180	246	1800	132	213	0	1	150.0	1010.0	1010	
		II	100	100	100	1800	0	100	0	1	150.0	50.0	50	
		III	392	260	392	1800	264	326	100	1	9180.0	1010.0	1010	
		IV	392	260	392	1800	264	326	100	1/2	4590.0	1010.0	1010	
		IVa	392	260	392	1800	264	326	100	1/2	4590.0	1010.0	1010	
		IVb	392	260	392	1800	264	326	100	1/2	4590.0	1010.0	1010	
		V	392	260	392	1800	264	326	100	1/2	4590.0	1010.0	1010	
7	Daily Reduction to 75% Power (-)	I	310	392	310	900	-328	351	75	1	6885.0	1010.0	1010	10000
		IIa	310	392	310	900	-328	351	0	1	150.0	1010.0	1010	
		IIb	205	246	205	900	-164	226	0	1	150.0	1010.0	1010	
		II	100	100	100	900	0	100	0	1	150.0	50.0	50	
		III	310	392	310	900	-328	351	75	1	6885.0	1010.0	1010	
		IV	310	392	310	900	-328	351	75	1/2	3442.5	1010.0	1010	
		IVa	310	392	310	900	-328	351	75	1/2	3442.5	1010.0	1010	
		IVb	310	392	310	900	-328	351	75	1/2	3442.5	1010.0	1010	
		V	310	392	310	900	-328	351	75	1/2	3442.5	1010.0	1010	
8	Daily Reduction to 75% Power (+)	I	392	310	392	900	328	351	75	1	6885.0	1010.0	1010	10000
		IIa	392	310	392	900	328	351	0	1	150.0	1010.0	1010	
		IIb	246	205	246	900	164	226	0	1	150.0	1010.0	1010	
		II	100	100	100	900	0	100	0	1	150.0	50.0	50	
		III	392	310	392	900	328	351	75	1	6885.0	1010.0	1010	
		IV	392	310	392	900	328	351	75	1/2	3442.5	1010.0	1010	
		IVa	392	310	392	900	328	351	75	1/2	3442.5	1010.0	1010	
		IVb	392	310	392	900	328	351	75	1/2	3442.5	1010.0	1010	
		V	392	310	392	900	328	351	75	1/2	3442.5	1010.0	1010	
9	Weekly Reduction to 50% Power (-)	I	280	392	280	1800	-224	336	50	1	4590.0	1010.0	1010	2000
		IIa	280	392	280	1800	-224	336	0	1	150.0	1010.0	1010	
		IIb	190	246	190	1800	-112	218	0	1	150.0	1010.0	1010	
		II	100	100	100	1800	0	100	0	1	150.0	50.0	50	
		III	280	392	280	1800	-224	336	50	1	4590.0	1010.0	1010	
		IV	280	392	280	1800	-224	336	50	1/2	2295.0	1010.0	1010	
		IVa	280	392	280	1800	-224	336	50	1/2	2295.0	1010.0	1010	
		IVb	280	392	280	1800	-224	336	50	1/2	2295.0	1010.0	1010	
		V	280	392	280	1800	-224	336	50	1/2	2295.0	1010.0	1010	

For notes, see last page of table.

Table 1: Thermal Cycle Definitions for Feedwater Line (continued)

Transient Cycle	Description (1)	Piping Region (3)	Thermal Conditions (2)									Pressure Conditions		No. of Cycles (1)
			Oper. Temp. (°F)	T_{init} (°F)	T_{final} (°F)	Time (sec.)	Rate (°F/hr)	T_{avg} (°F)	Flow (%)	Ratio	(gpm)(4)	Pinit (psig)	Pfinal (psig)	
10	Weekly Reduction to 50% Power (+)	I	392	280	392	1800	224	336	50	1	4590.0	1010.0	1010	2000
		IIa	392	280	392	1800	224	336	0	1	150.0	1010.0	1010	
		IIb	246	190	246	1800	112	218	0	1	150.0	1010.0	1010	
		II	100	100	100	1800	0	100	0	1	150.0	50.0	50	
		III	392	280	392	1800	224	336	50	1	4590.0	1010.0	1010	
		IV	392	280	392	1800	224	336	50	1/2	2295.0	1010.0	1010	
		IVa	392	280	392	1800	224	336	50	1/2	2295.0	1010.0	1010	
		IVb	392	280	392	1800	224	336	50	1/2	2295.0	1010.0	1010	
		V	392	280	392	1800	224	336	50	1/2	2295.0	1010.0	1010	
11	Loss of Feedwater Heater, Turbine Trip 1 (-) (Includes 10 Loss of Feedwater Heater Turbine Trip, and 300 Reduction to 0% Power)	I	265	392	265	1800	-254	329	50	1	4590.0	1010.0	1010	310
		IIa	265	392	265	1800	-254	329	0	1	150.0	1010.0	1010	
		IIb	182.5	246	182.5	1800	-127	214	0	1	150.0	1010.0	1010	
		II	100	100	100	1800	0	100	0	1	150.0	50.0	50	
		III	265	392	265	1800	-254	329	50	1	4590.0	1010.0	1010	
		IV	265	392	265	1800	-254	329	50	1/2	2295.0	1010.0	1010	
		IVa	265	392	265	1800	-254	329	50	1/2	2295.0	1010.0	1010	
		IVb	265	392	265	1800	-254	329	50	1/2	2295.0	1010.0	1010	
		V	265	392	265	1800	-254	329	50	1/2	2295.0	1010.0	1010	
12	Loss of Feedwater Heater, Turbine Trip 2 (-)	I	90	265	90	360	-1750	178	15	1	1377.0	1010.0	1010	10
		IIa	90	265	90	360	-1750	178	0	1	150.0	1010.0	1010	
		IIb	95	182.5	95	360	-875	139	0	1	150.0	1010.0	1010	
		II	100	100	100	360	0	100	0	1	150.0	50.0	50	
		III	90	265	90	360	-1750	178	15	1	1377.0	1010.0	1010	
		IV	90	265	90	360	-1750	178	15	1/2	688.5	1010.0	1010	
		IVa	90	265	90	360	-1750	178	15	1/2	688.5	1010.0	1010	
		IVb	90	265	90	360	-1750	178	15	1/2	688.5	1010.0	1010	
		V	90	265	90	360	-1750	178	15	1/2	688.5	1010.0	1010	
13	Loss of Feedwater Heater, Turbine Trip 3 (+)	I	265	90	265	900	700	178	15	1	1377.0	1010.0	1010	10
		IIa	265	90	265	900	700	178	0	1	150.0	1010.0	1010	
		IIb	182.5	95	182.5	900	350	139	0	1	150.0	1010.0	1010	
		II	100	100	100	900	0	100	0	1	150.0	50.0	50	
		III	265	90	265	900	700	178	15	1	1377.0	1010.0	1010	
		IV	265	90	265	900	700	178	15	1/2	688.5	1010.0	1010	
		IVa	265	90	265	900	700	178	15	1/2	688.5	1010.0	1010	
		IVb	265	90	265	900	700	178	15	1/2	688.5	1010.0	1010	
		V	265	90	265	900	700	178	15	1/2	688.5	1010.0	1010	
14	Loss of Feedwater Heater, Turbine Trip 4 (+)	I	392	265	392	1800	254	329	50	1	4590.0	1010.0	1010	10
		IIa	392	265	392	1800	254	329	0	1	150.0	1010.0	1010	
		IIb	246	182.5	246	1800	127	214	0	1	150.0	1010.0	1010	
		II	100	100	100	1800	0	100	0	1	150.0	50.0	50	
		III	392	265	392	1800	254	329	50	1	4590.0	1010.0	1010	
		IV	392	265	392	1800	254	329	50	1/2	2295.0	1010.0	1010	
		IVa	392	265	392	1800	254	329	50	1/2	2295.0	1010.0	1010	
		IVb	392	265	392	1800	254	329	50	1/2	2295.0	1010.0	1010	
		V	392	265	392	1800	254	329	50	1/2	2295.0	1010.0	1010	
15	Loss of Feedwater Heater, FW Heater Bypass (-)	I	265	392	265	90	-5080	329	100	1	9180.0	1010.0	1010	70
		IIa	265	392	265	90	-5080	329	0	1	150.0	1010.0	1010	
		IIb	182.5	246	182.5	90	-2540	214	0	1	150.0	1010.0	1010	
		II	100	100	100	90	0	100	0	1	150.0	50.0	50	
		III	265	392	265	90	-5080	329	100	1	9180.0	1010.0	1010	
		IV	265	392	265	90	-5080	329	100	1/2	4590.0	1010.0	1010	
		IVa	265	392	265	90	-5080	329	100	1/2	4590.0	1010.0	1010	
		IVb	265	392	265	90	-5080	329	100	1/2	4590.0	1010.0	1010	
		V	265	392	265	90	-5080	329	100	1/2	4590.0	1010.0	1010	
16	Loss of Feedwater Heater, FW Heater Bypass (+)	I	392	265	392	180	2540	329	100	1	9180.0	1010.0	1010	70
		IIa	392	265	392	180	2540	329	0	1	150.0	1010.0	1010	
		IIb	246	182.5	246	180	1270	214	0	1	150.0	1010.0	1010	
		II	100	100	100	180	0	100	0	1	150.0	50.0	50	
		III	392	265	392	180	2540	329	100	1	9180.0	1010.0	1010	
		IV	392	265	392	180	2540	329	100	1/2	4590.0	1010.0	1010	
		IVa	392	265	392	180	2540	329	100	1/2	4590.0	1010.0	1010	
		IVb	392	265	392	180	2540	329	100	1/2	4590.0	1010.0	1010	
		V	392	265	392	180	2540	329	100	1/2	4590.0	1010.0	1010	
17	SCRAM, T.G. Trip, Reactor Overpressure, and All Other Scrams 1 (-) (Includes 1 Reactor Overpressure, 228 Other SCRAMS and 60 Turbine Generator Trip)	I	275	392	275	60	-7020	334	110	1	10098.0	1010.0	1010	289
		IIa	275	392	275	60	-7020	334	0	1	150.0	1010.0	1010	
		IIb	187.5	246	187.5	60	-3510	217	0	1	150.0	1010.0	1010	
		II	100	100	100	60	0	100	0	1	150.0	50.0	50	
		III	275	392	275	60	-7020	334	110	1	10098.0	1010.0	1010	
		IV	275	392	275	60	-7020	334	110	1/2	5049.0	1010.0	1010	
		IVa	275	392	275	60	-7020	334	110	1/2	5049.0	1010.0	1010	
		IVb	275	392	275	60	-7020	334	110	1/2	5049.0	1010.0	1010	
		V	275	392	275	60	-7020	334	110	1/2	5049.0	1010.0	1010	
18	SCRAM, T.G. Trip, Reactor Overpressure, and All Other Scrams 2 (-) (Includes 1 Reactor Overpressure, 228 Other SCRAMS and 60 Turbine Generator Trip)	I	100	275	100	900	-700	188	3	1	275.4	1010.0	1010	289
		IIa	100	275	100	900	-700	188	0	1	150.0	1010.0	1010	
		IIb	100	187.5	100	900	-350	144	0	1	150.0	1010.0	1010	
		II	100	100	100	900	0	100	0	1	150.0	50.0	50	
		III	100	275	100	900	-700	188	3	1	275.4	1010.0	1010	
		IV	100	275	100	900	-700	188	3	1/2	137.7	1010.0	1010	
		IVa	100	275	100	900	-700	188	3	1/2	137.7	1010.0	1010	
		IVb	100	275	100	900	-700	188	3	1/2	137.7	1010.0	1010	
		V	100	275	100	900	-700	188	3	1/2	137.7	1010.0	1010	

For notes, see last page of table.

Table 1: Thermal Cycle Definitions for Feedwater Line (continued)

Transient Cycle	Description (1)	Piping Region (3)	Thermal Conditions (2)									Pressure Conditions		No. of Cycles (1)
			Oper. Temp. (°F)	T_{init} (°F)	T_{final} (°F)	Time (sec.)	Rate (°F/hr)	T_{avg} (°F)	Flow (%)	Ratio	(gpm)(4)	Pinit (psig)	Pfinal (psig)	
19	Hot Standby 1 (-)	I	265	265	265	0	STEP	265	0	1	200.0	1010.0	1010	300
		IIa	265	265	265	0	STEP	265	0	1	150.0	1010.0	1010	
		IIb	182.5	182.5	182.5	0	STEP	183	0	1	150.0	1010.0	1010	
		II	100	100	100	0	STEP	100	0	1	150.0	50.0	50	
		III	265	265	265	0	STEP	265	0	1	200.0	1010.0	1010	
		IV	265	265	265	0	STEP	265	0	1/2	100.0	1010.0	1010	
		IVa	323	265	323	0	STEP	294	0	1/2	100.0	1010.0	1010	
		IVb	382	265	382	0	STEP	324	0	1/2	100.0	1010.0	1010	
		V	440	265	440	0	STEP	353	0	1/2	100.0	1010.0	1010	
20	Hot Standby 2 (-)	I	265	265	265	0	0	265	0	1	200.0	1010.0	1010	300
		IIa	265	265	265	0	0	265	0	1	150.0	1010.0	1010	
		IIb	182.5	182.5	182.5	0	0	183	0	1	150.0	1010.0	1010	
		II	100	100	100	0	0	100	0	1	150.0	50.0	50	
		III	265	265	265	0	0	265	0	1	200.0	1010.0	1010	
		IV	265	265	265	0	0	265	0	1/2	100.0	1010.0	1010	
		IVa	360	323	360	3924	34	342	0	1/2	100.0	1010.0	1010	
		IVb	454	382	454	3924	66	418	0	1/2	100.0	1010.0	1010	
		V	549	440	549	3924	100	495	0	1/2	100.0	1010.0	1010	
21	Hot Standby 3 (-)	I	150	265	150	4140	-100	208	0	1	200.0	1010.0	1010	300
		IIa	150	265	150	4140	-100	208	0	1	150.0	1010.0	1010	
		IIb	125	182.5	125	4140	-50	154	0	1	150.0	1010.0	1010	
		II	100	100	100	0	0	100	0	1	150.0	50.0	50	
		III	150	265	150	4140	-100	208	0	1	200.0	1010.0	1010	
		IV	150	265	150	4140	-100	208	0	1/2	100.0	1010.0	1010	
		IVa	283	360	283	4140	-67	322	0	1/2	100.0	1010.0	1010	
		IVb	416	454	416	4140	-33	435	0	1/2	100.0	1010.0	1010	
		V	549	549	549	0	0	549	0	1/2	100.0	1010.0	1010	
22	Shutdown 1 (-)	I	150	150	150	0	0	150	0	1	200.0	1010.0	170	300
		IIa	150	150	150	0	0	150	0	1	150.0	1010.0	170	
		IIb	125	125	125	0	0	125	0	1	150.0	1010.0	170	
		II	100	100	100	0	0	100	0	1	150.0	50.0	50	
		III	150	150	150	0	0	150	0	1	200.0	1010.0	170	
		IV	150	150	150	0	0	150	0	1/2	100.0	1010.0	170	
		IVa*	225	283	225	6264	-33	254	0	1/2	100.0	1010.0	170	
		IVb	300	416	300	6264	-67	358	0	1/2	100.0	1010.0	170	
		V	375	549	375	6264	-100	462	0	1/2	100.0	1010.0	170	
23	Shutdown 2 (-)	I	150	150	150	0	0	150	0	1	200.0	170.0	88	300
		IIa	150	150	150	0	0	150	0	1	150.0	170.0	88	
		IIb	125	125	125	0	0	125	0	1	150.0	170.0	88	
		II	100	100	100	0	0	100	0	1	150.0	50.0	50	
		III	150	150	150	0	0	150	0	1	200.0	170.0	88	
		IV	150	150	150	0	0	150	0	1/2	100.0	170.0	88	
		IVa	210	225	210	600	-90	218	0	1/2	100.0	170.0	88	
		IVb	270	300	270	600	-180	285	0	1/2	100.0	170.0	88	
		V	330	375	330	600	-270	353	0	1/2	100.0	170.0	88	
24	Shutdown 3 (-)	I	100	150	100	8280	-22	125	0	1	200.0	88.0	50	300
		IIa	100	150	100	8280	-22	125	0	1	150.0	88.0	50	
		IIb	100	125	100	8280	-11	113	0	1	150.0	88.0	50	
		II	100	100	100	8280	0	100	0	1	150.0	50.0	50	
		III	100	150	100	8280	-22	125	0	1	200.0	88.0	50	
		IV	100	150	100	8280	-22	125	0	1/2	100.0	88.0	50	
		IVa	100	210	100	8280	-48	155	0	1/2	100.0	88.0	50	
		IVb	100	270	100	8280	-74	185	0	1/2	100.0	88.0	50	
		V	100	330	100	8280	-100	215	0	1/2	100.0	88.0	50	
25	SCRAM, Loss of Feedwater Pumps 1 (-)	I	392	392	392	12	0	392	0	1	200.0	1010.0	1190	10
		IIa	392	392	392	12	0	392	0	1	150.0	1010.0	1190	
		IIb	246	246	246	12	0	246	0	1	150.0	1010.0	1190	
		II	100	100	100	12	0	100	0	1	150.0	50.0	50	
		III	392	392	392	12	0	392	0	1	200.0	1010.0	1190	
		IV	392	392	392	12	0	392	0	1/2	100.0	1010.0	1190	
		IVa	450	392	450	12	17400	421	0	1/2	100.0	1010.0	1190	
		IVb	507	392	507	12	34500	450	0	1/2	100.0	1010.0	1190	
		V	565	392	565	12	51900	479	0	1/2	100.0	1010.0	1190	
26	SCRAM, Loss of Feedwater Pumps 2 (-) (First HPCI)	I	50	392	50	0	STEP	221	40	1	3672.0	1190.0	1135	10
		IIa	50	392	50	0	STEP	221	40	1	3672.0	1190.0	1135	
		IIb	50	246	50	0	STEP	148	40	1	3672.0	1190.0	1135	
		II	50	100	50	0	STEP	75	40	1	3672.0	50.0	1135	
		III	50	392	50	0	STEP	221	40	1	3672.0	1190.0	1135	
		IV	50	392	50	0	STEP	221	40	1/2	1836.0	1190.0	1135	
		IVa	50	450	50	0	STEP	250	40	1/2	1836.0	1190.0	1135	
		IVb	50	507	50	0	STEP	279	40	1/2	1836.0	1190.0	1135	
		V	50	565	50	0	STEP	308	40	1/2	1836.0	1190.0	1135	
27	SCRAM, Loss of Feedwater Pumps 3 (-)	I	150	50	150	1380	261	100	0	1	200.0	1135.0	1135	10
		IIa	150	50	150	1380	261	100	0	1	150.0	1135.0	1135	
		IIb	125	50	125	1380	196	88	0	1	150.0	1135.0	1135	
		II	100	50	100	1380	130	75	0	1	150.0	1135.0	50	
		III	150	50	150	1380	261	100	0	1	200.0	1135.0	1135	
		IV	150	50	150	1380	261	100	0	1/2	100.0	1135.0	1135	
		IVa	247	50	247	1380	514	149	0	1/2	100.0	1135.0	1135	
		IVb	343	50	343	1380	764	197	0	1/2	100.0	1135.0	1135	
		V	440	50	440	1380	1017	245	0	1/2	100.0	1135.0	1135	

For notes, see last page of table.

Table 1: Thermal Cycle Definitions for Feedwater Line (continued)

Transient Cycle	Description (1)	Piping Region (3)	Thermal Conditions (2)									Pressure Conditions		No. of Cycles (1)
			Oper. Temp. (°F)	T_{init} (°F)	T_{final} (°F)	Time (sec.)	Rate (°F/hr)	T_{avg} (°F)	Flow (%)	Ratio	(gpm)(4)	Pinit (psig)	Pfinal (psig)	
28	SCRAM, Loss of Feedwater Pumps 4 (+)	I	150	150	150	0	STEP	150	0	1	200.0	1135.0	1135	10
		IIa	150	150	150	0	STEP	150	0	1	150.0	1135.0	1135	
		IIb	125	125	125	0	STEP	125	0	1	150.0	1135.0	1135	
		II	100	100	100	0	STEP	100	0	1	150.0	50.0	50	
		III	150	150	150	0	STEP	150	0	1	200.0	1135.0	1135	
		IV	150	150	150	0	STEP	150	0	1/2	100.0	1135.0	1135	
		IVa	288	247	288	0	STEP	268	0	1/2	100.0	1135.0	1135	
		IVb	427	343	427	0	STEP	385	0	1/2	100.0	1135.0	1135	
		V	565	440	565	0	STEP	503	0	1/2	100.0	1135.0	1135	
29	SCRAM, Loss of Feedwater Pumps 5 (-) (Second HPCI)	I	50	150	50	0	STEP	100	30	1	2754.0	1135.0	885	10
		IIa	50	150	50	0	STEP	100	30	1	2754.0	1135.0	885	
		IIb	50	125	50	0	STEP	88	30	1	2754.0	1135.0	885	
		II	50	100	50	0	STEP	75	30	1	2754.0	1135.0	885	
		III	50	150	50	0	STEP	100	30	1	2754.0	1135.0	885	
		IV	50	150	50	0	STEP	100	30	1/2	1377.0	1135.0	885	
		IVa	50	288	50	0	STEP	169	30	1/2	1377.0	1135.0	885	
		IVb	50	427	50	0	STEP	239	30	1/2	1377.0	1135.0	885	
		V	50	565	50	0	STEP	308	30	1/2	1377.0	1135.0	885	
30	SCRAM, Loss of Feedwater Pumps 6 (+)	I	150	50	150	3060	118	100	0	1	200.0	885.0	1060	10
		IIa	150	50	150	3060	118	100	0	1	150.0	885.0	1060	
		IIb	125	50	125	3060	88	88	0	1	150.0	885.0	1060	
		II	100	50	100	3060	59	75	0	1	150.0	885.0	50	
		III	150	50	150	3060	118	100	0	1	200.0	885.0	1060	
		IV	150	50	150	3060	118	100	0	1/2	100.0	885.0	1060	
		IVa	247	50	247	3060	232	149	0	1/2	100.0	885.0	1060	
		IVb	343	50	343	3060	345	197	0	1/2	100.0	885.0	1060	
		V	440	50	440	3060	459	245	0	1/2	100.0	885.0	1060	
31	SCRAM, Loss of Feedwater Pumps 7 (+)	I	150	150	150	0	STEP	150	0	1	200.0	1060.0	1135	10
		IIa	150	150	150	0	STEP	150	0	1	150.0	1060.0	1135	
		IIb	125	125	125	0	STEP	125	0	1	150.0	1060.0	1135	
		II	100	100	100	0	STEP	100	0	1	150.0	50.0	50	
		III	150	150	150	0	STEP	150	0	1	200.0	1060.0	1135	
		IV	150	150	150	0	STEP	150	0	1/2	100.0	1060.0	1135	
		IVa	283	247	283	0	STEP	265	0	1/2	100.0	1060.0	1135	
		IVb	416	343	416	0	STEP	380	0	1/2	100.0	1060.0	1135	
		V	549	440	549	0	STEP	495	0	1/2	100.0	1060.0	1135	
32	SCRAM, Loss of Feedwater Pumps 8 (-) (Third HPCI)	I	50	150	50	0	STEP	100	17	1	1560.6	1135.0	675	10
		IIa	50	150	50	0	STEP	100	17	1	1560.6	1135.0	675	
		IIb	50	125	50	0	STEP	88	17	1	1560.6	1135.0	675	
		II	50	100	50	0	STEP	75	17	1	1560.6	50.0	675	
		III	50	150	50	0	STEP	100	17	1	1560.6	1135.0	675	
		IV	50	150	50	0	STEP	100	17	1/2	780.3	1135.0	675	
		IVa	50	283	50	0	STEP	167	17	1/2	780.3	1135.0	675	
		IVb	50	416	50	0	STEP	233	17	1/2	780.3	1135.0	675	
		V	50	549	50	0	STEP	300	17	1/2	780.3	1135.0	675	
33	SCRAM, Loss of Feedwater Pumps 9 (+)	I	150	50	150	300	1200	100	0	1	200.0	675.0	675	10
		IIa	150	50	150	300	1200	100	0	1	150.0	675.0	675	
		IIb	125	50	125	300	900	88	0	1	150.0	675.0	675	
		II	100	50	100	300	600	75	0	1	150.0	675.0	50	
		III	150	50	150	300	1200	100	0	1	200.0	675.0	675	
		IV	150	50	150	300	1200	100	0	1/2	100.0	675.0	675	
		IVa	200	50	200	300	1800	125	0	1/2	100.0	675.0	675	
		IVb	250	50	250	300	2400	150	0	1/2	100.0	675.0	675	
		V	300	50	300	300	3000	175	0	1/2	100.0	675.0	675	
34	SCRAM, Loss of Feedwater Pumps 10 (+)	I	150	150	150	8964	0	150	0	1	200.0	240.0	1010	10
		IIa	150	150	150	8964	0	150	0	1	150.0	240.0	1010	
		IIb	125	125	125	8964	0	125	0	1	150.0	240.0	1010	
		II	100	100	100	8964	0	100	0	1	150.0	50.0	50	
		III	150	150	150	8964	0	150	0	1	200.0	240.0	1010	
		IV	150	150	150	8964	0	150	0	1/2	100.0	240.0	1010	
		IVa	283	200	283	8964	33	242	0	1/2	100.0	240.0	1010	
		IVb	416	250	416	8964	67	333	0	1/2	100.0	240.0	1010	
		V	549	300	549	8964	100	425	0	1/2	100.0	240.0	1010	
35	SCRAM, SRV Blowdown 1 (-)	I	275	392	275	60	-7020	334	110	1	10098.0	1010.0	885	1
		IIa	275	392	275	60	-7020	334	0	1	150.0	1010.0	885	
		IIb	187.5	246	187.5	60	-3510	217	0	1	150.0	1010.0	885	
		II	100	100	100	60	0	100	0	1	150.0	50.0	50	
		III	275	392	275	60	-7020	334	110	1	10098.0	1010.0	885	
		IV	275	392	275	60	-7020	334	110	1/2	5049.0	1010.0	885	
		IVa	275	392	275	60	-7020	334	110	1/2	5049.0	1010.0	885	
		IVb	275	392	275	60	-7020	334	110	1/2	5049.0	1010.0	885	
		V	275	392	275	60	-7020	334	110	1/2	5049.0	1010.0	885	
36	SCRAM, SRV Blowdown 2 (-)	I	100	275	100	900	-700	188	3	1	275.4	885.0	50	1
		IIa	100	275	100	900	-700	188	0	1	150.0	885.0	50	
		IIb	100	187.5	100	900	-350	144	0	1	150.0	885.0	50	
		II	100	100	100	900	0	100	0	1	150.0	50.0	50	
		III	100	275	100	900	-700	188	3	1	275.4	885.0	50	
		IV	100	275	100	900	-700	188	3	1/2	137.7	885.0	50	
		IVa	100	275	100	900	-700	188	3	1/2	137.7	885.0	50	
		IVb	100	275	100	900	-700	188	3	1/2	137.7	885.0	50	
		V	100	275	100	900	-700	188	3	1/2	137.7	885.0	50	

For notes, see last page of table.

Table 1: Thermal Cycle Definitions for Feedwater Line (continued)

Transient Cycle	Description (1)	Piping Region (3)	Thermal Conditions (2) Oper. Temp. (°F)	T_{init} (°F)	T_{final} (°F)	Time (sec.)	Rate (°F/hr)	T_{avg} (°F)	Flow (%)	Ratio	(gpm)(4)	Pressure Conditions Pinit (psig)	Pfinal (psig)	No. of Cycles (1)
		I	100	100	100	0	0	100	0	1	200.0	50.0	1563	
		IIa	100	100	100	0	0	100	0	1	150.0	50.0	1563	
		IIb	100	100	100	0	0	100	0	1	150.0	50.0	1563	
		II	100	100	100	0	0	100	0	1	150.0	50.0	50	
37	Hydrostatic Test (+)	III	100	100	100	0	0	100	0	1	200.0	50.0	1563	1
		IV	100	100	100	0	0	100	0	1/2	100.0	50.0	1563	
		IVa	100	100	100	0	0.0	100	0	1/2	100.0	50.0	1563	
		IVb	100	100	100	0	0.0	100	0	1/2	100.0	50.0	1563	
		V	100	100	100	0	0	100	0	1/2	100.0	50.0	1563	
		I	100	100	100	0	0	100	0	1	200.0	1563.0	50	
		IIa	100	100	100	0	0	100	0	1	150.0	1563.0	50	
		IIb	100	100	100	0	0	100	0	1	150.0	1563.0	50	
		II	100	100	100	0	0	100	0	1	150.0	50.0	50	
38	Hydrostatic Test (-)	III	100	100	100	0	0	100	0	1	200.0	1563.0	50	1
		IV	100	100	100	0	0	100	0	1/2	100.0	1563.0	50	
		IVa	100	100	100	0	0.0	100	0	1/2	100.0	1563.0	50	
		IVb	100	100	100	0	0.0	100	0	1/2	100.0	1563.0	50	
		V	100	100	100	0	0	100	0	1/2	100.0	1563.0	50	
		I	392	392	392	60	0	392	110	1	10098.0	1010.0	1375	
	SCRAM, T.G. Trip, Reactor	IIa	392	392	392	60	0	392	0	1	150.0	1010.0	1375	
	Overpressure, and All Other	IIb	246	246	246	60	0	246	0	1	150.0	1010.0	1375	
	Scrams 1 (-)	II	100	100	100	60	0	100	0	1	150.0	50.0	50	
39	(Includes 1 Reactor	III	392	392	392	60	0	392	110	1	10098.0	1010.0	1375	289
	Overpressure, 228 Other	IV	392	392	392	60	0	392	110	1/2	5049.0	1010.0	1375	
	SCRAMS and 60 Turbine	IVa	392	392	392	60	0	392	110	1/2	5049.0	1010.0	1375	
	Generator Trip)	IVb	392	392	392	60	0	392	110	1/2	5049.0	1010.0	1375	
		V	392	392	392	60	0	392	110	1/2	5049.0	1010.0	1375	
		I	392	392	392	900	0	392	3	1	275.4	1375.0	940	
	SCRAM, T.G. Trip, Reactor	IIa	392	392	392	900	0	392	0	1	150.0	1375.0	940	
	Overpressure, and All Other	IIb	246	246	246	900	0	246	0	1	150.0	1375.0	940	
	Scrams 2 (-)	II	100	100	100	900	0	100	0	1	150.0	50.0	50	
40	(Includes 1 Reactor	III	392	392	392	900	0	392	3	1	275.4	1375.0	940	289
	Overpressure, 228 Other	IV	392	392	392	900	0	392	3	1/2	137.7	1375.0	940	
	SCRAMS and 60 Turbine	IVa	392	392	392	900	0	392	3	1/2	137.7	1375.0	940	
	Generator Trip)	IVb	392	392	392	900	0	392	3	1/2	137.7	1375.0	940	
		V	392	392	392	900	0	392	3	1/2	137.7	1375.0	940	
		I	392	392	392	900	0	392	3	1	275.4	940.0	1010	
	SCRAM, T.G. Trip, Reactor	IIa	392	392	392	900	0	392	0	1	150.0	940.0	1010	
	Overpressure, and All Other	IIb	246	246	246	900	0	246	0	1	150.0	940.0	1010	
	Scrams 3 (-)	II	100	100	100	900	0	100	0	1	150.0	50.0	50	
41	(Includes 1 Reactor	III	392	392	392	900	0	392	3	1	275.4	940.0	1010	289
	Overpressure, 228 Other	IV	392	392	392	900	0	392	3	1/2	137.7	940.0	1010	
	SCRAMS and 60 Turbine	IVa	392	392	392	900	0	392	3	1/2	137.7	940.0	1010	
	Generator Trip)	IVb	392	392	392	900	0	392	3	1/2	137.7	940.0	1010	
		V	392	392	392	900	0	392	3	1/2	137.7	940.0	1010	
		I	125	100	125	60	1500	113	0	1	200.0	1010.0	1010	
		IIa	125	100	125	60	1500	113	0	1	150.0	1010.0	1010	
		IIb	112.5	100	112.5	60	750	106	0	1	150.0	1010.0	1010	
		II	100	100	100	60	0	100	0	1	150.0	50.0	50	
42	Hot Standby, Feedwater	III	125	100	125	60	1500	113	0	1	200.0	1010.0	1010	300
	Cycling 1 (+)	IV	125	100	125	60	1500	113	0	1/2	100.0	1010.0	1010	
		IVa	180	100	180	60	4800	140	0	1/2	100.0	1010.0	1010	
		IVb	235	100	235	60	8100	168	0	1/2	100.0	1010.0	1010	
		V	290	100	290	60	11400	195	0	1/2	100.0	1010.0	1010	
		I	150	125	150	210	429	138	0	1	200.0	1010.0	1010	
		IIa	150	125	150	210	429	138	0	1	150.0	1010.0	1010	
		IIb	125	112.5	125	210	214	119	0	1	150.0	1010.0	1010	
		II	100	100	100	210	0	100	0	1	150.0	50.0	50	
43	Hot Standby, Feedwater	III	150	125	150	210	429	138	0	1	200.0	1010.0	1010	300
	Cycling 2 (+)	IV	150	125	150	210	429	138	0	1/2	100.0	1010.0	1010	
		IVa	283	180	283	210	1766	232	0	1/2	100.0	1010.0	1010	
		IVb	416	235	416	210	3103	326	0	1/2	100.0	1010.0	1010	
		V	549	290	549	210	4440	420	0	1/2	100.0	1010.0	1010	

For notes, see next page.

Table 1: Thermal Cycle Definitions for Feedwater Line (concluded)

Notes:

1. From Reference [13].

2. Normal operating conditions are 1,010 psig, 549°F (steam dome), 392°F (feedwater), and 4590 gpm (feedwater nozzle) [14].

3. See Figure 1.

4. For the transients where flow is stopped, the natural convection heat transfer coefficient was used. The same approximate value was used within each region. These values are:

   - 200 gpm for Regions I and III.
   - 150 gpm for Regions II, IIa, and IIb.
   - 100 gpm for Regions IV and V.

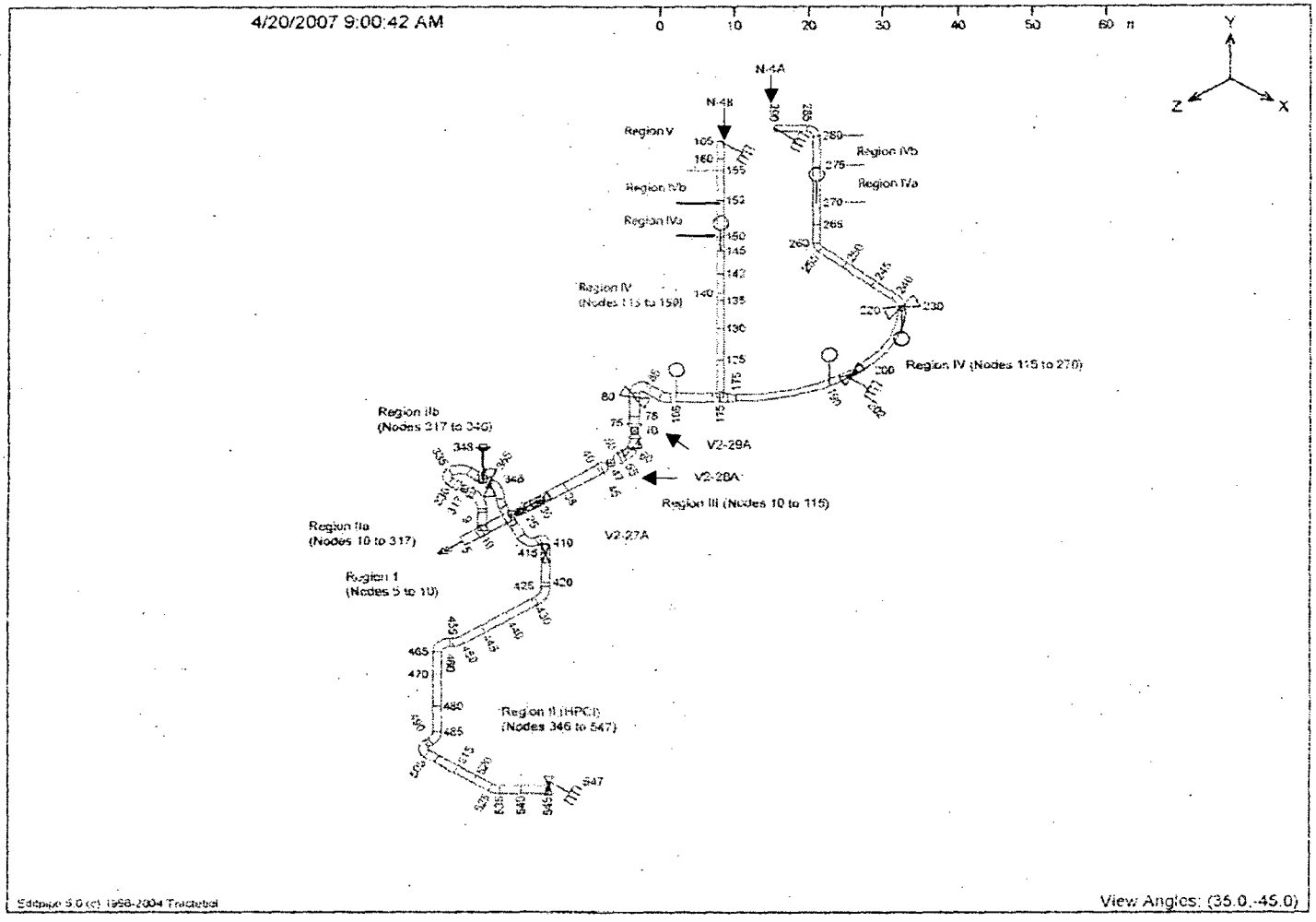

Figure 1: Feedwater/HPCI Piping from Anchor HD-36 to RPV Nozzles N-4A and N-4B

3.0 ASSUMPTIONS/DESIGN INPUT

In order to take advantage of improvements in the ASME Code that result in a lower calculated fatigue usage, this evaluation is done to the ASME Boiler and Pressure Vessel Code, Section III, 1998 Edition with 2000 Addenda [9]. The 1998 Edition of Section III (with 2000 Addenda) has been accepted by the US NRC for use in design analyses. Although there are a few restrictions on the application of this Edition, they involve the use of optional increased allowables that are not being used in this calculation.

A piping model was created using PIPESTRESS [1]. The calculation [2] that had previously analyzed the subject Class 1 feedwater piping contains the ADLPIPE input file used to create the PIPESTRESS input file for this evaluation. Valve dimensions and properties were also obtained from the ADLPIPE input file. The piping model is composed of one carbon steel grade (maximum carbon content of 0.30 %) [2]. Temperature dependent material properties were used with values obtained from Reference [5]. Table 2 summarizes these values. The resulting PIPESTRESS model (including boundary conditions) is shown in Figure 1. The drawings for both feedwater loops [3, 4] and the HPCI line [7] were also consulted to aid in building the PIPESTRESS model.

Assumptions:

1) The weight of insulation is included in the analysis and PIPESTRESS calculates the heat transfer effects of insulation.
2) Node 545 is the end of the as-modeled HPCI piping system. This is appropriate because of the distance from the HPCI/Feedwater tee, six pipe supports in the segment and multiple pipe direction changes.

The feedwater and HPCI line sizes are specified in the previous calculation [2] and are shown in Table 3.

Table 2: Material Properties for Feedwater System Class 1 Piping [2 App. E, 5]

SA 106 B and SA-234 WPB (Carbon Silicon Steel, C-Si)							
Temperature (°F)	Young's Modulus ($x10^6$ psi)	Coefficient of Linear Thermal Expansion (in/100 ft)	Mean Coefficient of Thermal Expansion[1] (10^{-6} /in/in/°F)	Thermal Conductivity[1] (btu/hr/ft/°F)	Thermal Diffusivity[1] (ft^2/hr)	Yield Stress S_y (ksi)	Design Stress Intensity S_m (ksi)
50	29.6	0[2]				35.0	20.0
70	29.5	0	6.4	27.5	0.529	35.0	20.0
100	29.3	0.2		27.6	0.512	35.0	20.0
150				27.6	0.496		
200	28.8	1.0		27.6	0.486	32.1	20.0
250				27.4	0.467		
300	28.3	1.9		27.2	0.453	31.0	20.0
350				27.0	0.440		
400	27.7	2.8		26.7	0.428	29.9	20.0
450				26.3	0.413		
500	27.3	3.7		25.9	0.398	28.5	18.9
550				25.5	0.387		
600	26.7	4.7		25.0	0.374	26.8	17.3

Notes:

1. These properties are used for the transient analysis only.
2. Assumed equivalent to the value at 70°F.

The material properties applied in the analyses are taken from ASME Section II Part D 1998 Edition with 2000 Addenda. This is consistent with information provided in the Design Input Record (page 13 of VY EC No. 1773, SI File No. VY-16Q-209). The use of a later code edition than that used for the original design code is acceptable since later editions typically reflect more accurate material properties than was published in prior Code editions.

Table 3: Feedwater/HPCI Piping Size Information [2]

	16" FW Downstream of V2-29A	16" FW Upstream of V2-29A	10" FW	14" HPCI
Pipe Schedule	80	120	120	120
Fittings Schedule	120	---	120	---
Piping O.D. (in.)	16.0	16.0	10.75	14.0
Piping Nom. Wall (in.)	0.843	1.218	0.843	1.093
Fitting Nom. Wall (in.)	1.218	---	0.843	---
Pipe Weight[1] (lb/ft)	136.46	192.3	89.20	150.7
Insulation Weight (lb/ft)	14.64	11.98	8.92	10.65[2]

Note:
1. Weight of contents automatically added by the PIPESTRESS Program.
2. Insulation weight assumed to be consistent with thickness (2 inches) and composition of insulation on the 16" FW upstream of V2-29A.

4.0 ANALYSIS

Through-wall thermal gradient terms were calculated by the PIPESTRESS program for all of the transients. Table 1 defines each thermal cycle definition (i.e., transient load case) and the region of the modeled piping those conditions are applicable.

The forces and moments due to differential thermal expansion need to be included in the fatigue evaluation. The differential thermal expansion cases as analyzed by the piping program, PIPESTRESS, correspond to the end temperature and pressure of the transient. Table 4 lists the thermal expansion cases.

The material properties were obtained from the ASME Code Section II, 1998 Edition, Part D, with 2000 Addenda [5]. E and α are taken at 70°F, and k, ρ, and c_p are taken at the average temperature over the range of the individual transients.

The internal heat transfer coefficient h for the transients with flow occurring in the pipe is calculated based on the following relation for forced convection [8]:

$$h = 0.023\ Re^{0.8}\ Pr^{0.4}\ k/D$$

Where Re = Reynolds number
Pr = Prandtl number

The heat transfer coefficients were calculated by PIPESTRESS using the above relation. The flow rates described for each transient in Table 1 were used. For the transients where flow is stopped, the natural convection heat transfer coefficient was used. The formula for h is [8]:

$$h = 0.55\ (Gr\ Pr)^{0.25} k/L$$

Where Gr = Grashof Number
L = pipe diameter

PIPESTRESS only has the forced convection heat transfer formula built in, so an equivalent flow rate was determined that would give the same heat transfer coefficient as the free convection coefficient.

As discussed in the next section, the PIPESTRESS input file "FWHPCI.FRE" will be run and analyzed to Section III, Subsection NB-3600 of ASME 1998 Edition [9] in order to evaluate acceptable fatigue usage values for the Class 1 feedwater loop A system. The code option available in PIPESTRESS is the 1998 edition without addenda. This is acceptable as the 1999 and 2000 addenda to the 1998 code did not change the fatigue analysis method which PIPESTRESS uses.

A Listing of the PIPESTRESS input is included as Appendix A.

Table 4: Thermal Cycle Load Cases

Load Set	Transients Represented	Region I Temp. (°F)	Region IIa Temp. (°F)	Region IIb Temp. (°F)	Region II Temp. (°F)	Region III Temp. (°F)	Region IV Temp. (°F)	Region IVa Temp. (°F)	Region IVb Temp. (°F)	Region V Temp. (°F)	Vessel Temp. (°F)	Region II Pressure (psig)	All other Regions Pressure (psig)
1	1	100	100	100	100	100	100	100	100	100	100	50	1100
2	2, 24, 36, 38	100	100	100	100	100	100	100	100	100	100	50	50
3	3, 21, 34, 43	150	150	125	100	150	150	283	416	549	549	50	1010
4	5	260	260	180	100	260	260	260	260	260	549	50	1010
5	6, 8, 10, 14, 16	392	392	246	100	392	392	392	392	392	549	50	1010
6	7	310	310	205	100	310	310	310	310	310	549	50	1010
7	9	280	280	190	100	280	280	280	280	280	549	50	1010
8	11, 13, 15	265	265	182.5	100	265	265	265	265	265	549	50	1010
9	12	90	90	95	100	90	90	90	90	90	549	50	1010
10	20	265	265	182.5	100	265	265	360	454	549	549	50	1010
11	22	150	150	125	100	150	150	225	300	375	375	50	170
12	23	150	150	125	100	150	150	210	270	330	330	50	88
13	25	392	392	246	100	392	392	450	507	565	565	50	1190
14	26	50	50	50	50	50	50	50	50	50	565	1135	1135
15	27	150	150	125	100	150	150	247	343	440	565	50	1135
16	28	150	150	125	100	150	150	288	427	565	565	50	1135
17	30	150	150	125	100	150	150	247	343	440	555	50	1060
18	31	150	150	125	100	150	150	283	416	549	565	50	1135
19	32	50	50	50	50	50	50	50	50	50	502	675	675
20	33	150	150	125	100	150	150	200	250	300	502	50	675
21	35	275	275	187.5	100	275	275	275	275	275	549	50	885
22	37	100	100	100	100	100	100	100	100	100	100	50	1563
23	39	392	392	246	100	392	392	392	392	392	600	50	1375
24	40	392	392	246	100	392	392	392	392	392	539	50	940
25	41	392	392	246	100	392	392	392	392	392	549	50	1010
26	17	275	275	187.5	100	275	275	275	275	275	539	50	1010
27	19	265	265	182.5	100	265	265	323	382	440	549	50	1010
28	4	100	100	100	100	100	100	100	100	100	549	50	1010
29	18	100	100	100	100	100	100	100	100	100	539	50	1010
30	42	125	125	112.5	100	125	125	180	235	290	549	50	1010
31	29	50	50	50	50	50	50	50	50	50	532	885	885

5.0 RESULTS OF ANALYSIS

Since the piping at VY was designed in accordance with USAS B31.1 methodology, fatigue analysis does not exist for the piping. Therefore, fatigue calculations are being developed for selected locations in the Class 1 piping systems at VY. This will result in detailed, Class 1 fatigue calculations for each selected location. Piping models and transient definitions have been developed for the Class 1 portion of the feedwater system, as documented in the previous sections of this calculation.

The limiting total fatigue usage for the analyzed feedwater/HPCI piping system occurs at Node 155 on the riser to the feedwater nozzle. The total usage at this location is U = 0.1661 (per the PIPESTRESS report FWHPCI.PRF) which passes Class 1 fatigue evaluation. The second highest total fatigue usage for the analyzed feedwater/HPCI piping system occurs at Node 175, the 16" to 10" reducer on the feedwater piping. The total usage at this location is U = 0.1114 (per the PIPESTRESS report FWHPCI.PRF) which passes Class 1 fatigue evaluation. The environmental fatigue multiplier to use from Reference [10] is 1.74. The total usage including environmental effects is therefore 0.289.

Appendix B contains the fatigue usage summary for node 155.

6.0 REFERENCES

1. PIPESTRESS, Version 3.5.1+0.26, DST Computer Services S.A., QA-1670-301, June, 2004.

2. HPCI/FW Piping Stress Information. ADLPIPE listing for FDW & HPCI piping from Calculation No. VYC-551, Rev. 2, Appendix A, SI File No. VY-05Q-229.

3. Vermont Yankee Nuclear Power Corp. Drawing No. VYI-FDW-Part 5, Rev. 1, "Piping Isometric Feedwater: Drywell-Main Steam Tunnel (FDW) Part 5," SI File No. VY-05Q-221.

4. Vermont Yankee Nuclear Power Corp. Drawing No. VYI-FDW-Part 5A, Rev. 1, "Piping Isometric Feedwater: Main Steam Tunnel and Drywell FDW-Part 5A," SI File No. VY-05Q-221.

5. American Society of Mechanical Engineers Boiler & Pressure Vessel Code, Section II, Materials, Part D, "Properties (Customary)," 1998 Edition including the 2000 Addenda.

6. Structural Integrity Associates Report No. SIR-01-130, Revision 0, "System Review and Recommendations for a Transient and Fatigue Monitoring System at the Vermont Yankee Nuclear Power Station," February 2002, SI File No. VY-05Q-401.

7. Vermont Yankee Nuclear Power Corp. Drawing No. VYI-HPCI-Part 5, Rev. 0, "Piping Isometric Drawing High Pressure Coolant Injection Main Steam Tunnel-Torus Area (HPCI) Part 5," SI File No. VY-05Q-223.

8. Holman, J.P., *Heat Transfer*, Fifth Edition, McGraw-Hill, 1981.

9. American Society of Mechanical Engineers Boiler & Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, 1998 Edition including the 2000 Addenda.

10. Structural Integrity Associates Calculation No. VY-16Q-303, Revision 0, "Environmental Fatigue Evaluation of Reactor Recirculation Inlet Nozzle and Vessel Shell/Bottom Head."

11. "Reactor Thermal Cycles," Attachment 1, page 2, of Entergy Design Input Record (DIR) EC No. 1773, Revision 0, "Environmental Fatigue Analysis for Vermont Yankee Nuclear Power Station," 7/3/07, SI File No. VY-16Q-209.

12. "Nozzle Thermal Cycles (Feedwater)," Attachment 1, page 3, of Entergy Design Input Record (DIR) EC No. 1773, Revision 0, "Environmental Fatigue Analysis for Vermont Yankee Nuclear Power Station," 7/3/07, SI File No. VY-16Q-209.

13. "Reactor Thermal Cycles for 60 Years of Operation," Attachment 1 of Entergy Design Input Record (DIR) EC No. 1773, Revision 0, "Environmental Fatigue Analysis for Vermont Yankee Nuclear Power Station," 7/3/07, SI File No. VY-16Q-209.

14. GE Certified Design Specification No. 26A6019, Revision 1, "REACTOR VESSEL – EXTENDED POWER UPRATE," August 29, 2003, SI File No. VY-05Q-236.

APPENDIX A

PIPESTRESS INPUT FILE ("FWHPCI.FRE")

(Pages A1 – A38)

```
IDEN JB=2     *Job number (1 to 9999)
     CD=1     *1=ASME Section III
     VA=0     *0=Calculate            2=Verify
     GR=-Y    *Direction of gravity
     IU=1     *Input units            0=SIU        1=USA
     OU=1     *Output units           0=SIU        1=USA
     CH=$     *Delimiter character
     AB=T     *FREE errors =abort
     PL=$Vermont Yankee$
     EN=$KRE$
TITL BL=3     *Modeling option:
              *  3 =uniform mass for static analysis
              *       lumped mass for dynamic analysis
              *       rotational inertia ignored
     GL=1     *Report forces/moment        0=Global     1=Local     2=G et L
     SU=1     *Support summary             0=No         1=Yes
     CV=15    *Code version - See Manual
     HS=1     *Highest 20 stress ratios for each case
     MD=1     *Hot modulus
     TI=$Vermont Yankee Feedwater Piping$
        $SI Fatigue Analysis$
FREQ RF=1 RP=8 FR=33 MP=20 MX=70 TI=$SEISMIC$
*
************************************
**** THERMAL CYCLE LOAD CASES****
************************************
LCAS RF=0 CA=1 TY=0 TI=$LC-1$      *TC-1
LCAS RF=0 CA=2 TY=0 TI=$LC-2$      *TC-2,24,36,38
LCAS RF=0 CA=3 TY=0 TI=$LC-3$      *TC-3,21,34,43
LCAS RF=0 CA=4 TY=0 TI=$LC-4$      *TC-5
LCAS RF=0 CA=5 TY=0 TI=$LC-5$      *TC-6,8,10,14,16
LCAS RF=0 CA=6 TY=0 TI=$LC-6$      *TC-7
LCAS RF=0 CA=7 TY=0 TI=$LC-7$      *TC-9
LCAS RF=0 CA=8 TY=0 TI=$LC-8$      *TC-11,13,15
LCAS RF=0 CA=9 TY=0 TI=$LC-9$      *TC-12
LCAS RF=0 CA=10 TY=0 TI=$LC-10$    *TC-20
LCAS RF=0 CA=11 TY=0 TI=$LC-11$    *TC-22
LCAS RF=0 CA=12 TY=0 TI=$LC-12$    *TC-23
LCAS RF=0 CA=13 TY=0 TI=$LC-13$    *TC-25
LCAS RF=0 CA=14 TY=0 TI=$LC-14$    *TC-26, 29
LCAS RF=0 CA=15 TY=0 TI=$LC-15$    *TC-27
LCAS RF=0 CA=16 TY=0 TI=$LC-16$    *TC-28
LCAS RF=0 CA=17 TY=0 TI=$LC-17$    *TC-30
LCAS RF=0 CA=18 TY=0 TI=$LC-18$    *TC-31
LCAS RF=0 CA=19 TY=0 TI=$LC-19$    *TC-32
LCAS RF=0 CA=20 TY=0 TI=$LC-20$    *TC-33
LCAS RF=0 CA=21 TY=0 TI=$LC-21$    *TC-35
LCAS RF=0 CA=22 TY=0 TI=$LC-22$    *TC-37
LCAS RF=0 CA=23 TY=0 TI=$LC-23$    *TC-39
LCAS RF=0 CA=24 TY=0 TI=$LC-24$    *TC-40
LCAS RF=0 CA=25 TY=0 TI=$LC-25$    *TC-41
LCAS RF=0 CA=26 TY=0 TI=$LC-26$    *TC-17
LCAS RF=0 CA=27 TY=0 TI=$LC-27$    *TC-19
LCAS RF=0 CA=28 TY=0 TI=$LC-28$    *TC-4
LCAS RF=0 CA=29 TY=0 TI=$LC-29$    *TC-18
LCAS RF=0 CA=30 TY=0 TI=$LC-30$    *TC-42
```

```
LCAS RF=0 CA=31 TY=0 TI=$LC-31     *TC-29
LCAS RF=6 CA=32 TY=6 TI=$SAM$
**********************
**** WEIGHT CASES****
**********************
LCAS CA=101  RF=1  TY=3  TI=$OPERATING WEIGHT$
LCAS CA=102  RF=2  TY=4  TI=$HYDROTEST WEIGHT$
*
********************************
**** THERMAL TRANSIENT CASES****
********************************
TCAS CA=201 RP=1 TI=$Design Hydrotest +$
TCAS CA=202 RP=1 TI=$Design Hydrotest -$
TCAS CA=203 RP=1 TI=$Startup +$
TCAS CA=204 RP=1 TI=$TRoll & Inc. PWR1 -$
TCAS CA=205 RP=1 TI=$TRoll & Inc. PWR2 +$
TCAS CA=206 RP=1 TI=$TRoll & Inc. PWR3 +$
TCAS CA=207 RP=1 TI=$DlyReduction to 75% -$
TCAS CA=208 RP=1 TI=$DlyReduction to 75% +$
TCAS CA=209 RP=1 TI=$WklyReduct to 50% -$
TCAS CA=210 RP=1 TI=$WklyReduct to 50% +$
TCAS CA=211 RP=1 TI=$LOFWH+TT 1 -$
TCAS CA=212 RP=1 TI=$LOFWH+TT 2 -$
TCAS CA=213 RP=1 TI=$LOFWH+TT 3 +$
TCAS CA=214 RP=1 TI=$LOFWH+TT 4 +$
TCAS CA=215 RP=1 TI=$LOFWH+PFWHTR Byp -$
TCAS CA=216 RP=1 TI=$LOFWH+PFWHTR Byp +$
TCAS CA=217 RP=1 TI=$SCRAM+TT+AllOtrScm -$
TCAS CA=218 RP=1 TI=$SCRAM+TT+AllOtrScm -$
TCAS CA=219 RP=1 TI=$HotStandby 1 +$
TCAS CA=220 RP=1 TI=$HotStandby 2 +$
TCAS CA=221 RP=1 TI=$HotStandby 3 -$
TCAS CA=222 RP=1 TI=$Shutdown 1 -$
TCAS CA=223 RP=1 TI=$Shutdown 2 -$
TCAS CA=224 RP=1 TI=$Shutdown 3 -$
TCAS CA=225 RP=1 TI=$SCRAM+LOFWP1 +$
TCAS CA=226 RP=1 TI=$SCRAM+LOFWP2 -$
TCAS CA=227 RP=1 TI=$SCRAM+LOFWP3 +$
TCAS CA=228 RP=1 TI=$SCRAM+LOFWP4 +$
TCAS CA=229 RP=1 TI=$SCRAM+LOFWP5 -$
TCAS CA=230 RP=1 TI=$SCRAM+LOFWP6 +$
TCAS CA=231 RP=1 TI=$SCRAM+LOFWP7 +$
TCAS CA=232 RP=1 TI=$SCRAM+LOFWP8 -$
TCAS CA=233 RP=1 TI=$SCRAM+LOFWP9 +$
TCAS CA=234 RP=1 TI=$SCRAM+LOFWP10+$
TCAS CA=235 RP=1 TI=$SCRAM+SRVBLDN1-$
TCAS CA=236 RP=1 TI=$SCRAM+SRVBLDN2-$
TCAS CA=237 RP=1 TI=$Hydro Test +$
TCAS CA=238 RP=1 TI=$Hydro Test -$
TCAS CA=239 RP=1 TI=$SCRAM+TG+OPres1 -$
TCAS CA=240 RP=1 TI=$SCRAM+TG+OPres2 -$
TCAS CA=241 RP=1 TI=$SCRAM+TG+OPres3 -$
TCAS CA=242 RP=1 TI=$HotSby_FWcyc +$
TCAS CA=243 RP=1 TI=$HotSby_FWcyc +$
**********************
**** SEISMIC CASES****
```

```
**********************
RCAS CA=103 EQ=3 EV=1 TY=1 SU=1 LO=1 FX=1 FY=1 FZ=1 TI=$OBE INERTIA$
*
** ************************
**** LOAD COMBINATION CASES *
** ************************
CCAS RF=1 CA=104      ME=1 FL=1  C1=103 CY=10  TI=$OBE$
CCAS RF=1 CA=401 SS=1 ME=1 EQ=3  C1=102 C2=103 TI=$EQUATION 9 LEVEL B$
CCAS RF=1 CA=402 SS=1 ME=3 F1=1  C1=103 C2=6 C3=32 TI=$NORMAL+OBE$
CCAS RF=1 CA=403 SS=1 ME=3 F1=-1 C1=103 C2=6 C3=32 TI=$NORMAL-OBE$
*
******************
**** LOAD SETS****
******************
*RF field is the highest temperature and pressure of the transient
*PR and MO fields are the final temperature and pressure of the transient
LSET RF=1  RP=1 CY=120   PR=1  MO=1  TR=+201 TI=$Design Hydrotest +    LS-1$
LSET RF=2  RP=1 CY=120   PR=2  MO=2  TR=-202 TI=$Design Hydrotest -    LS-2$
LSET RF=3  RP=1 CY=300   PR=3  MO=3  TR=+203 TI=$Startup +             LS-3$
LSET RF=3  RP=1 CY=610   PR=28 MO=28 TR=-204 TI=$TRoll & Inc. PWR1 -   LS-4$
LSET RF=4  RP=1 CY=599   PR=4  MO=4  TR=+205 TI=$TRoll & Inc. PWR2 +   LS-5$
LSET RF=5  RP=1 CY=599   PR=5  MO=5  TR=+206 TI=$TRoll & Inc. PWR3 +   LS-6$
LSET RF=5  RP=1 CY=10000 PR=6  MO=6  TR=-207 TI=$DlyReduction to 75% - LS-7$
LSET RF=5  RP=1 CY=10000 PR=5  MO=5  TR=+208 TI=$DlyReduction to 75% + LS-8$
LSET RF=5  RP=1 CY=2000  PR=7  MO=7  TR=-209 TI=$WklyReduct to 50% -   LS-9$
LSET RF=5  RP=1 CY=2000  PR=5  MO=5  TR=+210 TI=$WklyReduct to 50% +   LS-10$
LSET RF=5  RP=1 CY=310   PR=8  MO=8  TR=-211 TI=$LOFWH+TT 1 -          LS-11$
LSET RF=8  RP=1 CY=10    PR=9  MO=9  TR=-212 TI=$LOFWH+TT 2 -          LS-12$
LSET RF=8  RP=1 CY=10    PR=8  MO=8  TR=+213 TI=$LOFWH+TT 3 +          LS-13$
LSET RF=5  RP=1 CY=10    PR=5  MO=5  TR=+214 TI=$LOFWH+TT 4 +          LS-14$
LSET RF=5  RP=1 CY=70    PR=8  MO=8  TR=-215 TI=$LOFWH+PFWHTR Byp -    LS-15$
LSET RF=5  RP=1 CY=70    PR=5  MO=5  TR=+216 TI=$LOFWH+PFWHTR Byp +    LS-16$
LSET RF=5  RP=1 CY=289   PR=26 MO=26 TR=-217 TI=$SCRAM+TT+AllOtrScm -  LS-17$
LSET RF=26 RP=1 CY=289   PR=29 MO=29 TR=-218 TI=$SCRAM+TT+AllOtrScm -  LS-18$
LSET RF=27 RP=1 CY=300   PR=27 MO=27 TR=+219 TI=$HotStandby 1 +        LS-19$
LSET RF=10 RP=1 CY=300   PR=10 MO=10 TR=+220 TI=$HotStandby 2 +        LS-20$
LSET RF=10 RP=1 CY=300   PR=3  MO=3  TR=-221 TI=$HotStandby 3 -        LS-21$
LSET RF=3  RP=1 CY=300   PR=11 MO=11 TR=-222 TI=$Shutdown 1 -          LS-22$
LSET RF=11 RP=1 CY=300   PR=12 MO=12 TR=-223 TI=$Shutdown 2 -          LS-23$
LSET RF=12 RP=1 CY=300   PR=2  MO=2  TR=-224 TI=$Shutdown 3 -          LS-24$
LSET RF=13 RP=1 CY=10    PR=13 MO=13 TR=+225 TI=$SCRAM+LOFWP1 +        LS-25$
LSET RF=13 RP=1 CY=10    PR=14 MO=14 TR=-226 TI=$SCRAM+LOFWP2 -        LS-26$
LSET RF=15 RP=1 CY=10    PR=15 MO=15 TR=+227 TI=$SCRAM+LOFWP3 +        LS-27$
LSET RF=16 RP=1 CY=10    PR=16 MO=16 TR=+228 TI=$SCRAM+LOFWP4 +        LS-28$
LSET RF=16 RP=1 CY=10    PR=31 MO=31 TR=-229 TI=$SCRAM+LOFWP5 -        LS-29$
LSET RF=17 RP=1 CY=10    PR=17 MO=17 TR=+230 TI=$SCRAM+LOFWP6 +        LS-30$
LSET RF=18 RP=1 CY=10    PR=18 MO=18 TR=+231 TI=$SCRAM+LOFWP7 +        LS-31$
LSET RF=18 RP=1 CY=10    PR=19 MO=19 TR=-232 TI=$SCRAM+LOFWP8 -        LS-32$
LSET RF=20 RP=1 CY=10    PR=20 MO=20 TR=+233 TI=$SCRAM+LOFWP9 +        LS-33$
LSET RF=3  RP=1 CY=10    PR=3  MO=3  TR=+234 TI=$SCRAM+LOFWP10+        LS-34$
LSET RF=5  RP=1 CY=1     PR=21 MO=21 TR=-235 TI=$SCRAM+SRVBLDN1-       LS-35$
LSET RF=21 RP=1 CY=1     PR=2  MO=2  TR=-236 TI=$SCRAM+SRVBLDN2-       LS-36$
LSET RF=22 RP=1 CY=1     PR=22 MO=22 TR=+237 TI=$Hydro Test +          LS-37$
LSET RF=2  RP=1 CY=1     PR=2  MO=2  TR=-238 TI=$Hydro Test -          LS-38$
LSET RF=23 RP=1 CY=289   PR=23 MO=23 TR=-239 TI=$SCRAM+TG+OPres1 -     LS-39$
LSET RF=24 RP=1 CY=289   PR=24 MO=24 TR=-240 TI=$SCRAM+TG+OPres2 -     LS-40$
```

```
LSET RF=25 RP=1 CY=289    PR=25 MO=25 TR=-241 TI=$SCRAM+TG+OPres3 -      LS-41$
LSET RF=30 RP=1 CY=300    PR=30 MO=30 TR=+242 TI=$HotSbyFWcyc +          LS-42$
LSET RF=3  RP=1 CY=300    PR=3  MO=3  TR=+243 TI=$HotSbyFWcyc +          LS-43$
*
LSET RF=6 CY=5 FL=1 PR=6 MO=402 TI=$NORMAL+OBE  LS-132$
LSET RF=6 CY=5 FL=1 PR=6 MO=403 TI=$NORMAL-OBE  LS-133$

**************************
**** RESPONSE SPECTRA****
**************************
*SSE response spectra conservatively used
SPEC FS=OBE EV=1 ME=3 FP=1 TI=$RESPONSE$
     LV=1 DX=1 DY=1 DZ=1
      DI=X
        0.30/0.125  0.80/0.300  2.00/0.650  3.00/0.725  3.50/1.000  4.40/1.200
        5.00/1.900  5.75/2.850  6.00/3.375  8.25/3.375  9.00/3.000 10.00/2.400
       14.00/1.325 19.00/1.600 21.00/1.000 22.00/0.800 30.00/0.700 36.00/0.650
      DI=Y
        0.30/0.075  1.25/0.250  1.75/0.325  2.40/0.450  2.75/0.475  3.80/0.500
        4.40/0.500  4.80/0.600  7.25/0.600  7.50/0.700  8.50/0.700 10.00/0.925
       12.00/1.450 16.00/1.900 18.00/1.700 20.00/0.750 25.00/0.450 30.00/0.350
       36.00/0.325 36.10/0.325 36.20/0.325 36.30/0.325 36.40/0.325 36.50/0.325
      DI=Z
        0.30/0.150  1.00/0.350  2.00/0.625  4.00/1.000  4.50/1.400  5.00/2.000
        5.75/2.950  6.00/3.450  6.25/3.800  8.75/3.800 10.00/2.625  12.0/2.150
       15.00/1.300 17.50/1.450 20.00/0.875 30.00/0.650 36.00/0.650 36.10/0.650
*****************************
**** MATERIAL PROPERTIES ****
*****************************
* SA-106 Grade B and SA-234 WPB
MATH CD=106 EX=0 TY=1 *C-Si
*MATD TE=-100 EH=30.2 EX=0 SM=20 SY=35
MATD TE=50   EH=29.6 EX=0 SM=20 SY=35
MATD TE=70   EH=29.5 EX=0   SM=20   SY=35
MATD TE=100  EH=29.3 EX=0.2 SM=20.0 SY=35
MATD TE=200  EH=28.8 EX=1.0 SM=20.0 SY=32.1
MATD TE=300  EH=28.3 EX=1.9 SM=20.0 SY=31
MATD TE=400  EH=27.7 EX=2.8 SM=20.0 SY=29.9
MATD TE=500  EH=27.3 EX=3.7 SM=18.9 SY=28.5
MATD TE=600  EH=26.7 EX=4.7 SM=17.3 SY=26.8
*** Cross Sectional Properties
*REGION I- LINE 16 INCH FDW-16 SCH. 120 Run from 5 to 10
*Anchor HD36 to HPCI brnch
CROS CD=1 OD=16.0  WT=1.218 MA=204.28
          SO=1  ST=1  IN=0
*FEEDWATER Valves - V2-27A, V2-28A, V2-29A
CROS CD=2 OD=24.0  WT=2.436 MA=0.12
          SO=1  ST=1  IN=0  KL=1
*REGION III- LINE 16 INCH FDW-16 SCH. 80
*Piping Downstream of Valve V2-29A TO FW TEE
CROS CD=3 OD=16.0  WT=0.843 MA=151.1
          SO=1  ST=1  IN=0
*REGION III- LINE 16 INCH FDW-16 SCH. 120
*Fittings Downstream of Valve V2-29A TO FW TEE
CROS CD=4 OD=16.0  WT=1.218 MA=204.28
          SO=1  ST=1  IN=0
```

```
*REGION IV & V- LINES 10 INCH INCH FDW-21 AND 10 INCH FDW-19 SCH. 120
*Piping Downstream of FW TEE TO NOZZLES
CROS CD=5 OD=10.75 WT=0.843 MA=98.12
          SO=1  ST=1  IN=0
*REGION II- LINE 14 INCH HPCI-15A SCH. 120 FROM NODE 10 TO 547
CROS CD=6 OD=14.0  WT=1.093 MA=161.35
          SO=1  ST=1  IN=1
*REGION II- HPCI Valves
CROS CD=7 OD=21.0  WT=2.186 MA=0.12
          SO=1  ST=1  IN=1  KL=1
*
**********************
* STRUCTURE AND LOADS
*-------------------------------------------------------------------------------
DESN  TE=400.0  PR=1900.0 *FEEDWATER AND HPCI PIPING
*-------------------------------------------------------------------------------
*BEGIN REGION 1
*--------------
*Same for all regions except II
OPER CA=1  TE=100 PR=1100
OPER CA=22 TE=100 PR=1563
OPER CA=28 TE=100 PR=1010
OPER CA=29 TE=100 PR=1010

*Same for all regions
OPER CA=2  TE=100 PR=50
OPER CA=19 TE=50  PR=675
OPER CA=31 TE=50  PR=885

*Unique
OPER CA=3  TE=150 PR=1010
OPER CA=4  TE=260 PR=1010
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=265 PR=1010
OPER CA=11 TE=150 PR=170
OPER CA=12 TE=150 PR=88
OPER CA=13 TE=392 PR=1190
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=150 PR=1135
OPER CA=16 TE=150 PR=1135
OPER CA=17 TE=150 PR=1060
OPER CA=18 TE=150 PR=1135

OPER CA=20 TE=150 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
OPER CA=27 TE=265 PR=1010
```

```
OPER CA=30 TE=125 PR=1010

*
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=200 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=200 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=150 TT=16164 FL=200 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=150 FT=100 TT=0 FL=1377 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=1377 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=9180 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=6885 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=6885 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=1377 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=1377 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=9180 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=9180 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=10098 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=275.4 IP=1025 FP=1025 TP=900
TRAN CA=219 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=200 IP=1025 FP=1025 TP=0
TRAN CA=220 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=200 IP=1025 FP=1025 TP=0
TRAN CA=221 IS=1 FS=1 IT=265 FT=150 TT=4140 FL=200 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=150 FT=150 TT=0 FL=200 IP=1025 FP=185 TP=0
TRAN CA=223 IS=1 FS=1 IT=150 FT=150 TT=0 FL=200 IP=185 FP=103 TP=0
TRAN CA=224 IS=1 FS=1 IT=150 FT=100 TT=8280 FL=200 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=392 TT=12 FL=200 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=392 FT=50 TT=0 FL=3672 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=150 TT=1380 FL=200 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=150 FT=150 TT=0 FL=200 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=150 FT=50 TT=0 FL=2754 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=150 TT=3060 FL=200 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=150 FT=150 TT=0 FL=200 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=150 FT=50 TT=0 FL=1560.6 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=150 TT=300 FL=200 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=150 FT=150 TT=8964 FL=200 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=10098 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=275.4 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=200 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=200 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=10098 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=275.4 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=275.4 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=125 TT=60 FL=200 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=125 FT=150 TT=210 FL=200 IP=1025 FP=1025 TP=210

PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=204 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
```

```
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=220 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=221 CO=27.6 DI=0.483 EX=6.4 * Tavg=208
PAIR CA=222 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=223 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=224 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=225 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=226 CO=27.5 DI=0.478 EX=6.4 * Tavg=221
PAIR CA=227 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=228 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=229 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=230 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=231 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=232 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=233 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=234 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.508 EX=6.4 * Tavg=113
PAIR CA=243 CO=27.6 DI=0.500 EX=6.4 * Tavg=138
*
*REGION I GEOMETRY
* RUN 1 FROM ANCHOR HD36 TO HPCI brnCH- FDW-16 LINE A
MATL CD=106
CROS CD=1
COOR PT=5    AX=0 AY=0 AZ=0 *ANCHOR HD36
JUNC PT=5
TANG PT=9    DZ=-2.75  EW=1
TANG PT=10   DZ=-1 *WELDING TEE PER ANSI B16.9
*-------------------------------------------------------------------------------
*END REGION I
*-------------------------------------------------------------------------------
*BEGIN REGION 3
*---------------
*OPER cards same as those for region I
*
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=200 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=200 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=150 TT=16164 FL=200 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=150 FT=100 TT=0 FL=1377 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=1377 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=9180 IP=1025 FP=1025 TP=1800
```

```
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=6885 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=6885 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=1377 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=1377 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=9180 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=9180 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=10098 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=275.4 IP=1025 FP=1025 TP=900
TRAN CA=219 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=200 IP=1025 FP=1025 TP=0
TRAN CA=220 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=200 IP=1025 FP=1025 TP=0
TRAN CA=221 IS=1 FS=1 IT=265 FT=150 TT=4140 FL=200 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=150 FT=150 TT=0 FL=200 IP=1025 FP=185 TP=0
TRAN CA=223 IS=1 FS=1 IT=150 FT=150 TT=0 FL=200 IP=185 FP=103 TP=0
TRAN CA=224 IS=1 FS=1 IT=150 FT=100 TT=8280 FL=200 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=392 TT=12 FL=200 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=392 FT=50 TT=0 FL=3672 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=150 TT=1380 FL=200 IP=1150 FP=1150 TP=1380
TRAN CA=228 *IS=1 FS=1 IT=150 FT=150 TT=0 FL=200 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=150 FT=50 TT=0 FL=2754 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=150 TT=3060 FL=200 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=150 FT=150 TT=0 FL=200 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=150 FT=50 TT=0 FL=1560.6 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=150 TT=300 FL=200 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=150 FT=150 TT=8964 FL=200 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=10098 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=275.4 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=200 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=200 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=10098 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=275.4 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=275.4 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=125 TT=60 FL=200 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=125 FT=150 TT=210 FL=200 IP=1025 FP=1025 TP=210

*
PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=204 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
```

```
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=220 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=221 CO=27.6 DI=0.483 EX=6.4 * Tavg=208
PAIR CA=222 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=223 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=224 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=225 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=226 CO=27.5 DI=0.478 EX=6.4 * Tavg=221
PAIR CA=227 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=228 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=229 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=230 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=231 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=232 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=233 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=234 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.508 EX=6.4 * Tavg=113
PAIR CA=243 CO=27.6 DI=0.500 EX=6.4 * Tavg=138

*
*REGION III GEOMETRY
CROS CD=1
*JUNC PT=10
TANG PT=11  DZ=-1  EW=1
TANG PT=15  DZ=-4.17
TANG PT=20  DZ=-0.333  EW=1  *TA=1
CROS CD=2
VALV PT=22  DZ=-1.333 PL=1 MA=2.7  *VALVE V2-27A
VALV PT=25  DZ=-1.333 PL=2  EW=1  *TA=1
CROS CD=1
TANG PT=30  DZ=-2.792
LUMP PT=30  MA=1.285
TANG PT=38  DZ=-4.6
TANG PT=40  DZ=-6.317
TANG PT=45  DZ=-0.625  EW=1  *TA=1
CROS CD=2
VALV PT=47  DZ=-1.792 PL=1 MA=2.7  *VALVE V2-28A
VALV PT=50  DZ=-1.792 PL=2  EW=1  *TA=1
CROS CD=1
*TANG PT=55  DZ=-2.791  EW=1
TANG PT=55  DZ=-.791 EW=1
*BRAD PT=65  RA=2  SD=2  EW=1 Used this to determine midpoint viw .prd output
BEND PT=60 X1=0 Y1=0 Z1=-.828 X2=0 Y2=.586 Z2=-.586
BEND PT=65 X1=0 Y1=.586 Z1=-.586 X2=0 Y2=.828 Z2=0
*TANG PT=67  DY=2.084  EW=1  *TA=1
TANG PT=67  DY=.084
CROS CD=2
VALV PT=70  DY=1.333 PL=1 MA=3.25  *VALVE V2-29A
```

```
VALV PT=75  DY=1.333 PL=2  EW=1  *TA=1
CROS CD=3
TANG PT=78  DY=1.25
TANG PT=80  DY=3.5
TANG PT=82  DY=2.667  EW=1
CROS CD=4
BRAD PT=85  RA=2  EW=1
CROS CD=3
TANG PT=90  DX=2.875
TANG PT=95  DX=2.875  EW=1
CROS CD=4
BRAD PT=100 RA=2  EW=1
CROS CD=3
TANG PT=105 DX=1.12  DZ=-1.12
TANG PT=110 DX=3.477 DZ=-3.477  EW=1
CROS CD=4
TANG PT=115 DX=0.7071 DZ=-0.7071 EW=1
*
*-------------------------------------------------------------------------------
*END REGION III
*-------------------------------------------------------------------------------
*BEGIN REGION IV
*---------------
*OPER cards same as those for regions I and III
*
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=100 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=150 TT=16164 FL=100 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=150 FT=100 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=688.5 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=688.5 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=4590 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=4590 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=1025 FP=1025 TP=900
TRAN CA=219 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=220 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=221 IS=1 FS=1 IT=265 FT=150 TT=4140 FL=100 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=150 FT=150 TT=0 FL=100 IP=1025 FP=185 TP=0
TRAN CA=223 IS=1 FS=1 IT=150 FT=150 TT=0 FL=100 IP=185 FP=103 TP=0
TRAN CA=224 IS=1 FS=1 IT=150 FT=100 TT=8280 FL=100 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=392 TT=12 FL=100 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=392 FT=50 TT=0 FL=1836 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=150 TT=1380 FL=100 IP=1150 FP=1150 TP=1380
TRAN CA=228 *IS=1 FS=1 IT=150 FT=150 TT=0 FL=100 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=150 FT=50 TT=0 FL=1377 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=150 TT=3060 FL=100 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=150 FT=150 TT=0 FL=100 IP=1075 FP=1150 TP=0
```

```
TRAN CA=232 IS=1 FS=1 IT=150 FT=50 TT=0 FL=780.3 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=150 TT=300 FL=100 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=150 FT=150 TT=8964 FL=100 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=5049 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=125 TT=60 FL=100 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=125 FT=150 TT=210 FL=100 IP=1025 FP=1025 TP=210

*
PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=204 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=220 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=221 CO=27.6 DI=0.483 EX=6.4 * Tavg=208
PAIR CA=222 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=223 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=224 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=225 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=226 CO=27.5 DI=0.478 EX=6.4 * Tavg=221
PAIR CA=227 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=228 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=229 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=230 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=231 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=232 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=233 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=234 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.508 EX=6.4 * Tavg=113
```

```
PAIR CA=243 CO=27.6 DI=0.500 EX=6.4 * Tavg=138

*
*REGION IV GEOMETRY DOWNSTREAM OF FW brnCH TEE/REDUCER - 10 INCH PIPING
*RUN FROM FW TEE TO ELBOW BEFORE NOZZLE NBA, NODE 275
CROS CD=4
TANG PT=170  DX=0.7071  DZ=-0.7071  EW=1
ERED PT=175  DX=0.825 DZ=-0.825  AN=30
CROS CD=5
*RUN FROM FW TEE TO ELBOW BEFORE NOZZLE N4B, NODE 152
BEND PT=190  X1=4.813  Y1=0  Z1=-4.813  X2=1.283  Y2=0  Z2=-6.685
BEND PT=200  X1=0.449  Y1=0  Z1=-2.342  X2=-0.059  Y2=0  Z2=-2.384
STRU PT=201 DX=.198 DZ=.9802
STRU PT=202 DX=.198 DZ=.9802
ANCH PT=202
JUNC PT=200
BEND PT=220  X1=-0.2196  Y1=0  Z1=-8.859  X2=-6.266  Y2=0  Z2=-6.266
TANG PT=225  DX=-0.3388  DZ=-0.3388
TANG PT=230  DX=-0.3388  DZ=-0.3388
TANG PT=235  DX=-1.002  DZ=-1.002
BRAD PT=240  RA=1.25
TANG PT=245  DX=-2.693  DY=3.196  DZ=2.693
TANG PT=250  DX=-2.693  DY=3.196  DZ=2.693
TANG PT=255  DX=-2.693  DY=3.196  DZ=2.693
BRAD PT=260  RA=1.25
TANG PT=265  DY=3.958
TANG PT=270  DY=3.959
*-------------------------------------------------------------------------------
*END REGION IV
*-------------------------------------------------------------------------------
*BEGIN REGION IVa
*-------------------------------------------------------------------------------
OPER CA=3  TE=283 PR=1010
OPER CA=4  TE=260 PR=1010
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=360 PR=1010
OPER CA=11 TE=225 PR=170
OPER CA=12 TE=210 PR=88
OPER CA=13 TE=450 PR=1190
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=247 PR=1135
OPER CA=16 TE=288 PR=1135
OPER CA=17 TE=247 PR=1060
OPER CA=18 TE=283 PR=1135

OPER CA=20 TE=200 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
```

```
OPER CA=27 TE=323 PR=1010
OPER CA=30 TE=180 PR=1010
*
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=100 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=283 TT=16164 FL=100 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=283 FT=100 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=688.5 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=688.5 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=4590 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=4590 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=1025 FP=1025 TP=900
TRAN CA=219 IS=1 FS=1 IT=265 FT=323 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=220 IS=1 FS=1 IT=323 FT=360 TT=3924 FL=100 IP=1025 FP=1025 TP=3924
TRAN CA=221 IS=1 FS=1 IT=360 FT=283 TT=4140 FL=100 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=283 FT=225 TT=6264 FL=100 IP=1025 FP=185 TP=6264
TRAN CA=223 IS=1 FS=1 IT=225 FT=210 TT=600 FL=100 IP=185 FP=103 TP=600
TRAN CA=224 IS=1 FS=1 IT=210 FT=100 TT=8280 FL=100 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=450 TT=12 FL=100 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=450 FT=50 TT=0 FL=1836 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=247 TT=1380 FL=100 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=247 FT=288 TT=0 FL=100 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=288 FT=50 TT=0 FL=1377 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=247 TT=3060 FL=100 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=247 FT=283 TT=0 FL=100 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=283 FT=50 TT=0 FL=780.3 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=200 TT=300 FL=100 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=200 FT=283 TT=8964 FL=100 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=5049 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=180 TT=60 FL=100 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=180 FT=283 TT=210 FL=100 IP=1025 FP=1025 TP=210


PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.488 EX=6.4 * Tavg=192
PAIR CA=204 CO=27.6 DI=0.488 EX=6.4 * Tavg=192
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
```

```
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.2 DI=0.455 EX=6.4 * Tavg=294
PAIR CA=220 CO=27.0 DI=0.442 EX=6.4 * Tavg=342
PAIR CA=221 CO=27.1 DI=0.447 EX=6.4 * Tavg=322
PAIR CA=222 CO=27.4 DI=0.466 EX=6.4 * Tavg=254
PAIR CA=223 CO=27.5 DI=0.479 EX=6.4 * Tavg=218
PAIR CA=224 CO=27.6 DI=0.495 EX=6.4 * Tavg=155
PAIR CA=225 CO=26.5 DI=0.422 EX=6.4 * Tavg=421
PAIR CA=226 CO=27.4 DI=0.467 EX=6.4 * Tavg=250
PAIR CA=227 CO=27.6 DI=0.496 EX=6.4 * Tavg=149
PAIR CA=228 CO=27.3 DI=0.462 EX=6.4 * Tavg=268
PAIR CA=229 CO=27.6 DI=0.492 EX=6.4 * Tavg=169
PAIR CA=230 CO=27.6 DI=0.496 EX=6.4 * Tavg=149
PAIR CA=231 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=232 CO=27.6 DI=0.493 EX=6.4 * Tavg=167
PAIR CA=233 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=234 CO=27.4 DI=0.470 EX=6.4 * Tavg=242
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.499 EX=6.4 * Tavg=140
PAIR CA=243 CO=27.5 DI=0.474 EX=6.4 * Tavg=232


TANG PT=275  DY=6.583  EW=0
*
*-------------------------------------------------------------------------------
*END REGION IVa
*-------------------------------------------------------------------------------
*BEGIN REGION IVb
*-------------------------------------------------------------------------------
OPER CA=3  TE=416 PR=1010
OPER CA=4  TE=260 PR=1010
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=454 PR=1010
OPER CA=11 TE=300 PR=170
OPER CA=12 TE=270 PR=88
OPER CA=13 TE=507 PR=1190
OPER CA=14 TE=50  PR=1135
```

```
OPER CA=15 TE=343 PR=1135
OPER CA=16 TE=427 PR=1135
OPER CA=17 TE=343 PR=1060
OPER CA=18 TE=416 PR=1135

OPER CA=20 TE=250 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
OPER CA=27 TE=382 PR=1010
OPER CA=30 TE=235 PR=1010
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=100 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=416 TT=16164 FL=100 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=416 FT=100 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=688.5 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=688.5 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=4590 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=4590 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=1025 FP=1025 TP=900
TRAN CA=219 IS=1 FS=1 IT=265 FT=382 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=220 IS=1 FS=1 IT=382 FT=454 TT=3924 FL=100 IP=1025 FP=1025 TP=3924
TRAN CA=221 IS=1 FS=1 IT=454 FT=416 TT=4140 FL=100 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=416 FT=300 TT=6264 FL=100 IP=1025 FP=185 TP=6264
TRAN CA=223 IS=1 FS=1 IT=300 FT=270 TT=600 FL=100 IP=185 FP=103 TP=600
TRAN CA=224 IS=1 FS=1 IT=270 FT=100 TT=8280 FL=100 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=507 TT=12 FL=100 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=507 FT=50 TT=0 FL=1836 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=343 TT=1380 FL=100 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=343 FT=427 TT=0 FL=100 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=427 FT=50 TT=0 FL=1377 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=343 TT=3060 FL=100 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=343 FT=416 TT=0 FL=100 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=416 FT=50 TT=0 FL=780.3 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=250 TT=300 FL=100 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=250 FT=416 TT=8964 FL=100 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=5049 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=235 TT=60 FL=100 IP=1025 FP=1025 TP=60
```

```
TRAN CA=243 IS=1 FS=1 IT=235 FT=416 TT=210 FL=100 IP=1025 FP=1025 TP=210


PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.4 DI=0.465 EX=6.4 * Tavg=258
PAIR CA=204 CO=27.4 DI=0.465 EX=6.4 * Tavg=258
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.1 DI=0.447 EX=6.4 * Tavg=324
PAIR CA=220 CO=26.6 DI=0.423 EX=6.4 * Tavg=418
PAIR CA=221 CO=26.4 DI=0.418 EX=6.4 * Tavg=435
PAIR CA=222 CO=27.0 DI=0.438 EX=6.4 * Tavg=358
PAIR CA=223 CO=27.3 DI=0.457 EX=6.4 * Tavg=285
PAIR CA=224 CO=27.6 DI=0.489 EX=6.4 * Tavg=185
PAIR CA=225 CO=26.3 DI=0.413 EX=6.4 * Tavg=450
PAIR CA=226 CO=27.3 DI=0.459 EX=6.4 * Tavg=279
PAIR CA=227 CO=27.6 DI=0.487 EX=6.4 * Tavg=197
PAIR CA=228 CO=26.8 DI=0.432 EX=6.4 * Tavg=385
PAIR CA=229 CO=27.4 DI=0.471 EX=6.4 * Tavg=239
PAIR CA=230 CO=27.6 DI=0.487 EX=6.4 * Tavg=197
PAIR CA=231 CO=26.8 DI=0.433 EX=6.4 * Tavg=380
PAIR CA=232 CO=27.5 DI=0.473 EX=6.4 * Tavg=233
PAIR CA=233 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=234 CO=27.1 DI=0.444 EX=6.4 * Tavg=333
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.492 EX=6.4 * Tavg=168
PAIR CA=243 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
*
TANG PT=280  DY=6.583
*-------------------------------------------------------------------------------
*END REGION IVb
*-------------------------------------------------------------------------------
*BEGIN REGION V TO NOZZLE N4A, NODE 290
*-------------------------------------------------------------------------------

OPER CA=3  TE=549 PR=1010
OPER CA=4  TE=260 PR=1010
```

```
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=549 PR=1010
OPER CA=11 TE=375 PR=170
OPER CA=12 TE=330 PR=88
OPER CA=13 TE=565 PR=1190
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=440 PR=1135
OPER CA=16 TE=565 PR=1135
OPER CA=17 TE=440 PR=1060
OPER CA=18 TE=549 PR=1135

OPER CA=20 TE=300 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
OPER CA=27 TE=440 PR=1010
OPER CA=30 TE=290 PR=1010
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=100 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=549 TT=16164 FL=100 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=549 FT=100 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=688.5 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=688.5 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=4590 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=4590 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=1025 FP=1025 TP=900
TRAN CA=219 IS=1 FS=1 IT=265 FT=440 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=220 IS=1 FS=1 IT=440 FT=549 TT=3924 FL=100 IP=1025 FP=1025 TP=3924
TRAN CA=221 *IS=1 FS=1 IT=549 FT=549 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=222 IS=1 FS=1 IT=549 FT=375 TT=6264 FL=100 IP=1025 FP=185 TP=6264
TRAN CA=223 IS=1 FS=1 IT=375 FT=330 TT=600 FL=100 IP=185 FP=103 TP=600
TRAN CA=224 IS=1 FS=1 IT=330 FT=100 TT=8280 FL=100 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=565 TT=12 FL=100 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=565 FT=50 TT=0 FL=1836 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=440 TT=1380 FL=100 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=440 FT=565 TT=0 FL=100 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=565 FT=50 TT=0 FL=1377 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=440 TT=3060 FL=100 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=440 FT=549 TT=0 FL=100 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=549 FT=50 TT=0 FL=780.3 IP=1150 FP=690 TP=0
```

```
TRAN CA=233 IS=1 FS=1 IT=50 FT=300 TT=300 FL=100 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=300 FT=549 TT=8964 FL=100 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=5049 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=290 TT=60 FL=100 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=290 FT=549 TT=210 FL=100 IP=1025 FP=1025 TP=210

PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.1 DI=0.447 EX=6.4 * Tavg=325
PAIR CA=204 CO=27.1 DI=0.447 EX=6.4 * Tavg=325
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.0 DI=0.439 EX=6.4 * Tavg=353
PAIR CA=220 CO=25.9 DI=0.400 EX=6.4 * Tavg=495
PAIR CA=221 CO=25.5 DI=0.387 EX=6.4 * Tavg=549
PAIR CA=222 CO=26.2 DI=0.409 EX=6.4 * Tavg=462
PAIR CA=223 CO=27.0 DI=0.439 EX=6.4 * Tavg=353
PAIR CA=224 CO=27.5 DI=0.480 EX=6.4 * Tavg=215
PAIR CA=225 CO=26.1 DI=0.404 EX=6.4 * Tavg=479
PAIR CA=226 CO=27.2 DI=0.451 EX=6.4 * Tavg=308
PAIR CA=227 CO=27.4 DI=0.469 EX=6.4 * Tavg=245
PAIR CA=228 CO=25.9 DI=0.397 EX=6.4 * Tavg=503
PAIR CA=229 CO=27.2 DI=0.451 EX=6.4 * Tavg=308
PAIR CA=230 CO=27.4 DI=0.469 EX=6.4 * Tavg=245
PAIR CA=231 CO=25.9 DI=0.400 EX=6.4 * Tavg=495
PAIR CA=232 CO=27.2 DI=0.453 EX=6.4 * Tavg=300
PAIR CA=233 CO=27.6 DI=0.491 EX=6.4 * Tavg=175
PAIR CA=234 CO=26.5 DI=0.421 EX=6.4 * Tavg=425
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.487 EX=6.4 * Tavg=195
PAIR CA=243 CO=26.5 DI=0.422 EX=6.4 * Tavg=420
```

```
BRAD PT=285  RA=1.25
TANG PT=290  DX=-4.007  DZ=4.007  EW=1
NOZZ PT=290   *NOZZLE N4A
AMVT  CA=1 PT=290 DX=0.0196 DY=0.1069 DZ=-0.0196
AMVT  CA=2 PT=290 DX=0.0196 DY=0.1069 DZ=-0.0196
AMVT  CA=3 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT  CA=4 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT  CA=5 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT  CA=6 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT  CA=7 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT  CA=8 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT  CA=9 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT CA=10 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT CA=11 PT=290 DX=0.1993 DY=1.0867 DZ=-0.1993
AMVT CA=12 PT=290 DX=0.1699 DY=0.9264 DZ=-0.1699
AMVT CA=13 PT=290 DX=0.3234 DY=1.7637 DZ=-0.3234
AMVT CA=14 PT=290 DX=0.3234 DY=1.7637 DZ=-0.3234
AMVT CA=15 PT=290 DX=0.3234 DY=1.7637 DZ=-0.3234
AMVT CA=16 PT=290 DX=0.3234 DY=1.7637 DZ=-0.3234
AMVT CA=17 PT=290 DX=0.3169 DY=1.7281 DZ=-0.3169
AMVT CA=18 PT=290 DX=0.3234 DY=1.7637 DZ=-0.3234
AMVT CA=19 PT=290 DX=0.2823 DY=1.5392 DZ=-0.2823
AMVT CA=20 PT=290 DX=0.2823 DY=1.5392 DZ=-0.2823
AMVT CA=21 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT CA=22 PT=290 DX=0.0196 DY=0.1069 DZ=-0.0196
AMVT CA=23 PT=290 DX=0.3463 DY=1.8884 DZ=-0.3463
AMVT CA=24 PT=290 DX=0.3064 DY=1.6711 DZ=-0.3064
AMVT CA=25 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT CA=26 PT=290 DX=0.3064 DY=1.6711 DZ=-0.3064
AMVT CA=27 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT CA=28 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT CA=29 PT=290 DX=0.3064 DY=1.6711 DZ=-0.3064
AMVT CA=30 PT=290 DX=0.3130 DY=1.7067 DZ=-0.3130
AMVT CA=31 PT=290 DX=0.3019 DY=1.6461 DZ=-0.3019

AMVT CA=32 PT=290 DX=-.09   DY=.015   DZ=-.093
*-------------------------------------------------------------------------
*END REGION V
*--------------
*BEGIN REGION IV
*--------------
OPER CA=3  TE=150 PR=1010
OPER CA=4  TE=260 PR=1010
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=265 PR=1010
OPER CA=11 TE=150 PR=170
OPER CA=12 TE=150 PR=88
OPER CA=13 TE=392 PR=1190
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=150 PR=1135
OPER CA=16 TE=150 PR=1135
OPER CA=17 TE=150 PR=1060
```

```
OPER CA=18 TE=150 PR=1135

OPER CA=20 TE=150 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
OPER CA=27 TE=265 PR=1010

OPER CA=30 TE=125 PR=1010
*
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=100 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=150 TT=16164 FL=100 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=150 FT=100 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=688.5 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=688.5 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=4590 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=4590 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=1025 FP=1025 TP=900
TRAN CA=219 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=220 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=221 IS=1 FS=1 IT=265 FT=150 TT=4140 FL=100 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=150 FT=150 TT=0 FL=100 IP=1025 FP=185 TP=0
TRAN CA=223 IS=1 FS=1 IT=150 FT=150 TT=0 FL=100 IP=185 FP=103 TP=0
TRAN CA=224 IS=1 FS=1 IT=150 FT=100 TT=8280 FL=100 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=392 TT=12 FL=100 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=392 FT=50 TT=0 FL=1836 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=150 TT=1380 FL=100 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=150 FT=150 TT=0 FL=100 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=150 FT=50 TT=0 FL=1377 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=150 TT=3060 FL=100 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=150 FT=150 TT=0 FL=100 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=150 FT=50 TT=0 FL=780.3 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=150 TT=300 FL=100 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=150 FT=150 TT=8964 FL=100 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=5049 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=125 TT=60 FL=100 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=125 FT=150 TT=210 FL=100 IP=1025 FP=1025 TP=210
```

```
*
PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=204 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=220 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=221 CO=27.6 DI=0.483 EX=6.4 * Tavg=208
PAIR CA=222 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=223 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=224 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=225 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=226 CO=27.5 DI=0.478 EX=6.4 * Tavg=221
PAIR CA=227 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=228 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=229 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=230 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=231 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=232 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=233 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=234 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.508 EX=6.4 * Tavg=113
PAIR CA=243 CO=27.6 DI=0.500 EX=6.4 * Tavg=138

*
*REGION IV GEOMETRY DOWNSTREAM OF FW brnCH TEE/REDUCER - 10 INCH PIPING
*RUN FROM FW TEE TO ELBOW BEFORE NOZZLE N4A, NODE 155
JUNC PT=115
CROS CD=5
BRAN PT=120  DX=-0.5022  DY=0.596   DZ=-0.5022  TE=1 EW=1
TANG PT=125  DX=-2.594   DY=3.078   DZ=-2.594
TANG PT=130  DX=-2.594   DY=3.078   DZ=-2.594
TANG PT=135  DX=-2.594   DY=3.078   DZ=-2.594  EW=0
```

```
BRAD PT=140  RA=1.25  EW=0
TANG PT=142  DY=4
TANG PT=145  DY=4
TANG PT=150  DY=2.53
*-------------------------------------------------------------------------------
*END REGION IV
*-------------------------------------------------------------------------------
*BEGIN REGION IVa
*-------------------------------------------------------------------------------
OPER CA=3  TE=283 PR=1010
OPER CA=4  TE=260 PR=1010
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=360 PR=1010
OPER CA=11 TE=225 PR=170
OPER CA=12 TE=210 PR=88
OPER CA=13 TE=450 PR=1190
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=247 PR=1135
OPER CA=16 TE=288 PR=1135
OPER CA=17 TE=247 PR=1060
OPER CA=18 TE=283 PR=1135

OPER CA=20 TE=200 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
OPER CA=27 TE=323 PR=1010
OPER CA=30 TE=180 PR=1010
*
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=100 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=283 TT=16164 FL=100 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=283 FT=100 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=688.5 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=688.5 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=4590 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=4590 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=1025 FP=1025 TP=900
TRAN CA=219 IS=1 FS=1 IT=265 FT=323 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=220 IS=1 FS=1 IT=323 FT=360 TT=3924 FL=100 IP=1025 FP=1025 TP=3924
```

```
TRAN CA=221 IS=1 FS=1 IT=360 FT=283 TT=4140 FL=100 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=283 FT=225 TT=6264 FL=100 IP=1025 FP=185 TP=6264
TRAN CA=223 IS=1 FS=1 IT=225 FT=210 TT=600 FL=100 IP=185 FP=103 TP=600
TRAN CA=224 IS=1 FS=1 IT=210 FT=100 TT=8280 FL=100 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=450 TT=12 FL=100 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=450 FT=50 TT=0 FL=1836 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=247 TT=1380 FL=100 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=247 FT=288 TT=0 FL=100 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=288 FT=50 TT=0 FL=1377 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=247 TT=3060 FL=100 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=247 FT=283 TT=0 FL=100 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=283 FT=50 TT=0 FL=780.3 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=200 TT=300 FL=100 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=200 FT=283 TT=8964 FL=100 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=5049 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=180 TT=60 FL=100 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=180 FT=283 TT=210 FL=100 IP=1025 FP=1025 TP=210


PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.488 EX=6.4 * Tavg=192
PAIR CA=204 CO=27.6 DI=0.488 EX=6.4 * Tavg=192
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.2 DI=0.455 EX=6.4 * Tavg=294
PAIR CA=220 CO=27.0 DI=0.442 EX=6.4 * Tavg=342
PAIR CA=221 CO=27.1 DI=0.447 EX=6.4 * Tavg=322
PAIR CA=222 CO=27.4 DI=0.466 EX=6.4 * Tavg=254
PAIR CA=223 CO=27.5 DI=0.479 EX=6.4 * Tavg=218
PAIR CA=224 CO=27.6 DI=0.495 EX=6.4 * Tavg=155
PAIR CA=225 CO=26.5 DI=0.422 EX=6.4 * Tavg=421
PAIR CA=226 CO=27.4 DI=0.467 EX=6.4 * Tavg=250
PAIR CA=227 CO=27.6 DI=0.496 EX=6.4 * Tavg=149
PAIR CA=228 CO=27.3 DI=0.462 EX=6.4 * Tavg=268
PAIR CA=229 CO=27.6 DI=0.492 EX=6.4 * Tavg=169
PAIR CA=230 CO=27.6 DI=0.496 EX=6.4 * Tavg=149
PAIR CA=231 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
```

```
PAIR CA=232 CO=27.6 DI=0.493 EX=6.4 * Tavg=167
PAIR CA=233 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=234 CO=27.4 DI=0.470 EX=6.4 * Tavg=242
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.499 EX=6.4 * Tavg=140
PAIR CA=243 CO=27.5 DI=0.474 EX=6.4 * Tavg=232

*
TANG PT=152  DY=6.53  EW=0
*
*-------------------------------------------------------------------------------
*END REGION IVa
*-------------------------------------------------------------------------------
*BEGIN REGION IVb
*-------------------------------------------------------------------------------
OPER CA=3  TE=416 PR=1010
OPER CA=4  TE=260 PR=1010
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=454 PR=1010
OPER CA=11 TE=300 PR=170
OPER CA=12 TE=270 PR=88
OPER CA=13 TE=507 PR=1190
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=343 PR=1135
OPER CA=16 TE=427 PR=1135
OPER CA=17 TE=343 PR=1060
OPER CA=18 TE=416 PR=1135

OPER CA=20 TE=250 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
OPER CA=27 TE=382 PR=1010
OPER CA=30 TE=235 PR=1010
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=100 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=416 TT=16164 FL=100 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=416 FT=100 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
```

```
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=688.5 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=688.5 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=4590 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=4590 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=1025 FP=1025 TP=900
TRAN CA=219 IS=1 FS=1 IT=265 FT=382 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=220 IS=1 FS=1 IT=382 FT=454 TT=3924 FL=100 IP=1025 FP=1025 TP=3924
TRAN CA=221 IS=1 FS=1 IT=454 FT=416 TT=4140 FL=100 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=416 FT=300 TT=6264 FL=100 IP=1025 FP=185 TP=6264
TRAN CA=223 IS=1 FS=1 IT=300 FT=270 TT=600 FL=100 IP=185 FP=103 TP=600
TRAN CA=224 IS=1 FS=1 IT=270 FT=100 TT=8280 FL=100 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=507 TT=12 FL=100 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=507 FT=50 TT=0 FL=1836 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=343 TT=1380 FL=100 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=343 FT=427 TT=0 FL=100 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=427 FT=50 TT=0 FL=1377 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=343 TT=3060 FL=100 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=343 FT=416 TT=0 FL=100 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=416 FT=50 TT=0 FL=780.3 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=250 TT=300 FL=100 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=250 FT=416 TT=8964 FL=100 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=5049 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=235 TT=60 FL=100 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=235 FT=416 TT=210 FL=100 IP=1025 FP=1025 TP=210

PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.4 DI=0.465 EX=6.4 * Tavg=258
PAIR CA=204 CO=27.4 DI=0.465 EX=6.4 * Tavg=258
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.1 DI=0.447 EX=6.4 * Tavg=324
PAIR CA=220 CO=26.6 DI=0.423 EX=6.4 * Tavg=418
PAIR CA=221 CO=26.4 DI=0.418 EX=6.4 * Tavg=435
```

```
PAIR CA=222 CO=27.0 DI=0.438 EX=6.4 * Tavg=358
PAIR CA=223 CO=27.3 DI=0.457 EX=6.4 * Tavg=285
PAIR CA=224 CO=27.6 DI=0.489 EX=6.4 * Tavg=185
PAIR CA=225 CO=26.3 DI=0.413 EX=6.4 * Tavg=450
PAIR CA=226 CO=27.3 DI=0.459 EX=6.4 * Tavg=279
PAIR CA=227 CO=27.6 DI=0.487 EX=6.4 * Tavg=197
PAIR CA=228 CO=26.8 DI=0.432 EX=6.4 * Tavg=385
PAIR CA=229 CO=27.4 DI=0.471 EX=6.4 * Tavg=239
PAIR CA=230 CO=27.6 DI=0.487 EX=6.4 * Tavg=197
PAIR CA=231 CO=26.8 DI=0.433 EX=6.4 * Tavg=380
PAIR CA=232 CO=27.5 DI=0.473 EX=6.4 * Tavg=233
PAIR CA=233 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=234 CO=27.1 DI=0.444 EX=6.4 * Tavg=333
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.492 EX=6.4 * Tavg=168
PAIR CA=243 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
*
TANG PT=155  DY=6.523
*--------------
*END REGION IVb
*-----------------------------------------------
*BEGIN REGION V GEOMETRY TO NOZZLE N4B, NODE 165
*-----------------------------------------------
OPER CA=3  TE=549 PR=1010
OPER CA=4  TE=260 PR=1010
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=549 PR=1010
OPER CA=11 TE=375 PR=170
OPER CA=12 TE=330 PR=88
OPER CA=13 TE=565 PR=1190
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=440 PR=1135
OPER CA=16 TE=565 PR=1135
OPER CA=17 TE=440 PR=1060
OPER CA=18 TE=549 PR=1135

OPER CA=20 TE=300 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
OPER CA=27 TE=440 PR=1010
OPER CA=30 TE=290 PR=1010
```

```
TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=100 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=549 TT=16164 FL=100 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=549 FT=100 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=688.5 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=4590 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=3442.5 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=688.5 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=688.5 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=2295 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=4590 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=4590 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=1025 FP=1025 TP=900
TRAN CA=219 IS=1 FS=1 IT=265 FT=440 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=220 IS=1 FS=1 IT=440 FT=549 TT=3924 FL=100 IP=1025 FP=1025 TP=3924
TRAN CA=221 *IS=1 FS=1 IT=549 FT=549 TT=0 FL=100 IP=1025 FP=1025 TP=0
TRAN CA=222 IS=1 FS=1 IT=549 FT=375 TT=6264 FL=100 IP=1025 FP=185 TP=6264
TRAN CA=223 IS=1 FS=1 IT=375 FT=330 TT=600 FL=100 IP=185 FP=103 TP=600
TRAN CA=224 IS=1 FS=1 IT=330 FT=100 TT=8280 FL=100 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=565 TT=12 FL=100 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=565 FT=50 TT=0 FL=1836 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=440 TT=1380 FL=100 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=440 FT=565 TT=0 FL=100 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=565 FT=50 TT=0 FL=1377 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=440 TT=3060 FL=100 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=440 FT=549 TT=0 FL=100 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=549 FT=50 TT=0 FL=780.3 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=300 TT=300 FL=100 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=300 FT=549 TT=8964 FL=100 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=5049 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=137.7 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=100 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=5049 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=137.7 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=290 TT=60 FL=100 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=290 FT=549 TT=210 FL=100 IP=1025 FP=1025 TP=210

PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.1 DI=0.447 EX=6.4 * Tavg=325
PAIR CA=204 CO=27.1 DI=0.447 EX=6.4 * Tavg=325
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
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PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.0 DI=0.439 EX=6.4 * Tavg=353
PAIR CA=220 CO=25.9 DI=0.400 EX=6.4 * Tavg=495
PAIR CA=221 CO=25.5 DI=0.387 EX=6.4 * Tavg=549
PAIR CA=222 CO=26.2 DI=0.409 EX=6.4 * Tavg=462
PAIR CA=223 CO=27.0 DI=0.439 EX=6.4 * Tavg=353
PAIR CA=224 CO=27.5 DI=0.480 EX=6.4 * Tavg=215
PAIR CA=225 CO=26.1 DI=0.404 EX=6.4 * Tavg=479
PAIR CA=226 CO=27.2 DI=0.451 EX=6.4 * Tavg=308
PAIR CA=227 CO=27.4 DI=0.469 EX=6.4 * Tavg=245
PAIR CA=228 CO=25.9 DI=0.397 EX=6.4 * Tavg=503
PAIR CA=229 CO=27.2 DI=0.451 EX=6.4 * Tavg=308
PAIR CA=230 CO=27.4 DI=0.469 EX=6.4 * Tavg=245
PAIR CA=231 CO=25.9 DI=0.400 EX=6.4 * Tavg=495
PAIR CA=232 CO=27.2 DI=0.453 EX=6.4 * Tavg=300
PAIR CA=233 CO=27.6 DI=0.491 EX=6.4 * Tavg=175
PAIR CA=234 CO=26.5 DI=0.421 EX=6.4 * Tavg=425
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.487 EX=6.4 * Tavg=195
PAIR CA=243 CO=26.5 DI=0.422 EX=6.4 * Tavg=420
BRAD PT=160  RA=1.25
TANG PT=165  DX=-4.007  DZ=-4.007  EW=1
NOZZ PT=165   *NOZZLE N4B
AMVT CA=1  PT=165 DX=0.0196 DY=0.1069 DZ=0.0196
AMVT CA=2  PT=165 DX=0.0196 DY=0.1069 DZ=0.0196
AMVT CA=3  PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=4  PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=5  PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=6  PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=7  PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=8  PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=9  PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=10 PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=11 PT=165 DX=0.1993 DY=1.0867 DZ=0.1993
AMVT CA=12 PT=165 DX=0.1699 DY=0.9264 DZ=0.1699
AMVT CA=13 PT=165 DX=0.3234 DY=1.7637 DZ=0.3234
AMVT CA=14 PT=165 DX=0.3234 DY=1.7637 DZ=0.3234
AMVT CA=15 PT=165 DX=0.3234 DY=1.7637 DZ=0.3234
AMVT CA=16 PT=165 DX=0.3234 DY=1.7637 DZ=0.3234
AMVT CA=17 PT=165 DX=0.3169 DY=1.7281 DZ=0.3169
AMVT CA=18 PT=165 DX=0.3234 DY=1.7637 DZ=0.3234
AMVT CA=19 PT=165 DX=0.2823 DY=1.5392 DZ=0.2823
AMVT CA=20 PT=165 DX=0.2823 DY=1.5392 DZ=0.2823
AMVT CA=21 PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=22 PT=165 DX=0.0196 DY=0.1069 DZ=0.0196
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AMVT CA=23 PT=165 DX=0.3463 DY=1.8884 DZ=0.3463
AMVT CA=24 PT=165 DX=0.3064 DY=1.6711 DZ=0.3064
AMVT CA=25 PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=26 PT=165 DX=0.3064 DY=1.6711 DZ=0.3064
AMVT CA=27 PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=28 PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=29 PT=165 DX=0.3064 DY=1.6711 DZ=0.3064
AMVT CA=30 PT=165 DX=0.3130 DY=1.7067 DZ=0.3130
AMVT CA=31 PT=165 DX=0.3019 DY=1.6461 DZ=0.3019
AMVT CA=32 PT=165 DX=-.09   DY=.015   DZ=-.093
*-------------------------------------------------------------------------------
*END REGION V
*-------------------------------------------------------------------------------
*REGION II GEOMETRY - HPCI Line brnch
CROS CD=6
JUNC PT=10
*-------------------------------------------------------------------------------
*BEGIN REGION IIa
*-------------------------------------------------------------------------------
OPER CA=3  TE=150 PR=1010
OPER CA=4  TE=260 PR=1010
OPER CA=5  TE=392 PR=1010
OPER CA=6  TE=310 PR=1010
OPER CA=7  TE=280 PR=1010
OPER CA=8  TE=265 PR=1010
OPER CA=9  TE=90  PR=1010
OPER CA=10 TE=265 PR=1010
OPER CA=11 TE=150 PR=170
OPER CA=12 TE=150 PR=88
OPER CA=13 TE=392 PR=1190
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=150 PR=1135
OPER CA=16 TE=150 PR=1135
OPER CA=17 TE=150 PR=1060
OPER CA=18 TE=150 PR=1135

OPER CA=20 TE=150 PR=675
OPER CA=21 TE=275 PR=885

OPER CA=23 TE=392 PR=1375
OPER CA=24 TE=392 PR=940
OPER CA=25 TE=392 PR=1010
OPER CA=26 TE=275 PR=1010
OPER CA=27 TE=265 PR=1010

OPER CA=30 TE=125 PR=1010

TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=150 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=150 TT=16164 FL=150 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=150 FT=100 TT=0 FL=150 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=260 TT=0 FL=150 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=260 FT=392 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=392 FT=310 TT=900 FL=150 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=310 FT=392 TT=900 FL=150 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=392 FT=280 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
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TRAN CA=210 IS=1 FS=1 IT=280 FT=392 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=392 FT=265 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=265 FT=90 TT=360 FL=150 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=90 FT=265 TT=900 FL=150 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=265 FT=392 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=392 FT=265 TT=90 FL=150 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=265 FT=392 TT=180 FL=150 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=392 FT=275 TT=60 FL=150 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=275 FT=100 TT=900 FL=150 IP=1025 FP=1025 TP=900
TRAN CA=219 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=150 IP=1025 FP=1025 TP=0
TRAN CA=220 *IS=1 FS=1 IT=265 FT=265 TT=0 FL=150 IP=1025 FP=1025 TP=0
TRAN CA=221 IS=1 FS=1 IT=265 FT=150 TT=4140 FL=150 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=150 FT=150 TT=0 FL=150 IP=1025 FP=185 TP=0
TRAN CA=223 IS=1 FS=1 IT=150 FT=150 TT=0 FL=150 IP=185 FP=103 TP=0
TRAN CA=224 IS=1 FS=1 IT=150 FT=100 TT=8280 FL=150 IP=103 FP=65 TP=8280
TRAN CA=225 IS=1 FS=1 IT=392 FT=392 TT=12 FL=150 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=392 FT=50 TT=0 FL=3672 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=150 TT=1380 FL=150 IP=1150 FP=1150 TP=1380
TRAN CA=228 IS=1 FS=1 IT=150 FT=150 TT=0 FL=150 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=150 FT=50 TT=0 FL=2754 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=150 TT=3060 FL=150 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=150 FT=150 TT=0 FL=150 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=150 FT=50 TT=0 FL=1560.6 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=150 TT=300 FL=150,IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=150 FT=150 TT=8964 FL=150 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=392 FT=275 TT=60 FL=150 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=275 FT=100 TT=900 FL=150 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=392 FT=392 TT=60 FL=150 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=392 FT=392 TT=900 FL=150 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=392 FT=392 TT=900 FL=150 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=125 TT=60 FL=150 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=125 FT=150 TT=210 FL=150 IP=1025 FP=1025 TP=210

PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=204 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=205 CO=27.6 DI=0.490 EX=6.4 * Tavg=180
PAIR CA=206 CO=27.1 DI=0.446 EX=6.4 * Tavg=326
PAIR CA=207 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=208 CO=27.0 DI=0.440 EX=6.4 * Tavg=351
PAIR CA=209 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=210 CO=27.1 DI=0.444 EX=6.4 * Tavg=336
PAIR CA=211 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=212 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=213 CO=27.6 DI=0.490 EX=6.4 * Tavg=178
PAIR CA=214 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=215 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=216 CO=27.1 DI=0.445 EX=6.4 * Tavg=329
PAIR CA=217 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=218 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=219 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=220 CO=27.3 DI=0.463 EX=6.4 * Tavg=265
PAIR CA=221 CO=27.6 DI=0.483 EX=6.4 * Tavg=208
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PAIR CA=222 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=223 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=224 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=225 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=226 CO=27.5 DI=0.478 EX=6.4 * Tavg=221
PAIR CA=227 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=228 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=229 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=230 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=231 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=232 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=233 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=234 CO=27.6 DI=0.496 EX=6.4 * Tavg=150
PAIR CA=235 CO=27.1 DI=0.444 EX=6.4 * Tavg=334
PAIR CA=236 CO=27.6 DI=0.488 EX=6.4 * Tavg=188
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=240 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=241 CO=26.7 DI=0.430 EX=6.4 * Tavg=392
PAIR CA=242 CO=27.6 DI=0.508 EX=6.4 * Tavg=113
PAIR CA=243 CO=27.6 DI=0.500 EX=6.4 * Tavg=138

*
BRAN PT=301  DY=1  TE=1 EW=1
TANG PT=302  DY=2.333
TANG PT=305  DY=2.333  EW=1
BRAD PT=310  RA=1.75  EW=1
TANG PT=315  DX=-2.333  EW=1
CROS CD=7
VALV PT=317  DX=-1.167 PL=1 MA=2.05
*-------------------------------------------------------------------------------
*BEGIN REGION IIb
*-------------------------------------------------------------------------------

OPER CA=3  TE=125   PR=1010
OPER CA=4  TE=180   PR=1010
OPER CA=5  TE=246   PR=1010
OPER CA=6  TE=205   PR=1010
OPER CA=7  TE=190   PR=1010
OPER CA=8  TE=182.5 PR=1010
OPER CA=9  TE=95    PR=1010
OPER CA=10 TE=182.5 PR=1010
OPER CA=11 TE=125   PR=170
OPER CA=12 TE=125   PR=88
OPER CA=13 TE=246   PR=1190
OPER CA=14 TE=50    PR=1135
OPER CA=15 TE=125   PR=1135
OPER CA=16 TE=125   PR=1135
OPER CA=17 TE=125   PR=1060
OPER CA=18 TE=125   PR=1135

OPER CA=20 TE=125   PR=675
OPER CA=21 TE=187.5 PR=885

OPER CA=23 TE=246   PR=1375
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OPER CA=24 TE=246    PR=940
OPER CA=25 TE=246    PR=1010
OPER CA=26 TE=187.5  PR=1010
OPER CA=27 TE=182.5  PR=1010

OPER CA=30 TE=112.5 PR=1010

TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=150 IP=15 FP=1115 TP=1800
TRAN CA=202 IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=1115 FP=65 TP=0
TRAN CA=203 IS=1 FS=1 IT=100 FT=125 TT=16164 FL=150 IP=65 FP=1025 TP=16164
TRAN CA=204 IS=1 FS=1 IT=125 FT=100 TT=0 FL=150 IP=1025 FP=1025 TP=0
TRAN CA=205 IS=1 FS=1 IT=100 FT=180 TT=0 FL=150 IP=1025 FP=1025 TP=0
TRAN CA=206 IS=1 FS=1 IT=180 FT=246 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=207 IS=1 FS=1 IT=246 FT=205 TT=900 FL=150 IP=1025 FP=1025 TP=900
TRAN CA=208 IS=1 FS=1 IT=205 FT=246 TT=900 FL=150 IP=1025 FP=1025 TP=900
TRAN CA=209 IS=1 FS=1 IT=246 FT=190 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=210 IS=1 FS=1 IT=190 FT=246 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=211 IS=1 FS=1 IT=246 FT=182.5 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=212 IS=1 FS=1 IT=182.5 FT=95 TT=360 FL=150 IP=1025 FP=1025 TP=360
TRAN CA=213 IS=1 FS=1 IT=95 FT=182.5 TT=900 FL=150 IP=1025 FP=1025 TP=900
TRAN CA=214 IS=1 FS=1 IT=182.5 FT=246 TT=1800 FL=150 IP=1025 FP=1025 TP=1800
TRAN CA=215 IS=1 FS=1 IT=246 FT=182.5 TT=90 FL=150 IP=1025 FP=1025 TP=90
TRAN CA=216 IS=1 FS=1 IT=182.5 FT=246 TT=180 FL=150 IP=1025 FP=1025 TP=180
TRAN CA=217 IS=1 FS=1 IT=246 FT=187.5 TT=60 FL=150 IP=1025 FP=1025 TP=60
TRAN CA=218 IS=1 FS=1 IT=187.5 FT=100 TT=900 FL=150 IP=1025 FP=1025 TP=900
TRAN CA=219 *IS=1 FS=1 IT=182.5 FT=182.5 TT=0 FL=150 IP=1025 FP=1025 TP=0
TRAN CA=220 *IS=1 FS=1 IT=182.5 FT=182.5 TT=0 FL=150 IP=1025 FP=1025 TP=0
TRAN CA=221 IS=1 FS=1 IT=182.5 FT=125 TT=4140 FL=150 IP=1025 FP=1025 TP=4140
TRAN CA=222 IS=1 FS=1 IT=125 FT=125 TT=0 FL=150 IP=1025 FP=185 TP=0
TRAN CA=223 IS=1 FS=1 IT=125 FT=125 TT=0 FL=150 IP=185 FP=103 TP=0
TRAN CA=224 IS=1 FS=1 IT=125 FT=100 TT=8280 FL=150 IP=103 FP=65 TP=8280
TRAN CA=225 *IS=1 FS=1 IT=246 FT=246 TT=12 FL=150 IP=1025 FP=1205 TP=12
TRAN CA=226 IS=1 FS=1 IT=246 FT=50 TT=0 FL=3672 IP=1205 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=125 TT=1380 FL=150 IP=1150 FP=1150 TP=1380
TRAN CA=228 *IS=1 FS=1 IT=125 FT=125 TT=0 FL=150 IP=1150 FP=1150 TP=0
TRAN CA=229 IS=1 FS=1 IT=125 FT=50 TT=0 FL=2754 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=125 TT=3060 FL=150 IP=900 FP=1075 TP=3060
TRAN CA=231 IS=1 FS=1 IT=125 FT=125 TT=0 FL=150 IP=1075 FP=1150 TP=0
TRAN CA=232 IS=1 FS=1 IT=125 FT=50 TT=0 FL=1560.6 IP=1150 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=125 TT=300 FL=150 IP=690 FP=690 TP=300
TRAN CA=234 IS=1 FS=1 IT=125 FT=125 TT=8964 FL=150 IP=255 FP=1025 TP=8964
TRAN CA=235 IS=1 FS=1 IT=246 FT=187.5 TT=60 FL=150 IP=1025 FP=900 TP=60
TRAN CA=236 IS=1 FS=1 IT=187.5 FT=100 TT=900 FL=150 IP=900 FP=65 TP=900
TRAN CA=237 IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=1578 TP=0
TRAN CA=238 IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=1578 FP=65 TP=0
TRAN CA=239 IS=1 FS=1 IT=246 FT=246 TT=60 FL=150 IP=1025 FP=1390 TP=60
TRAN CA=240 IS=1 FS=1 IT=246 FT=246 TT=900 FL=150 IP=1390 FP=955 TP=900
TRAN CA=241 IS=1 FS=1 IT=246 FT=246 TT=900 FL=150 IP=955 FP=1025 TP=900
TRAN CA=242 IS=1 FS=1 IT=100 FT=112.5 TT=60 FL=150 IP=1025 FP=1025 TP=60
TRAN CA=243 IS=1 FS=1 IT=112.5 FT=125 TT=210 FL=150 IP=1025 FP=1025 TP=210

PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.508 EX=6.4 * Tavg=113
PAIR CA=204 CO=27.6 DI=0.508 EX=6.4 * Tavg=113
PAIR CA=205 CO=27.6 DI=0.499 EX=6.4 * Tavg=140
```

```
PAIR CA=206 CO=27.5 DI=0.481 EX=6.4 * Tavg=213
PAIR CA=207 CO=27.5 DI=0.476 EX=6.4 * Tavg=226
PAIR CA=208 CO=27.5 DI=0.476 EX=6.4 * Tavg=226
PAIR CA=209 CO=27.5 DI=0.479 EX=6.4 * Tavg=218
PAIR CA=210 CO=27.5 DI=0.479 EX=6.4 * Tavg=218
PAIR CA=211 CO=27.5 DI=0.481 EX=6.4 * Tavg=214
PAIR CA=212 CO=27.6 DI=0.500 EX=6.4 * Tavg=139
PAIR CA=213 CO=27.6 DI=0.500 EX=6.4 * Tavg=139
PAIR CA=214 CO=27.5 DI=0.481 EX=6.4 * Tavg=214
PAIR CA=215 CO=27.5 DI=0.481 EX=6.4 * Tavg=214
PAIR CA=216 CO=27.5 DI=0.481 EX=6.4 * Tavg=214
PAIR CA=217 CO=27.5 DI=0.480 EX=6.4 * Tavg=217
PAIR CA=218 CO=27.6 DI=0.498 EX=6.4 * Tavg=144
PAIR CA=219 CO=27.6 DI=0.489 EX=6.4 * Tavg=183
PAIR CA=220 CO=27.6 DI=0.489 EX=6.4 * Tavg=183
PAIR CA=221 CO=27.6 DI=0.495 EX=6.4 * Tavg=154
PAIR CA=222 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=223 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=224 CO=27.6 DI=0.508 EX=6.4 * Tavg=113
PAIR CA=225 CO=27.4 DI=0.469 EX=6.4 * Tavg=246
PAIR CA=226 CO=27.6 DI=0.497 EX=6.4 * Tavg=148
PAIR CA=227 CO=27.6 DI=0.519 EX=6.4 * Tavg=88
PAIR CA=228 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=229 CO=27.6 DI=0.519 EX=6.4 * Tavg=88
PAIR CA=230 CO=27.6 DI=0.519 EX=6.4 * Tavg=88
PAIR CA=231 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=232 CO=27.6 DI=0.519 EX=6.4 * Tavg=88
PAIR CA=233 CO=27.6 DI=0.519 EX=6.4 * Tavg=88
PAIR CA=234 CO=27.6 DI=0.504 EX=6.4 * Tavg=125
PAIR CA=235 CO=27.5 DI=0.480 EX=6.4 * Tavg=217
PAIR CA=236 CO=27.6 DI=0.498 EX=6.4 * Tavg=144
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=27.4 DI=0.469 EX=6.4 * Tavg=246
PAIR CA=240 CO=27.4 DI=0.469 EX=6.4 * Tavg=246
PAIR CA=241 CO=27.4 DI=0.469 EX=6.4 * Tavg=246
PAIR CA=242 CO=27.6 DI=0.510 EX=6.4 * Tavg=106
PAIR CA=243 CO=27.6 DI=0.506 EX=6.4 * Tavg=119
VALV PT=320  DX=-1.167 PL=2  EW=1
CROS CD=6
TANG PT=325  DX=-0.666
TANG PT=330  DX=-2.667  EW=1
BRAD PT=335  RA=1.75  EW=1
TANP         DZ=-3.5
BRAD PT=340  RA=1.75  EW=1
TANG PT=345  DX=3.333  EW=1
CROS CD=7
VALV PT=346  DX=1.167 PL=1 MA=1.725
*-------------------------------------------------------------------------------
*END REGION IIb
*-------------------------------------------------------------------------------
*BEGIN REGION II
*-------------------------------------------------------------
OPER CA=1  TE=100 PR=50

OPER CA=3  TE=100 PR=50
```

```
OPER CA=4  TE=100 PR=50
OPER CA=5  TE=100 PR=50
OPER CA=6  TE=100 PR=50
OPER CA=7  TE=100 PR=50
OPER CA=8  TE=100 PR=50
OPER CA=9  TE=100 PR=50
OPER CA=10 TE=100 PR=50
OPER CA=11 TE=100 PR=50
OPER CA=12 TE=100 PR=50
OPER CA=13 TE=100 PR=50
OPER CA=14 TE=50  PR=1135
OPER CA=15 TE=100 PR=50
OPER CA=16 TE=100 PR=50
OPER CA=17 TE=100 PR=50
OPER CA=18 TE=100 PR=50

OPER CA=20 TE=100 PR=50
OPER CA=21 TE=100 PR=50
OPER CA=22 TE=100 PR=50
OPER CA=23 TE=100 PR=50
OPER CA=24 TE=100 PR=50
OPER CA=25 TE=100 PR=50
OPER CA=26 TE=100 PR=50
OPER CA=27 TE=100 PR=50
OPER CA=28 TE=100 PR=50
OPER CA=29 TE=100 PR=50
OPER CA=30 TE=100 PR=50

TRAN CA=201 IS=1 FS=1 IT=70 FT=100 TT=1800 FL=150 IP=15 FP=65 TP=1800
TRAN CA=202 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=203 *IS=1 FS=1 IT=100 FT=100 TT=16164 FL=150 IP=65 FP=65 TP=16164
TRAN CA=204 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=205 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=206 *IS=1 FS=1 IT=100 FT=100 TT=1800 FL=150 IP=65 FP=65 TP=1800
TRAN CA=207 *IS=1 FS=1 IT=100 FT=100 TT=900 FL=150 IP=65 FP=65 TP=900
TRAN CA=208 *IS=1 FS=1 IT=100 FT=100 TT=900 FL=150 IP=65 FP=65 TP=900
TRAN CA=209 *IS=1 FS=1 IT=100 FT=100 TT=1800 FL=150 IP=65 FP=65 TP=1800
TRAN CA=210 *IS=1 FS=1 IT=100 FT=100 TT=1800 FL=150 IP=65 FP=65 TP=1800
TRAN CA=211 *IS=1 FS=1 IT=100 FT=100 TT=1800 FL=150 IP=65 FP=65 TP=1800
TRAN CA=212 *IS=1 FS=1 IT=100 FT=100 TT=360 FL=150 IP=65 FP=65 TP=360
TRAN CA=213 *IS=1 FS=1 IT=100 FT=100 TT=900 FL=150 IP=65 FP=65 TP=900
TRAN CA=214 *IS=1 FS=1 IT=100 FT=100 TT=1800 FL=150 IP=65 FP=65 TP=1800
TRAN CA=215 *IS=1 FS=1 IT=100 FT=100 TT=90 FL=150 IP=65 FP=65 TP=90
TRAN CA=216 *IS=1 FS=1 IT=100 FT=100 TT=180 FL=150 IP=65 FP=65 TP=180
TRAN CA=217 *IS=1 FS=1 IT=100 FT=100 TT=60 FL=150 IP=65 FP=65 TP=60
TRAN CA=218 *IS=1 FS=1 IT=100 FT=100 TT=900 FL=150 IP=65 FP=65 TP=900
TRAN CA=219 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=220 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=221 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=222 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=223 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=224 *IS=1 FS=1 IT=100 FT=100 TT=8280 FL=150 IP=65 FP=65 TP=8280
TRAN CA=225 *IS=1 FS=1 IT=100 FT=100 TT=12 FL=150 IP=65 FP=65 TP=12
TRAN CA=226 IS=1 FS=1 IT=100 FT=50 TT=0 FL=3672 IP=65 FP=1150 TP=0
TRAN CA=227 IS=1 FS=1 IT=50 FT=100 TT=1380 FL=150 IP=1150 FP=65 TP=1380
TRAN CA=228 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
```

```
TRAN CA=229 IS=1 FS=1 IT=100 FT=50 TT=0 FL=2754 IP=1150 FP=900 TP=0
TRAN CA=230 IS=1 FS=1 IT=50 FT=100 TT=3060 FL=150 IP=900 FP=65 TP=3060
TRAN CA=231 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=232 IS=1 FS=1 IT=100 FT=50 TT=0 FL=1560.6 IP=65 FP=690 TP=0
TRAN CA=233 IS=1 FS=1 IT=50 FT=100 TT=300 FL=150 IP=690 FP=65 TP=300
TRAN CA=234 *IS=1 FS=1 IT=100 FT=100 TT=8964 FL=150 IP=65 FP=65 TP=8964
TRAN CA=235 *IS=1 FS=1 IT=100 FT=100 TT=60 FL=150 IP=65 FP=65 TP=60
TRAN CA=236 *IS=1 FS=1 IT=100 FT=100 TT=900 FL=150 IP=65 FP=65 TP=900
TRAN CA=237 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=238 *IS=1 FS=1 IT=100 FT=100 TT=0 FL=150 IP=65 FP=65 TP=0
TRAN CA=239 *IS=1 FS=1 IT=100 FT=100 TT=60 FL=150 IP=65 FP=65 TP=60
TRAN CA=240 *IS=1 FS=1 IT=100 FT=100 TT=900 FL=150 IP=65 FP=65 TP=900
TRAN CA=241 *IS=1 FS=1 IT=100 FT=100 TT=900 FL=150 IP=65 FP=65 TP=900
TRAN CA=242 *IS=1 FS=1 IT=100 FT=100 TT=60 FL=150 IP=65 FP=65 TP=60
TRAN CA=243 *IS=1 FS=1 IT=100 FT=100 TT=210 FL=150 IP=65 FP=65 TP=210

PAIR CA=201 CO=27.6 DI=0.521 EX=6.4 * Tavg=85
PAIR CA=202 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=203 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=204 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=205 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=206 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=207 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=208 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=209 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=210 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=211 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=212 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=213 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=214 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=215 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=216 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=217 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=218 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=219 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=220 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=221 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=222 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=223 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=224 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=225 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=226 CO=27.5 DI=0.526 EX=6.4 * Tavg=75
PAIR CA=227 CO=27.5 DI=0.526 EX=6.4 * Tavg=75
PAIR CA=228 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=229 CO=27.5 DI=0.526 EX=6.4 * Tavg=75
PAIR CA=230 CO=27.5 DI=0.526 EX=6.4 * Tavg=75
PAIR CA=231 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=232 CO=27.5 DI=0.526 EX=6.4 * Tavg=75
PAIR CA=233 CO=27.5 DI=0.526 EX=6.4 * Tavg=75
PAIR CA=234 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=235 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=236 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=237 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=238 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=239 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=240 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
```

```
PAIR CA=241 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=242 CO=27.6 DI=0.512 EX=6.4 * Tavg=100
PAIR CA=243 CO=27.6 DI=0.512 EX=6.4 * Tavg=100

VALV PT=350  DX=1.167 PL=2  EW=1
CROS CD=6
TANG PT=355  DX=0.167
TANG PT=360  DX=2.083  EW=1
BRAD PT=380  RA=1.75  EW=1
TANP         DY=-2.479
BRAD PT=390  RA=1.75  EW=1
TANG PT=392  DX=2.585 DY=-2.585
TANG PT=395  DX=2.585 DY=-2.585  EW=1
BRAD PT=400  RA=1.75  EW=1
TANG PT=405  DZ=-3.417
BRAD PT=410  RA=1.17  EW=1
TANG PT=415  DY=-3
TANG PT=420  DY=-5.25
TANG PT=425  DY=-2.417
BRAD PT=430  RA=1.75  EW=1
TANG PT=435  DZ=2.333
TANG PT=440  DZ=4.757
TANG PT=445  DZ=4.757
TANG PT=450  DZ=4.757
BRAD PT=455  RA=1.75  EW=1
TANG PT=460  DX=-1.989  DZ=1.989
BRAD PT=465  RA=1.75  EW=1
TANG PT=470  DY=-5.722
TANG PT=480  DY=-5.722
TANG PT=485  DY=-5.722
BRAD PT=490  RA=1.17  EW=1
TANG PT=495  DZ=1.667
TANG PT=500  DZ=2.0833
BRAD PT=505  RA=1.75  EW=1
TANG PT=510  DX=3.682
TANG PT=515  DX=3.682
TANG PT=520  DX=3.682
TANG PT=525  DX=3.682
BRAD PT=535  RA=1.75
TANG PT=540  DX=2.556  DZ=-2.556
TANG PT=545  DX=2.555  DZ=-2.555
STRU PT=546  DX=-.7071 DZ=-.7071
STRU PT=547  DX=-.7071 DZ=-.7071
ANCH PT=547
*-------------------------------------------------------------------------------
*END REGION II
*-------------------------------------------------------------------------------
*
*** VALVE OPERATOR ***
CROS CD=7
JUNC PT=346
VALV PT=348 DY=5.567 PL=3 MA=2.52
*** SUPPORTS AND ANCHORS ***
CSUP PT=105 DY=1  KP=5000  PI=0 *FW-9
CSUP PT=190 DY=1  KP=1000  PI=0 *FW-6
CSUP PT=220 DY=-1 KP=1000  PI=0 *FW-4
```

```
CSUP PT=270 DY=1  KP=1000  PI=0 *FW-2
CSUP PT=145 DY=1  KP=1000  PI=0 *FW-7
*
RSTN PT=230 DX=-0.6123  DY=-0.5  DZ=0.6123  SP=370  *FW-3
*
RSTN PT=80   DX=1.0                              SP=200  *FDW-H10

RSTN PT=201  DX=0.198 DZ=0.9802    SP=1000  *FDW-H23
RSTN PT=546  DX=-0.7071  DZ=-0.7071             SP=1000 *BELLOWS
RSTN PT=355   DY=1.0                                    *HPCI-H31
RSTN PT=415   DX=1.0  DZ=1.0                            *HPCI-H32
RSTN PT=30    DX=1.0  DY=1.0                            *FDW-HD37 FLUED HEAD
ROTR PT=30    RZ=1                                      *FDW_HD37 FLUED HEAD
RSTN PT=60  DX=1.0 DY=1.0                       SP=200  *FDW-H24
RSTN PT=5 DX=1 DY=1 DZ=1
ROTR PT=5 RZ=1
ENDP
```

APPENDIX B

PIPESTRESS OUTPUT FILE ("FWHPCI.PRF")

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1242]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

DELTA T1 IN DEGREES F
PRESSURES IN PSI
STRESSES IN PSI

SUMMARY OF LOAD SETS AT POINT 155 LR ELBOW 155 TO 160 GLOBAL MOMENTS IN FT-LB

LOAD SET NO.	LOAD SET DESCRIPTION		CYCLES	DYNAM. CYCLES	PRESSURE	MOMENT X	MOMENT Y	MOMENT Z	TRANSIENT STRESSES EQ. 10	EQ. 11	EQ. 13	DELTA T1
1	Design Hydrotest +	LS-1	120		1100.	55.	22.	54.	0.	50.	0.	0.3
2	Design Hydrotest -	LS-2	120		50.	56.	21.	54.	0.	0.	0.	0.0
3	Startup +	LS-3	300		1010.	14505.	-695.	-12403.	25110.	25114.	12555.	0.5
4	TRoll & Inc. PWR1 -	LS-4	610		1010.	24012.	-983.	-21319.	-25109.	-54064.	-12555.	-169.9
5	TRoll & Inc. PWR2 +	LS-5	599		1010.	13760.	-442.	-11409.	0.	15049.	0.	78.5
6	TRoll & Inc. PWR3 +	LS-6	599		1010.	4661.	45.	-2630.	0.	252.	0.	1.4
7	DlyReduction to 75% -	LS-7	10000		1010.	10313.	-259.	-8082.	0.	-317.	0.	-1.7
8	DlyReduction to 75% +	LS-8	10000		1010.	4661.	45.	-2630.	0.	317.	0.	1.7
9	WklyReduct to 50% -	LS-9	2000		1010.	12381.	-369.	-10078.	0.	-215.	0.	-1.2
10	WklyReduct to 50% +	LS-10	2000		1010.	4661.	45.	-2630.	0.	215.	0.	1.2
11	LOFWH+TT 1 -	LS-11	310		1010.	13415.	-424.	-11077.	0.	-243.	0.	-1.3
12	LOFWH+TT 2 -	LS-12	10		1010.	24520.	-1009.	-21810.	0.	-1480.	0.	-7.9
13	LOFWH+TT 3 +	LS-13	10		1010.	13415.	-424.	-11077.	0.	619.	0.	3.3
14	LOFWH+TT 4 +	LS-14	10		1010.	4661.	45.	-2630.	0.	243.	0.	1.3
15	LOFWH+PFWHTR Byp -	LS-15	70		1010.	13415.	-424.	-11077.	0.	-4784.	0.	-25.7
16	LOFWH+PFWHTR Byp +	LS-16	70		1010.	4661.	45.	-2630.	0.	2433.	0.	13.1
17	SCRAM+TT+AllOtrScm -	LS-17	289		1010.	12192.	-365.	-9935.	0.	-6434.	0.	-34.4
18	SCRAM+TT+AllOtrScm +	LS-18	289		1010.	23480.	-960.	-20844.	0.	-593.	0.	-3.2
19	HotStandby 1 +	LS-19	300		1010.	10450.	-359.	-8332.	10951.	10969.	5476.	39.7
20	HotStandby 2 +	LS-20	300		1010.	8500.	-316.	-6524.	17948.	17967.	8974.	0.6
21	HotStandby 3 -	LS-21	300		1010.	14505.	-695.	-12403.	0.	0.	0.	0.0
22	Shutdown 1 -	LS-22	300		170.	7904.	-355.	-6594.	-25111.	-25113.	-12555.	-0.6
23	Shutdown 2 -	LS-23	300		88.	6239.	-269.	-5132.	-14160.	-14241.	-7080.	-1.4
24	Shutdown 3 -	LS-24	300		50.	56.	21.	54.	-11328.	-11330.	-5664.	-0.5
25	SCRAM+LOFWP1 +	LS-25	10		1190.	2347.	86.	-451.	10950.	10965.	5475.	42.2
26	SCRAM+LOFWP2 -	LS-26	10		1135.	26504.	-1110.	-23646.	-10950.	-57147.	-5475.	-251.2
27	SCRAM+LOFWP3 +	LS-27	10		1135.	17301.	-771.	-14962.	18318.	18515.	9159.	5.3
28	SCRAM+LOFWP4 +	LS-28	10		1135.	15136.	-727.	-12959.	26076.	26097.	13038.	31.3
29	SCRAM+LOFWP5 -	LS-29	10		885.	24686.	-1036.	-22025.	-26053.	-64906.	-13027.	-223.8
30	SCRAM+LOFWP6 +	LS-30	10		1060.	16738.	-747.	-14459.	18317.	18413.	9159.	2.4
31	SCRAM+LOFWP7 +	LS-31	10		1135.	15415.	-733.	-13217.	25130.	25158.	12565.	27.2

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1243]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

DELTA T1 IN DEGREES F
PRESSURES IN PSI
STRESSES IN PSI

SUMMARY OF LOAD SETS AT POINT 155 LR ELBOW 155 TO 160 GLOBAL MOMENTS IN FT-LB

LOAD SET NO.	LOAD SET DESCRIPTION		CYCLES	DYNAM. CYCLES	PRESSURE	MOMENT X	MOMENT Y	MOMENT Z	TRANSIENT STRESSES EQ. 10	EQ. 11	EQ. 13	DELTA T1
32	SCRAM+LOFWP8 -	LS-32	10		675.	23044.	-968.	-20560.	-25110.	-53661.	-12555.	-167.0
33	SCRAM+LOFWP9 +	LS-33	10		675.	16095.	-672.	-13953.	9507.	10417.	4754.	15.0
34	SCRAM+LOFWP10+	LS-34	10		1010.	14505.	-695.	-12403.	25119.	25126.	12559.	0.5
35	SCRAM+SRVBLDN1-	LS-35	1		885.	12714.	-388.	-10400.	0.	-6434.	0.	-34.4
36	SCRAM+SRVBLDN2-	LS-36	1		50.	56.	21.	54.	0.	-593.	0.	-3.2
37	Hydro Test +	LS-37	1		1563.	54.	22.	54.	0.	0.	0.	0.0
38	Hydro Test -	LS-38	1		50.	56.	21.	54.	0.	0.	0.	0.0
39	SCRAM+TG+OPres1 -	LS-39	289		1375.	7411.	-66.	-5088.	0.	0.	0.	0.0
40	SCRAM+TG+OPres2 -	LS-40	289		940.	4126.	66.	-2152.	0.	0.	0.	0.0
41	SCRAM+TG+OPres3 -	LS-41	289		1010.	4661.	45.	-2630.	0.	0.	0.	0.0
42	HotSbyFWcyc +	LS-42	300		1010.	20056.	-857.	-17600.	10427.	10652.	5214.	29.2
43	HotSbyFWcyc +	LS-43	300		1010.	14505.	-695.	-12403.	25130.	25446.	12565.	23.6
44	NORMAL+OBE LS-132		5	10(1)	1010.	14078.	-2008.	-11434.	0.	0.	0.	0.0
45	NORMAL-OBE LS-133		5	10(1)	1010.	10494.	1458.	-8380.	0.	0.	0.	0.0
101	WEIGHT					10013.	720.	-7200.				
104	DYNAMIC FLAG= 1					1792.	1733.	1527.				

B1	C1	K1	B2	C2	K2	C3	K3	C3PRIM	C4	Z	DIAM/TH	MATERIAL	E
0.106	1.247	1.000	2.022	3.034	1.000	1.000	1.000	0.500	1.100	0.60321E+02	12.752	CARBON STEEL	0.2950E+08

THIS ANALYSIS IS FOR THE BODY OF THE FITTING.

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1244]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	SP EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
28	29	62066.b	7949.	255.1	35508.	100939.	1.317	66456.	1808.	53580.	759.3
29	31	60890.b	7720.	251.0	35035.	99771.	1.273	63498.	2050.	53580.	763.1
29	43	60634.b	8457.	247.4	34041.	99802.	1.263	63040.	2098.	53580.	763.1
29	34	60622.b	8457.	224.3	34035.	99482.	1.263	62816.	2122.	53580.	763.1
3	29	60614.b	8457.	224.3	34031.	99470.	1.263	62793.	2125.	53580.	763.1
28	32	61463.b	6621.	198.3	36705.	90035.	1.294	58265.	2697.	53580.	763.1
20	29	58527.b	13533.	224.4	30450.	97400.	1.185	57693.	2783.	53580.	763.1
25	29	58182.b	18755.	266.0	28382.	97049.	1.172	56861.	2915.	53580.	759.3
31	32	60288.b	6392.	194.2	36232.	88867.	1.219	54146.	3406.	54348.	766.8
4	28	59539.b	7360.	201.2	34042.	88515.	1.222	54103.	3415.	53580.	763.1
32	43	60031.b	7129.	190.6	35238.	88898.	1.209	53745.	3488.	54348.	766.8
32	34	60020.b	7129.	167.6	35233.	88578.	1.209	53533.	3532.	54348.	766.8
3	32	60011.b	7129.	167.6	35228.	88566.	1.208	53512.	3536.	54348.	766.8
4	31	58364.b	7131.	197.0	33569.	87347.	1.148	50128.	4354.	54348.	766.8
4	43	58108.b	7868.	193.5	32576.	87378.	1.138	49733.	4465.	54348.	766.8
4	34	58096.b	7868.	170.4	32570.	87058.	1.138	49533.	4523.	54348.	766.8
3	4	58088.b	7868.	170.4	32566.	87046.	1.138	49512.	4529.	54348.	766.8
25	32	57580.b	17427.	209.2	29579.	86146.	1.149	49505.	4531.	53580.	763.1
20	32	57925.b	12205.	167.6	31647.	86496.	1.132	48941.	4700.	54348.	766.8
26	43	47001.g	9927.	274.8	26489.	93513.	1.000	46757.	5404.	53580.	763.1
26	34	46989.g	9927.	251.8	26484.	93193.	1.000	46597.	5460.	53580.	763.1
3	26	46980.g	9927.	251.7	26479.	93181.	1.000	46591.	5462.	53580.	763.1
26	28	46445.g	9419.	282.5	25969.	92663.	1.000	46332.	5553.	53580.	759.3
27	29	52528.g	6169.	229.1	31629.	91578.	1.000	45789.	5750.	53580.	788.7
2	29	52662.g	19973.	223.8	27119.	91515.	1.000	45758.	5762.	53580.	849.3
24	29	52662.g	19973.	223.3	27119.	91515.	1.000	45758.	5762.	53580.	810.3

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1245]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
29	36	52662.g	19973.	220.6	27119.	91515.	1.000	45758.	5762.	53580.	821.0
29	38	52662.g	19973.	223.8	27119.	91515.	1.000	45758.	5762.	53580.	849.3
22	28	64676.b	5819.	31.9	40719.	64699.	1.414	45748.	5766.	53580.	763.1
26	31	45270.g	9190.	278.4	25496.	91495.	1.000	45747.	5766.	53580.	763.1
29	30	52386.g	6625.	226.2	31032.	91335.	1.000	45668.	5796.	53580.	788.7
4	25	55656.b	18165.	212.0	26916.	84625.	1.077	45590.	5825.	53580.	763.1
20	26	44893.g	15003.	251.8	22898.	91110.	1.000	45555.	5838.	53580.	763.1
29	37	51415.g	19974.	223.8	25871.	90268.	1.000	45134.	6002.	53580.	784.2
5	29	36248.		302.3		90149.	1.000	45075.	6025.	53580.	823.9
4	20	56000.b	12943.	170.5	28984.	84975.	1.061	45071.	6026.	54348.	766.8
19	29	49926.g	11928.	263.5	26952.	88796.	1.000	44398.	6302.	53580.	788.7
25	26	42561.		293.4		88773.	1.000	44386.	6307.	53580.	759.3
2	26	41017.		251.2		87213.	1.000	43607.	6647.	53580.	849.3
24	26	41395.		250.8		87213.	1.000	43607.	6647.	53580.	810.3
26	36	41017.		248.0		87213.	1.000	43607.	6647.	53580.	821.0
26	38	41017.		251.2		87213.	1.000	43607.	6647.	53580.	849.3
1	29	47735.g	19973.	224.1	22191.	86638.	1.000	43319.	6779.	53580.	849.3
22	31	63959.b	6048.	27.7	40246.	63989.	1.354	43310.	6783.	54348.	766.8
23	29	47490.g	15103.	222.4	26817.	86343.	1.000	43172.	6848.	53580.	801.6
16	29	43884.g	16837.	236.9	21476.	85169.	1.000	42585.	7132.	53580.	798.3
22	29	45501.g	13765.	223.2	26165.	84354.	1.000	42177.	7338.	53580.	763.1
26	30	37958.		253.6		84251.	1.000	42125.	7365.	53580.	788.7
29	33	44347.g	7118.	238.8	26905.	84109.	1.000	42055.	7402.	53580.	816.1
5	26	22614.		329.7		83859.	1.000	41930.	7467.	53580.	823.9
29	39	44560.g	14613.	223.8	24377.	83413.	1.000	41706.	7587.	53580.	787.5
26	27	36908.		256.6		83301.	1.000	41651.	7617.	53580.	788.7

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1246]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
8	29	43884.g	16837.	225.5	21476.	83053.	1.000	41527.	7684.	53580.	798.3
6	29	43884.g	16837.	225.2	21476.	82988.	1.000	41494.	7702.	53580.	798.3
14	29	43884.g	16837.	225.1	21476.	82979.	1.000	41490.	7705.	53580.	798.3
10	29	43884.g	16837.	225.0	21476.	82951.	1.000	41475.	7713.	53580.	798.3
29	41	43884.g	16837.	223.8	21476.	82736.	1.000	41368.	7772.	53580.	798.3
29	40	43760.g	17270.	223.8	20920.	82613.	1.000	41307.	7807.	53580.	798.3
19	26	36292.		290.9		82507.	1.000	41253.	7836.	53580.	788.7
23	26	39055.		249.8		82041.	1.000	41021.	7969.	53580.	801.6
26	37	35796.		251.2		81993.	1.000	40996.	7983.	53580.	784.2
2	4	52124.g	19385.	169.9	27641.	81079.	1.000	40539.	8253.	54348.	851.7
4	24	52124.g	19385.	169.4	27641.	81079.	1.000	40539.	8253.	54348.	813.4
4	36	52124.g	19385.	166.7	27641.	81079.	1.000	40539.	8253.	54348.	824.1
4	38	52124.g	19385.	169.9	27641.	81079.	1.000	40539.	8253.	54348.	851.7
22	43	62228.b	5311.	24.1	39253.	62546.	1.290	40342.	8374.	54348.	766.8
27	32	51926.g	4842.	172.4	32826.	80674.	1.000	40337.	8377.	54348.	792.1
30	32	51784.g	5297.	169.4	32229.	80431.	1.000	40216.	8452.	54348.	792.1
29	42	41341.		253.0		80418.	1.000	40209.	8456.	53580.	818.0
22	34	62217.b	5311.	1.1	39247.	62226.	1.290	40123.	8510.	54348.	766.8
3	22	62208.b	5311.	1.1	39243.	62214.	1.289	40105.	8521.	54348.	766.8
22	26	48016.g	15236.	250.7	27681.	80052.	1.000	40026.	8571.	53580.	763.1
26	33	32701.		266.2		79807.	1.000	39904.	8649.	53580.	816.1
32	37	50812.g	18645.	167.0	27068.	79364.	1.000	39682.	8794.	54348.	788.7
5	32	35646.		245.5		79246.	1.000	39623.	8832.	54348.	827.0
4	27	50002.g	5580.	175.2	30163.	79153.	1.000	39577.	8863.	54348.	792.1
1	26	32672.		251.5		78918.	1.000	39459.	8942.	53580.	849.3
4	30	49860.g	6036.	172.2	29566.	78911.	1.000	39455.	8944.	54348.	792.1

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1247]
Vermont Yankee Feedwater PipingSl Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
16	26	30250.		264.3		78880.	1.000	39440.	8955.	53580.	798.3
7	29	39141.		222.1		77994.	1.000	38997.	9260.	53580.	798.3
19	32	49324.g	10600.	206.7	28149.	77893.	1.000	38946.	9296.	54348.	792.1
29	45	39023.		223.8		77876.	1.000	38938.	9302.	53580.	814.2
4	37	48890.g	19386.	169.9	24406.	77845.	1.000	38922.	9313.	54348.	788.7
4	5	33721.		248.4		77724.	1.000	38862.	9356.	54348.	827.0
26	40	31239.		251.2		77436.	1.000	38718.	9459.	53580.	798.3
2	32	48721.g	18644.	167.0	24978.	77272.	1.000	38636.	9519.	54348.	851.7
24	32	48721.g	18644.	166.6	24978.	77272.	1.000	38636.	9519.	54348.	813.4
32	36	48721.g	18644.	163.9	24978.	77272.	1.000	38636.	9519.	54348.	824.1
32	38	48721.g	18644.	167.0	24978.	77272.	1.000	38636.	9519.	54348.	851.7
8	26	30250.		252.9		76764.	1.000	38382.	9707.	53580.	798.3
6	26	30250.		252.6		76698.	1.000	38349.	9732.	53580.	798.3
14	26	30250.		252.5		76689.	1.000	38345.	9735.	53580.	798.3
10	26	30250.		252.4		76661.	1.000	38331.	9746.	53580.	798.3
26	41	30250.		251.2		76447.	1.000	38223.	9827.	53580.	798.3
17	29	37547.		189.4		76400.	1.000	38200.	9845.	53580.	798.3
4	19	47399.g	11338.	209.6	25486.	76372.	1.000	38186.	9856.	54348.	792.1
9	29	37405.		222.7		76258.	1.000	38129.	9899.	53580.	798.3
13	29	36537.		227.1		76009.	1.000	38004.	9996.	53580.	822.9
4	23	46952.g	14514.	168.5	27338.	75906.	1.000	37953.	10042.	54348.	804.7
1	32	47132.g	18645.	167.3	23388.	75733.	1.000	37867.	10120.	54348.	851.7
11	29	36537.		222.5		75390.	1.000	37695.	10278.	53580.	798.3
15	29	36537.		198.1		75390.	1.000	37695.	10278.	53580.	798.3
26	39	28939.		251.2		75136.	1.000	37568.	10397.	53580.	787.5
29	35	36132.		189.4		74985.	1.000	37492.	10468.	53580.	798.3

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1248]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
29	44	36112.		223.8		74965.	1.000	37482.	10477.	53580.	814.2
21	29	35503.		223.8		74356.	1.000	37178.	10772.	53580.	763.1
16	32	43282.		180.1		74266.	1.000	37133.	10817.	54348.	801.4
1	4	45210.g	19385.	170.1	20726.	74214.	1.000	37107.	10843.	54348.	851.7
26	42	27708.		280.4		74129.	1.000	37064.	10885.	53580.	818.0
4	22	44964.g	13177.	169.3	26687.	73917.	1.000	36959.	10992.	54348.	766.8
4	33	43808.g	6529.	184.9	27427.	73672.	1.000	36836.	11117.	54348.	819.2
4	16	41357.		162.9		72745.	1.000	36372.	11607.	54348.	801.4
32	39	43959.g	13286.	167.0	25574.	72510.	1.000	36255.	11735.	54348.	793.6
8	32	43282.		168.7		72150.	1.000	36075.	11936.	54348.	801.4
23	32	43549.g	13774.	165.6	24676.	72100.	1.000	36050.	11964.	54348.	804.7
6	32	43282.		168.4		72085.	1.000	36042.	11972.	54348.	801.4
14	32	43282.		168.3		72076.	1.000	36038.	11978.	54348.	801.4
10	32	43282.		168.2		72048.	1.000	36024.	11993.	54348.	801.4
32	41	43282.		167.0		71833.	1.000	35917.	12116.	54348.	801.4
32	40	43158.		167.0		71710.	1.000	35855.	12187.	54348.	801.4
7	26	25507.		249.5		71704.	1.000	35852.	12190.	53580.	798.3
26	45	25383.		251.2		71580.	1.000	35790.	12262.	53580.	814.2
4	40	42346.		169.9		71301.	1.000	35651.	12426.	54348.	801.4
4	39	42033.		169.9		70988.	1.000	35494.	12614.	54348.	793.6
26	35	24485.		216.8		70682.	1.000	35341.	12801.	53580.	798.3
4	8	41357.		171.6		70629.	1.000	35314.	12834.	54348.	801.4
4	6	41357.		171.2		70563.	1.000	35282.	12874.	54348.	801.4
4	14	41357.		171.2		70554.	1.000	35277.	12880.	54348.	801.4
4	10	41357.		171.0		70526.	1.000	35263.	12897.	54348.	801.4
4	41	41357.		169.9		70312.	1.000	35156.	13032.	54348.	801.4

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1249]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD PAIR	SET	SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
22	32	41561.		166.5		70111.	1.000	35056.	13159.	54348.	766.8
17	26	23913.		216.8		70110.	1.000	35055.	13160.	53580.	798.3
9	26	23771.		250.1		69968.	1.000	34984.	13251.	53580.	798.3
32	33	40406.		182.1		69867.	1.000	34934.	13316.	54348.	819.2
13	26	22903.		254.6		69719.	1.000	34860.	13413.	53580.	822.9
32	42	40739.		196.2		69515.	1.000	34757.	13548.	54348.	821.2
11	26	22903.		249.9		69100.	1.000	34550.	13826.	53580.	798.3
15	26	22903.		225.6		69100.	1.000	34550.	13826.	53580.	798.3
26	44	22472.		251.2		68669.	1.000	34334.	14124.	53580.	814.2
26	29	29511.		27.4		68364.	1.000	34182.	14340.	53580.	759.3
22	27	58697.b	7598.	5.9	36840.	58896.	1.160	34161.	14370.	54348.	792.1
21	26	21870.		251.2		68067.	1.000	34034.	14554.	53580.	763.1
4	42	38815.		199.0		67994.	1.000	33997.	14607.	54348.	821.2
29	32	29051.		56.8		67904.	1.000	33952.	14674.	53580.	763.1
24	28	58057.b	12029.	31.8	34782.	58080.	1.167	33893.	14760.	53580.	810.3
7	32	38539.		165.3		67091.	1.000	33545.	15288.	54348.	801.4
32	45	38428.		167.0		66979.	1.000	33489.	15375.	54348.	817.3
18	29	28066.		220.6		66919.	1.000	33459.	15422.	53580.	821.0
4	29	27637.		53.9		66490.	1.000	33245.	15763.	53580.	763.1
12	29	27212.		215.9		66064.	1.000	33032.	16111.	53580.	822.9
4	7	36614.		168.2		65569.	1.000	32785.	16530.	54348.	801.4
17	32	36945.		132.6		65496.	1.000	32748.	16592.	54348.	801.4
4	45	36498.		169.9		65453.	1.000	32726.	16630.	54348.	817.3
9	32	36804.		165.9		65355.	1.000	32677.	16715.	54348.	801.4
13	32	35935.		170.4		65106.	1.000	32553.	16934.	54348.	826.0
22	30	57644.b	7142.	2.9	36243.	57742.	1.121	32373.	17257.	54348.	792.1

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1250]
Vermont Yankee Feedwater PipingS1 Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
4	35	35592.		135.4		64547.	1.000	32273.	17438.	54348.	801.4
11	32	35935.		165.7		64487.	1.000	32243.	17493.	54348.	801.4
15	32	35935.		141.4		64487.	1.000	32243.	17493.	54348.	801.4
32	35	35530.		132.6		64082.	1.000	32041.	17873.	54348.	801.4
32	44	35518.		167.0		64070.	1.000	32035.	17884.	54348.	817.3
4	17	35020.		135.4		63975.	1.000	31987.	17974.	54348.	801.4
4	9	34878.		168.7		63833.	1.000	31917.	18111.	54348.	801.4
24	31	57340.b	12259.	27.6	34309.	57370.	1.110	31844.	18252.	54348.	813.4
26	32	31565.		84.2		63602.	1.000	31801.	18336.	53580.	763.1
4	13	34010.		173.2		63584.	1.000	31792.	18353.	54348.	826.0
21	32	34901.		167.0		63452.	1.000	31726.	18484.	54348.	766.8
4	11	34010.		168.6		62965.	1.000	31483.	18975.	54348.	801.4
4	15	34010.		144.2		62965.	1.000	31483.	18975.	54348.	801.4
4	44	33589.		169.9		62544.	1.000	31272.	19413.	54348.	817.3
4	21	32977.		169.9		61932.	1.000	30966.	20067.	54348.	766.8
18	26	14433.		248.0		60630.	1.000	30315.	21420.	53580.	821.0
23	28	55715.b	7157.	32.7	35896.	55816.	1.080	30132.	21821.	53580.	801.6
4	26	28162.		81.3		60199.	1.000	30100.	21893.	53580.	763.1
12	26	13576.		243.3		59773.	1.000	29886.	22376.	53580.	822.9
24	43	55610.b	11521.	24.0	33315.	55927.	1.046	29262.	23875.	54348.	813.4
24	34	55598.b	11521.	1.0	33309.	55607.	1.046	29083.	24329.	54348.	813.4
3	24	55590.b	11521.	1.0	33305.	55595.	1.046	29068.	24367.	54348.	813.4
12	32	28939.		159.1		57491.	1.000	28745.	25217.	54348.	826.0
4	32	28514.		2.8		57469.	1.000	28735.	25246.	54348.	766.8
18	32	28086.		163.9		56638.	1.000	28319.	26401.	54348.	824.1
23	31	54998.b	7386.	28.5	35423.	55107.	1.024	28212.	26708.	54348.	804.7

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1251]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
4	18	25540.		166.7		54495.	1.000	27247.	29720.	54348.	824.1
4	12	25536.		161.9		54491.	1.000	27245.	29726.	54348.	826.0
23	43	53267.g	6649.	25.0	34429.	53664.	1.000	26832.	31155.	54348.	804.7
23	34	53256.g	6649.	1.9	34423.	53344.	1.000	26672.	31732.	54348.	804.7
3	23	53247.g	6649.	1.9	34419.	53332.	1.000	26666.	31754.	54348.	804.7
22	42	52114.g	9899.	29.7	31901.	52341.	1.000	26170.	33637.	54348.	821.2
24	27	52078.g	13808.	5.8	30903.	52277.	1.000	26138.	33763.	58680.	833.3
5	22	36363.		79.1		51414.	1.000	25707.	35533.	54348.	827.0
24	30	51025.g	13352.	2.8	30306.	51123.	1.000	25561.	36158.	58680.	833.3
20	22	50097.g	363.	1.1	35661.	50120.	1.000	25060.	38425.	54348.	766.8
23	27	49736.g	8936.	6.7	32017.	50014.	1.000	25007.	38676.	58680.	825.8
22	25	49174.g	5006.	42.7	33593.	49190.	1.000	24595.	40698.	53580.	763.1
23	30	48683.g	8480.	3.8	31420.	48860.	1.000	24430.	41549.	58680.	825.8
28	36	46729.g	12029.	34.5	29118.	47343.	1.000	23672.	45771.	53580.	821.0
2	28	46729.g	12029.	31.3	29118.	46750.	1.000	23375.	47577.	53580.	849.3
28	38	46729.g	12029.	31.3	29118.	46750.	1.000	23375.	47577.	53580.	849.3
31	36	46012.g	12259.	30.3	28644.	46633.	1.000	23317.	47944.	54348.	824.1
22	33	45280.g	6649.	15.6	28778.	46192.	1.000	23096.	49364.	54348.	819.2
2	31	46012.g	12259.	27.2	28644.	46040.	1.000	23020.	49865.	54348.	851.7
31	38	46012.g	12259.	27.2	28644.	46040.	1.000	23020.	49865.	54348.	851.7
24	42	45494.		29.6		45720.	1.000	22860.	51538.	60000.	856.2
12	22	45390.g	13603.	7.4	26687.	45392.	1.000	22696.	53409.	54348.	826.0
36	43	44282.g	11521.	26.8	27651.	45190.	1.000	22595.	54602.	54348.	824.1
34	36	44270.g	11521.	3.7	27645.	44871.	1.000	22435.	56559.	54348.	824.1
3	36	44262.g	11521.	3.7	27641.	44859.	1.000	22429.	56635.	54348.	824.1
5	24	29744.		79.0		44794.	1.000	22397.	57040.	60000.	860.7

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1252]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
19	22	44599.g	1861.	40.2	32163.	44619.	1.000	22310.	58159.	54348.	792.1
2	43	44282.g	11521.	23.6	27651.	44597.	1.000	22299.	58299.	54348.	851.7
38	43	44282.g	11521.	23.6	27651.	44597.	1.000	22299.	58299.	54348.	851.7
18	22	44533.g	12746.	2.6	26687.	44536.	1.000	22268.	58701.	54348.	824.1
2	34	44270.g	11521.	0.5	27645.	44278.	1.000	22139.	60417.	54348.	851.7
34	38	44270.g	11521.	0.5	27645.	44278.	1.000	22139.	60417.	54348.	851.7
2	3	44262.g	11521.	0.5	27641.	44266.	1.000	22133.	60499.	54348.	851.7
3	38	44262.g	11521.	0.5	27641.	44266.	1.000	22133.	60499.	54348.	851.7
23	42	43153.		30.5		43458.	1.000	21729.	66286.	60000.	849.3
20	24	43368.		1.0		43390.	1.000	21695.	66803.	54348.	813.4
5	23	27401.		79.9		42530.	1.000	21265.	73771.	60000.	853.9
22	37	42394.		0.6		42396.	1.000	21198.	74933.	54348.	788.7
27	36	40750.		8.5		41540.	1.000	20770.	82915.	58680.	841.7
28	37	41509.		31.3		41529.	1.000	20765.	83019.	53580.	784.2
37	43	41048.		23.6		41364.	1.000	20682.	84683.	54348.	788.7
20	23	41038.		2.0		41138.	1.000	20569.	87007.	54348.	804.7
34	37	41036.		0.5		41044.	1.000	20522.	88005.	54348.	788.7
3	37	41028.		0.5		41032.	1.000	20516.	88134.	54348.	788.7
2	27	40750.		5.3		40947.	1.000	20473.	89044.	58680.	868.4
27	38	40750.		5.3		40947.	1.000	20473.	89044.	58680.	868.4
31	37	40792.		27.2		40820.	1.000	20410.	90429.	54348.	788.7
30	36	39697.		5.6		40386.	1.000	20193.	95348.	58680.	841.7
2	30	39697.		2.4		39793.	1.000	19897.	101886.	58680.	868.4
30	38	39697.		2.4		39793.	1.000	19897.	101886.	58680.	868.4
24	33	38661.		15.5		39572.	1.000	19786.	103950.	60000.	854.6
12	24	38769.		7.5		38770.	1.000	19385.	111907.	60000.	860.0

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1253]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
1	22	38714.		0.8		38766.	1.000	19383.	111954.	54348.	851.7
1	28	38385.		31.1		38406.	1.000	19203.	115784.	53580.	849.3
19	24	37973.		40.1		37992.	1.000	18996.	120392.	58680.	833.3
18	24	37912.		2.7		37914.	1.000	18957.	121286.	60000.	858.4
1	31	37668.		26.9		37696.	1.000	18848.	123834.	54348.	851.7
1	43	37368.		23.3		37683.	1.000	18842.	123981.	54348.	851.7
23	25	37549.		43.5		37644.	1.000	18822.	124447.	53580.	801.6
1	34	37356.		0.3		37364.	1.000	18682.	127846.	54348.	851.7
1	3	37348.		0.3		37352.	1.000	18676.	127996.	54348.	851.7
25	28	37321.		10.8		37342.	1.000	18671.	128119.	53580.	759.3
16	22	34887.		13.6		37322.	1.000	18661.	128359.	54348.	801.4
23	33	36319.		16.4		37309.	1.000	18655.	128517.	60000.	847.8
25	43	36861.		18.6		37176.	1.000	18588.	130181.	53580.	763.1
21	22	37098.		0.6		37100.	1.000	18550.	131149.	54348.	766.8
28	40	36950.		31.3		36971.	1.000	18485.	132812.	53580.	798.3
25	34	36849.		41.6		36857.	1.000	18428.	134297.	53580.	763.1
3	25	36841.		41.6		36845.	1.000	18422.	134456.	53580.	763.1
13	22	36074.		3.9		36696.	1.000	18348.	136430.	54348.	826.0
28	35	30200.		65.8		36655.	1.000	18328.	136979.	53580.	798.3
25	31	36604.		15.0		36632.	1.000	18316.	137291.	53580.	763.1
22	44	36626.		0.6		36628.	1.000	18314.	137342.	54348.	817.3
12	23	36429.		6.5		36509.	1.000	18255.	138959.	60000.	853.1
12	28	34857.		39.3		36357.	1.000	18179.	141064.	53580.	822.9
31	40	36233.		27.2		36261.	1.000	18130.	142421.	54348.	801.4
17	28	29626.		65.8		36082.	1.000	18041.	144986.	53580.	798.3
11	22	36074.		0.7		36077.	1.000	18038.	145056.	54348.	801.4

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1254]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
15	22	36074.		25.1		36077.	1.000	18038.	145056.	54348.	801.4
28	41	35960.		31.3		35981.	1.000	17991.	146447.	53580.	798.3
6	28	35960.		30.0		35981.	1.000	17991.	146449.	53580.	798.3
8	28	35960.		29.6		35981.	1.000	17991.	146449.	53580.	798.3
10	28	35960.		30.2		35981.	1.000	17991.	146449.	53580.	798.3
14	28	35960.		30.0		35981.	1.000	17991.	146449.	53580.	798.3
16	28	35960.		18.3		35981.	1.000	17991.	146449.	53580.	798.3
31	35	29482.		61.6		35944.	1.000	17972.	146991.	54348.	801.4
30	37	35668.		2.4		35764.	1.000	17882.	149673.	58680.	819.8
19	23	35632.		41.1		35730.	1.000	17865.	150191.	58680.	825.8
27	37	35529.		5.3		35726.	1.000	17863.	150253.	58680.	819.8
22	39	35660.		0.6		35662.	1.000	17831.	151224.	54348.	793.6
18	23	35572.		1.8		35653.	1.000	17826.	151370.	60000.	851.6
17	31	28909.		61.6		35371.	1.000	17686.	155755.	54348.	801.4
31	41	35243.		27.2		35272.	1.000	17636.	157347.	54348.	801.4
6	31	35243.		25.8		35271.	1.000	17636.	157350.	54348.	801.4
8	31	35243.		25.5		35271.	1.000	17636.	157350.	54348.	801.4
10	31	35243.		26.0		35271.	1.000	17636.	157350.	54348.	801.4
14	31	35243.		25.9		35271.	1.000	17636.	157350.	54348.	801.4
16	31	35243.		14.1		35271.	1.000	17636.	157350.	54348.	801.4
12	43	33425.		31.5		35220.	1.000	17610.	158176.	54348.	826.0
9	22	35211.		0.6		35213.	1.000	17606.	158293.	54348.	801.4
8	22	34887.		2.3		35206.	1.000	17603.	158403.	54348.	801.4
12	31	33681.		35.1		35189.	1.000	17595.	158680.	54348.	826.0
6	22	34887.		1.9		35141.	1.000	17570.	159466.	54348.	801.4
14	22	34887.		1.9		35132.	1.000	17566.	159612.	54348.	801.4

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1255]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
10	22	34887.		1.7		35104.	1.000	17552.	160075.	54348.	801.4
17	22	35068.		33.9		35070.	1.000	17535.	160627.	54348.	801.4
36	42	34166.		32.3		34983.	1.000	17492.	162071.	60000.	864.5
12	34	33413.		8.5		34900.	1.000	17450.	163460.	54348.	826.0
22	41	34887.		0.6		34889.	1.000	17445.	163651.	54348.	801.4
3	12	33405.		8.5		34888.	1.000	17444.	163664.	54348.	826.0
40	43	34503.		23.6		34819.	1.000	17409.	164848.	54348.	801.4
22	40	34759.		0.6		34761.	1.000	17381.	165831.	54348.	801.4
28	39	34652.		31.3		34673.	1.000	17337.	167354.	53580.	787.5
18	28	34000.		34.5		34614.	1.000	17307.	168392.	53580.	821.0
39	43	34193.		23.6		34509.	1.000	17254.	170242.	54348.	793.6
35	43	27756.		58.0		34506.	1.000	17253.	170292.	54348.	801.4
34	40	34491.		0.5		34499.	1.000	17249.	170419.	54348.	801.4
22	35	34495.		33.9		34498.	1.000	17249.	170442.	54348.	801.4
3	40	34483.		0.5		34487.	1.000	17243.	170635.	54348.	801.4
2	42	34166.		29.2		34390.	1.000	17195.	172368.	60000.	893.7
38	42	34166.		29.2		34390.	1.000	17195.	172368.	60000.	893.7
34	39	34181.		0.5		34189.	1.000	17095.	176049.	54348.	793.6
34	35	27745.		35.0		34186.	1.000	17093.	176101.	54348.	801.4
3	39	34173.		0.5		34177.	1.000	17089.	176274.	54348.	793.6
3	35	27736.		35.0		34174.	1.000	17087.	176326.	54348.	801.4
5	36	18416.		81.7		34057.	1.000	17029.	178513.	60000.	869.1
22	45	33979.		0.6		33981.	1.000	16990.	179967.	54348.	817.3
31	39	33935.		27.2		33963.	1.000	16982.	180307.	54348.	793.6
17	43	27181.		58.0		33931.	1.000	16966.	180916.	54348.	801.4
41	43	33514.		23.6		33829.	1.000	16915.	182887.	54348.	801.4

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1256]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
6	43	33514.		22.2		33829.	1.000	16915.	182890.	54348.	801.4
8	43	33514.		21.9		33829.	1.000	16915.	182890.	54348.	801.4
10	43	33514.		22.4		33829.	1.000	16915.	182890.	54348.	801.4
14	43	33514.		22.3		33829.	1.000	16915.	182890.	54348.	801.4
16	43	33514.		10.5		33829.	1.000	16915.	182890.	54348.	801.4
17	34	27170.		35.0		33612.	1.000	16806.	187194.	54348.	801.4
3	17	27161.		35.0		33599.	1.000	16800.	187437.	54348.	801.4
34	41	33502.		0.5		33510.	1.000	16755.	189252.	54348.	801.4
6	34	33502.		0.8		33510.	1.000	16755.	189256.	54348.	801.4
8	34	33502.		1.2		33510.	1.000	16755.	189256.	54348.	801.4
10	34	33502.		0.6		33510.	1.000	16755.	189256.	54348.	801.4
14	34	33502.		0.8		33510.	1.000	16755.	189256.	54348.	801.4
16	34	33502.		12.5		33510.	1.000	16755.	189256.	54348.	801.4
7	22	33497.		1.1		33499.	1.000	16750.	189470.	54348.	801.4
3	41	33494.		0.5		33498.	1.000	16749.	189499.	54348.	801.4
3	6	33494.		0.8		33497.	1.000	16749.	189503.	54348.	801.4
3	8	33494.		1.2		33497.	1.000	16749.	189503.	54348.	801.4
3	10	33494.		0.6		33497.	1.000	16749.	189503.	54348.	801.4
3	14	33494.		0.8		33497.	1.000	16749.	189503.	54348.	801.4
3	16	33494.		12.5		33497.	1.000	16749.	189503.	54348.	801.4
18	43	32568.		26.8		33477.	1.000	16738.	189930.	54348.	824.1
2	5	18416.		78.5		33465.	1.000	16732.	190176.	60000.	905.8
5	38	18416.		78.5		33465.	1.000	16732.	190176.	60000.	905.8
18	31	32824.		30.3		33445.	1.000	16723.	190566.	54348.	824.1
15	28	28620.		57.0		33425.	1.000	16713.	190984.	53580.	798.3
18	34	32556.		3.7		33157.	1.000	16578.	196612.	54348.	824.1

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1257]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
3	18	32548.		3.7		33145.	1.000	16572.	196871.	54348.	824.1
12	20	31318.		8.5		32817.	1.000	16409.	205131.	54348.	826.0
24	25	32755.		42.6		32771.	1.000	16386.	206456.	53580.	810.3
15	31	27902.		52.8		32714.	1.000	16357.	208114.	54348.	801.4
20	28	32655.		30.7		32675.	1.000	16338.	209234.	53580.	763.1
20	36	32040.		3.8		32653.	1.000	16327.	209888.	54348.	824.1
1	27	32405.		5.1		32602.	1.000	16301.	211385.	58680.	868.4
12	25	30973.		50.1		32467.	1.000	16233.	215442.	53580.	822.9
2	22	32275.		0.6		32278.	1.000	16139.	221264.	54348.	851.7
22	24	32275.		0.1		32278.	1.000	16139.	221264.	54348.	813.4
22	36	32275.		2.6		32278.	1.000	16139.	221264.	54348.	824.1
22	38	32275.		0.6		32278.	1.000	16139.	221264.	54348.	851.7
1	30	31988.		2.1		32084.	1.000	16042.	227424.	58680.	868.4
2	20	32040.		0.6		32060.	1.000	16030.	228208.	54348.	851.7
20	38	32040.		0.6		32060.	1.000	16030.	228208.	54348.	851.7
20	31	31938.		26.6		31966.	1.000	15983.	231302.	54348.	766.8
25	30	31481.		39.8		31577.	1.000	15789.	244590.	53580.	788.7
7	28	31219.		33.0		31557.	1.000	15779.	245285.	53580.	798.3
25	27	31341.		36.8		31538.	1.000	15769.	245964.	53580.	788.7
15	43	26180.		49.2		31279.	1.000	15640.	255410.	54348.	801.4
28	45	31220.		31.3		31241.	1.000	15620.	256841.	53580.	814.2
28	42	31152.		2.2		31173.	1.000	15587.	259394.	53580.	818.0
27	40	30970.		5.3		31167.	1.000	15583.	259631.	58680.	822.5
37	42	30932.		29.2		31156.	1.000	15578.	260037.	60000.	868.4
18	20	30461.		3.8		31074.	1.000	15537.	263206.	54348.	824.1
19	28	31051.		8.4		31071.	1.000	15536.	263297.	53580.	788.7

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 (1258)
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
15	34	26168.		26.2		30959.	1.000	15480.	267678.	54348.	801.4
3	15	26159.		26.2		30947.	1.000	15474.	268157.	54348.	801.4
27	35	24217.		39.8		30848.	1.000	15424.	272130.	58680.	822.5
7	31	30502.		28.9		30847.	1.000	15424.	272146.	54348.	801.4
23	37	30758.		1.4		30838.	1.000	15419.	272503.	60000.	838.6
18	25	30116.		45.3		30723.	1.000	15362.	277200.	53580.	821.0
28	33	30567.		16.3		30588.	1.000	15294.	282853.	53580.	816.1
20	43	30208.		23.0		30523.	1.000	15262.	285593.	54348.	766.8
31	45	30493.		27.2		30521.	1.000	15260.	285693.	54348.	817.3
21	24	30480.		0.5		30481.	1.000	15241.	287400.	54348.	813.4
19	31	30333.		12.5		30362.	1.000	15181.	292600.	54348.	792.1
33	37	29424.		15.0		30334.	1.000	15167.	293826.	60000.	860.6
17	27	23644.		39.8		30276.	1.000	15138.	296416.	58680.	822.5
5	37	15182.		78.5		30231.	1.000	15115.	298432.	60000.	892.0
20	34	30196.		0.0		30203.	1.000	15102.	299660.	54348.	766.8
3	20	30188.		0.1		30191.	1.000	15096.	300210.	54348.	766.8
27	41	29980.		5.3		30178.	1.000	15089.	300835.	58680.	822.5
6	27	29980.		4.0		30177.	1.000	15089.	300844.	58680.	822.5
8	27	29980.		3.6		30177.	1.000	15089.	300844.	58680.	822.5
10	27	29980.		4.2		30177.	1.000	15089.	300844.	58680.	822.5
14	27	29980.		4.0		30177.	1.000	15089.	300844.	58680.	822.5
16	27	29980.		7.7		30177.	1.000	15089.	300844.	58680.	822.5
13	24	29455.		3.8		30076.	1.000	15038.	305510.	60000.	860.0
42	43	29721.		5.6		30036.	1.000	15018.	307361.	54348.	821.2
30	40	29917.		2.4		30014.	1.000	15007.	308417.	58680.	822.5
31	42	29977.		2.0		30005.	1.000	15003.	308818.	54348.	821.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1259]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
24	44	29966.		0.5		29968.	1.000	14984.	310575.	60000.	853.1
9	28	29486.		32.5		29721.	1.000	14861.	322516.	53580.	798.3
34	42	29709.		28.6		29716.	1.000	14858.	322754.	54348.	821.2
3	42	29701.		28.6		29704.	1.000	14852.	323355.	54348.	821.2
30	35	23164.		36.8		29695.	1.000	14847.	323829.	58680.	822.5
11	24	29455.		0.8		29457.	1.000	14728.	335946.	60000.	840.6
15	24	29455.		25.2		29457.	1.000	14728.	335946.	60000.	840.6
33	43	29133.		8.6		29449.	1.000	14724.	336356.	54348.	819.2
31	33	29392.		12.1		29420.	1.000	14710.	337846.	54348.	819.2
7	43	28774.		25.3		29406.	1.000	14703.	338595.	54348.	801.4
33	34	29122.		14.5		29129.	1.000	14565.	353547.	54348.	819.2
17	30	22592.		36.8		29122.	1.000	14561.	353924.	58680.	822.5
3	33	29113.		14.5		29117.	1.000	14559.	354220.	54348.	819.2
43	45	28797.		23.6		29112.	1.000	14556.	354495.	54348.	817.3
7	34	28762.		2.2		29086.	1.000	14543.	355926.	54348.	801.4
3	7	28753.		2.2		29074.	1.000	14537.	356604.	54348.	801.4
30	41	28928.		2.4		29024.	1.000	14512.	359424.	58680.	822.5
6	30	28928.		1.0		29024.	1.000	14512.	359435.	58680.	822.5
8	30	28928.		0.7		29024.	1.000	14512.	359435.	58680.	822.5
10	30	28928.		1.2		29024.	1.000	14512.	359435.	58680.	822.5
14	30	28928.		1.1		29024.	1.000	14512.	359435.	58680.	822.5
16	30	28928.		10.7		29024.	1.000	14512.	359435.	58680.	822.5
9	31	28768.		28.3		29011.	1.000	14505.	360192.	54348.	801.4
2	12	27441.		7.9		28921.	1.000	14460.	365335.	60000.	903.8
12	36	27441.		4.8		28921.	1.000	14460.	365335.	60000.	868.4
12	38	27441.		7.9		28921.	1.000	14460.	365335.	60000.	903.8

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1260]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
19	43	28604.		16.1		28920.	1.000	14460.	365397.	54348.	792.1
30	39	28811.		2.4		28907.	1.000	14454.	366116.	58680.	822.5
11	28	28620.		32.6		28884.	1.000	14442.	367461.	53580.	798.3
27	39	28671.		5.3		28868.	1.000	14434.	368386.	58680.	822.5
20	35	22397.		35.0		28851.	1.000	14425.	369387.	54348.	801.4
33	36	27333.		18.2		28836.	1.000	14418.	370288.	60000.	863.0
20	37	28806.		0.6		28826.	1.000	14413.	370834.	54348.	788.7
34	45	28785.		0.5		28792.	1.000	14396.	372829.	54348.	817.3
3	45	28777.		0.5		28780.	1.000	14390.	373546.	54348.	817.3
27	43	28412.		18.2		28727.	1.000	14364.	376708.	54348.	792.1
13	28	28620.		28.0		28641.	1.000	14321.	381903.	53580.	822.9
19	34	28592.		39.1		28600.	1.000	14300.	384425.	54348.	792.1
9	24	28590.		0.7		28591.	1.000	14296.	384960.	60000.	840.6
3	19	28584.		39.2		28588.	1.000	14294.	385169.	54348.	792.1
25	35	22050.		76.6		28499.	1.000	14249.	390691.	53580.	798.3
28	44	28431.		31.3		28451.	1.000	14226.	393669.	53580.	814.2
17	24	28447.		34.0		28449.	1.000	14224.	393854.	60000.	840.6
27	34	28400.		4.8		28407.	1.000	14204.	396461.	54348.	792.1
3	27	28392.		4.8		28395.	1.000	14198.	397234.	54348.	792.1
5	28	28333.		47.2		28354.	1.000	14177.	399912.	53580.	823.9
2	33	27333.		15.0		28243.	1.000	14121.	407140.	60000.	889.7
33	38	27333.		15.0		28243.	1.000	14121.	407140.	60000.	889.7
21	23	28137.		1.4		28218.	1.000	14109.	408793.	54348.	804.7
11	31	27902.		28.5		28173.	1.000	14086.	411773.	54348.	801.4
28	30	27997.		28.9		28018.	1.000	14009.	422270.	53580.	788.7
13	31	27902.		23.8		27930.	1.000	13965.	428376.	54348.	826.0

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1261]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
27	28	27856.		26.0		27877.	1.000	13939.	432081.	53580.	788.7
24	35	27875.		34.0		27877.	1.000	13938.	432125.	60000.	840.6
13	23	27112.		4.7		27812.	1.000	13906.	436721.	60000.	853.1
23	44	27648.		1.4		27729.	1.000	13864.	442732.	60000.	846.3
31	44	27673.		27.2		27701.	1.000	13851.	444748.	54348.	817.3
30	43	27360.		21.2		27675.	1.000	13838.	446650.	54348.	792.1
5	31	27614.		51.4		27642.	1.000	13821.	449150.	54348.	827.0
20	42	27614.		28.6		27634.	1.000	13817.	449757.	54348.	821.2
15	27	22635.		31.0		27616.	1.000	13808.	451074.	58680.	822.5
3	28	27578.		30.8		27599.	1.000	13799.	452344.	53580.	763.1
21	28	27578.		31.3		27599.	1.000	13799.	452344.	53580.	763.1
28	34	27578.		30.8		27599.	1.000	13799.	452344.	53580.	763.1
28	43	27578.		7.7		27599.	1.000	13799.	452344.	53580.	763.1
9	43	27041.		24.7		27572.	1.000	13786.	454392.	54348.	801.4
1	42	27252.		28.9		27476.	1.000	13738.	461639.	60000.	893.7
17	20	20982.		35.0		27436.	1.000	13718.	464734.	54348.	801.4
30	34	27348.		1.8		27356.	1.000	13678.	470989.	54348.	792.1
3	30	27340.		1.9		27344.	1.000	13672.	471943.	54348.	792.1
25	42	27269.		13.0		27283.	1.000	13642.	476732.	53580.	818.0
24	39	27275.		0.5		27276.	1.000	13638.	477271.	60000.	840.6
19	36	26645.		42.9		27255.	1.000	13628.	478974.	58680.	841.7
9	34	27030.		1.7		27252.	1.000	13626.	479249.	54348.	801.4
3	9	27021.		1.7		27240.	1.000	13620.	480224.	54348.	801.4
1	23	27078.		1.7		27208.	1.000	13604.	482793.	60000.	878.3
11	23	27112.		0.1		27193.	1.000	13597.	483997.	60000.	833.8
15	23	27112.		24.3		27193.	1.000	13597.	483997.	60000.	833.8

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1262]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
18	36	26584.		0.0		27177.	1.000	13589.	485280.	60000.	866.8
2	18	26584.		3.2		27177.	1.000	13589.	485286.	60000.	899.7
18	38	26584.		3.2		27177.	1.000	13589.	485286.	60000.	899.7
31	43	26861.		3.6		27177.	1.000	13588.	485321.	54348.	766.8
24	45	27103.		0.5		27105.	1.000	13552.	491227.	60000.	853.1
22	23	27100.		0.8		27103.	1.000	13551.	491420.	54348.	804.7
17	25	20635.		76.6		27084.	1.000	13542.	492958.	53580.	798.3
20	33	27026.		14.4		27046.	1.000	13523.	496131.	54348.	819.2
12	27	25319.		13.3		26996.	1.000	13498.	500727.	58680.	843.2
3	31	26861.		26.6		26889.	1.000	13445.	518868.	54348.	766.8
21	31	26861.		27.2		26889.	1.000	13445.	518868.	54348.	766.8
31	34	26861.		26.6		26889.	1.000	13445.	518868.	54348.	766.8
20	27	26676.		4.8		26872.	1.000	13436.	521787.	54348.	792.1
7	24	26861.		1.2		26862.	1.000	13431.	523582.	60000.	840.6
30	31	26821.		24.8		26850.	1.000	13425.	525802.	54348.	792.1
15	20	21992.		26.2		26795.	1.000	13398.	535458.	54348.	801.4
12	30	25177.		10.3		26753.	1.000	13376.	543158.	58680.	843.2
11	43	26180.		24.9		26738.	1.000	13369.	545912.	54348.	801.4
27	31	26681.		21.8		26709.	1.000	13355.	551258.	54348.	792.1
25	33	26682.		27.1		26696.	1.000	13348.	553668.	53580.	816.1
2	19	26645.		39.7		26662.	1.000	13331.	560023.	58680.	868.4
19	38	26645.		39.7		26662.	1.000	13331.	560023.	58680.	868.4
1	33	25744.		14.8		26654.	1.000	13327.	561655.	60000.	889.7
1	5	11502.		78.2		26550.	1.000	13275.	581619.	60000.	905.8
13	43	26180.		20.3		26495.	1.000	13248.	592663.	54348.	826.0
43	44	26148.		23.6		26464.	1.000	13232.	599029.	54348.	817.3

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1263]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
15	30	21583.		28.0		26463.	1.000	13232.	599165.	58680.	822.5
15	25	21645.		67.8		26444.	1.000	13222.	603148.	53580.	798.3
11	34	26168.		1.8		26418.	1.000	13209.	608383.	54348.	801.4
3	11	26159.		1.8		26406.	1.000	13203.	610902.	54348.	801.4
9	23	26247.		0.2		26328.	1.000	13164.	627410.	60000.	833.8
28	31	26306.		4.2		26327.	1.000	13163.	627701.	53580.	763.1
5	43	25895.		54.9		26211.	1.000	13106.	653074.	54348.	827.0
17	23	26105.		33.1		26185.	1.000	13093.	658887.	60000.	833.8
13	34	26168.		2.8		26175.	1.000	13088.	661145.	54348.	826.0
3	13	26159.		2.8		26163.	1.000	13082.	663907.	54348.	826.0
34	44	26137.		0.5		26144.	1.000	13072.	668334.	54348.	817.3
3	44	26128.		0.5		26132.	1.000	13066.	671130.	54348.	817.3
5	25	21935.		36.4		26033.	1.000	13017.	694402.	53580.	823.9
5	34	25884.		78.0		25891.	1.000	12946.	729405.	54348.	827.0
3	5	25875.		78.0		25879.	1.000	12940.	732486.	54348.	827.0
16	23	23283.		14.4		25797.	1.000	12899.	753773.	60000.	833.8
7	27	25238.		7.0		25752.	1.000	12876.	765629.	58680.	822.5
20	30	25623.		1.8		25719.	1.000	12859.	774672.	54348.	792.1
12	37	24207.		7.9		25687.	1.000	12843.	783405.	60000.	888.0
23	35	25532.		33.1		25613.	1.000	12807.	803942.	60000.	833.8
5	12	9038.		86.5		25567.	1.000	12783.	817215.	60000.	870.6
3	43	25130.		23.1		25446.	1.000	12723.	852773.	54348.	766.8
21	43	25130.		23.6		25446.	1.000	12723.	852773.	54348.	766.8
34	43	25130.		23.0		25446.	1.000	12723.	852773.	54348.	766.8
27	45	25182.		5.3		25379.	1.000	12690.	873244.	58680.	836.3
19	27	25071.		34.3		25268.	1.000	12634.	908503.	58680.	813.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1264]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD PAIR	SET	SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
18	27	24462.		8.5		25252.	1.000	12626.	913613.	58680.	841.7
23	39	25107.		1.4		25188.	1.000	12594.	934874.	60000.	833.8
1	20	25126.		0.3		25146.	1.000	12573.	948882.	54348.	851.7
3	34	25119.		0.0		25126.	1.000	12563.	955635.	54348.	766.8
21	34	25119.		0.5		25126.	1.000	12563.	955635.	54348.	766.8
3	21	25110.		0.5		25114.	1.000	12557.	959796.	54348.	766.8
18	30	24320.		5.5		25009.	1.000	12505.	996650.	58680.	841.7
23	45	24883.		1.4		24963.	1.000	12482.	>1000000.	60000.	846.3
20	25	24601.		41.6		24621.	1.000	12310.	>1000000.	53580.	763.1
40	42	24388.		29.2		24612.	1.000	12306.	>1000000.	60000.	846.7
16	24	22175.		13.5		24609.	1.000	12305.	>1000000.	60000.	840.6
7	23	24523.		0.3		24604.	1.000	12302.	>1000000.	60000.	833.8
7	30	24186.		4.1		24599.	1.000	12300.	>1000000.	58680.	822.5
39	42	24075.		29.2		24300.	1.000	12150.	>1000000.	60000.	846.7
35	42	17634.		63.6		24292.	1.000	12146.	>1000000.	60000.	846.7
30	45	24139.		2.4		24235.	1.000	12118.	>1000000.	58680.	836.3
12	19	22716.		47.6		24214.	1.000	12107.	>1000000.	58680.	843.2
19	30	24018.		37.3		24114.	1.000	12057.	>1000000.	58680.	813.2
18	37	23350.		3.2		23943.	1.000	11972.	>1000000.	60000.	880.1
9	27	23503.		6.5		23914.	1.000	11957.	>1000000.	58680.	822.5
5	18	8182.		81.7		23823.	1.000	11912.	>1000000.	60000.	869.1
17	42	17061.		63.6		23720.	1.000	11860.	>1000000.	60000.	846.7
8	23	23283.		3.1		23681.	1.000	11841.	>1000000.	60000.	833.8
5	40	8626.		78.5		23674.	1.000	11837.	>1000000.	60000.	851.3
41	42	23398.		29.2		23623.	1.000	11811.	>1000000.	60000.	846.7
6	42	23398.		27.8		23622.	1.000	11811.	>1000000.	60000.	846.7

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1265]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
8	42	23398.		27.5		23622.	1.000	11811.	>1000000.	60000.	846.7
10	42	23398.		28.0		23622.	1.000	11811.	>1000000.	60000.	846.7
14	42	23398.		27.8		23622.	1.000	11811.	>1000000.	60000.	846.7
16	42	23398.		16.1		23622.	1.000	11811.	>1000000.	60000.	846.7
6	23	23283.		2.7		23616.	1.000	11808.	>1000000.	60000.	833.8
14	23	23283.		2.7		23607.	1.000	11803.	>1000000.	60000.	833.8
10	23	23283.		2.5		23579.	1.000	11789.	>1000000.	60000.	833.8
2	17	17119.		34.4		23553.	1.000	11777.	>1000000.	60000.	875.7
17	36	17119.		31.3		23553.	1.000	11777.	>1000000.	60000.	849.0
17	38	17119.		34.4		23553.	1.000	11777.	>1000000.	60000.	875.7
33	39	22569.		15.0		23479.	1.000	11740.	>1000000.	60000.	845.2
19	37	23411.		39.7		23428.	1.000	11714.	>1000000.	58680.	819.8
23	41	23283.		1.4		23364.	1.000	11682.	>1000000.	60000.	833.8
5	39	8313.		78.5		23362.	1.000	11681.	>1000000.	60000.	851.3
24	37	23355.		0.5		23356.	1.000	11678.	>1000000.	60000.	851.8
5	35	1871.		113.0		23354.	1.000	11677.	>1000000.	60000.	851.3
23	40	23146.		1.4		23227.	1.000	11613.	>1000000.	60000.	833.8
27	33	22925.		9.7		23122.	1.000	11561.	>1000000.	58680.	837.9
11	27	22635.		6.6		23075.	1.000	11537.	>1000000.	58680.	822.5
20	21	23025.		0.6		23045.	1.000	11522.	>1000000.	54348.	766.8
2	35	16547.		34.4		22981.	1.000	11491.	>1000000.	60000.	875.7
35	36	16547.		31.3		22981.	1.000	11491.	>1000000.	60000.	849.0
35	38	16547.		34.4		22981.	1.000	11491.	>1000000.	60000.	875.7
2	15	18127.		25.7		22911.	1.000	11456.	>1000000.	60000.	875.7
15	36	18127.		22.5		22911.	1.000	11456.	>1000000.	60000.	849.0
15	38	18127.		25.7		22911.	1.000	11456.	>1000000.	60000.	875.7

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1266]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
17	33	15555.		49.5		22900.	1.000	11450.	>1000000.	60000.	845.2
13	27	22635.		2.0		22832.	1.000	11416.	>1000000.	58680.	843.2
33	41	21891.		15.0		22801.	1.000	11400.	>1000000.	60000.	845.2
6	33	21891.		13.7		22801.	1.000	11400.	>1000000.	60000.	845.2
8	33	21891.		13.3		22801.	1.000	11400.	>1000000.	60000.	845.2
10	33	21891.		13.9		22801.	1.000	11400.	>1000000.	60000.	845.2
14	33	21891.		13.7		22801.	1.000	11400.	>1000000.	60000.	845.2
16	33	21891.		2.0		22801.	1.000	11400.	>1000000.	60000.	845.2
5	17	1299.		113.0		22783.	1.000	11391.	>1000000.	60000.	851.3
9	30	22450.		3.5		22761.	1.000	11381.	>1000000.	58680.	822.5
21	25	22681.		42.2		22695.	1.000	11348.	>1000000.	53580.	763.1
5	41	7636.		78.5		22685.	1.000	11342.	>1000000.	60000.	851.3
5	6	7636.		77.2		22685.	1.000	11342.	>1000000.	60000.	851.3
5	8	7636.		76.8		22685.	1.000	11342.	>1000000.	60000.	851.3
5	10	7636.		77.4		22685.	1.000	11342.	>1000000.	60000.	851.3
5	14	7636.		77.2		22685.	1.000	11342.	>1000000.	60000.	851.3
5	16	7636.		65.5		22685.	1.000	11342.	>1000000.	60000.	851.3
33	40	21767.		15.0		22677.	1.000	11339.	>1000000.	60000.	845.2
20	44	22548.		0.6		22567.	1.000	11284.	>1000000.	54348.	817.3
5	27	22346.		73.2		22543.	1.000	11271.	>1000000.	58680.	844.0
8	24	22175.		2.2		22493.	1.000	11247.	>1000000.	60000.	840.6
27	44	22291.		5.3		22488.	1.000	11244.	>1000000.	58680.	836.3
18	19	21860.		42.9		22470.	1.000	11235.	>1000000.	58680.	841.7
6	24	22175.		1.8		22428.	1.000	11214.	>1000000.	60000.	840.6
14	24	22175.		1.8		22419.	1.000	11210.	>1000000.	60000.	840.6
10	24	22175.		1.6		22391.	1.000	11195.	>1000000.	60000.	840.6

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1267]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
5	20	22281.		77.9		22301.	1.000	11150.	>1000000.	54348.	827.0
20	40	22243.		0.6		22263.	1.000	11132.	>1000000.	54348.	801.4
11	20	21992.		1.9		22254.	1.000	11127.	>1000000.	54348.	801.4
24	41	22175.		0.5		22176.	1.000	11088.	>1000000.	60000.	840.6
25	44	22161.		42.2		22175.	1.000	11088.	>1000000.	53580.	814.2
1	12	20527.		8.2		22056.	1.000	11028.	>1000000.	60000.	903.8
25	36	21427.		45.3		22035.	1.000	11017.	>1000000.	53580.	821.0
13	20	21992.		2.8		22011.	1.000	11006.	>1000000.	54348.	826.0
30	33	21873.		12.6		21969.	1.000	10984.	>1000000.	58680.	837.9
20	39	21947.		0.6		21967.	1.000	10983.	>1000000.	54348.	793.6
11	30	21583.		3.7		21922.	1.000	10961.	>1000000.	58680.	822.5
11	25	21645.		43.5		21902.	1.000	10951.	>1000000.	53580.	798.3
27	42	21615.		23.8		21812.	1.000	10906.	>1000000.	58680.	839.4
21	27	21600.		5.3		21797.	1.000	10898.	>1000000.	54348.	792.1
35	37	15300.		34.4		21734.	1.000	10867.	>1000000.	60000.	833.7
13	30	21583.		1.0		21679.	1.000	10840.	>1000000.	58680.	843.2
13	25	21645.		38.8		21660.	1.000	10830.	>1000000.	53580.	822.9
30	42	21473.		26.8		21569.	1.000	10784.	>1000000.	58680.	839.4
12	33	19125.		23.0		21514.	1.000	10757.	>1000000.	60000.	864.5
33	35	14141.		49.5		21486.	1.000	10743.	>1000000.	60000.	845.2
2	25	21427.		42.2		21442.	1.000	10721.	>1000000.	53580.	849.3
25	38	21427.		42.2		21442.	1.000	10721.	>1000000.	53580.	849.3
5	30	21294.		76.1		21390.	1.000	10695.	>1000000.	58680.	844.0
9	20	21124.		1.7		21358.	1.000	10679.	>1000000.	54348.	801.4
30	44	21261.		2.4		21358.	1.000	10679.	>1000000.	58680.	836.3
20	41	21254.		0.6		21274.	1.000	10637.	>1000000.	54348.	801.4

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1268]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
6	20	21254.		0.8		21274.	1.000	10637.	>1000000.	54348.	801.4
8	20	21254.		1.1		21274.	1.000	10637.	>1000000.	54348.	801.4
10	20	21254.		0.6		21274.	1.000	10637.	>1000000.	54348.	801.4
14	20	21254.		0.7		21274.	1.000	10637.	>1000000.	54348.	801.4
16	20	21254.		12.5		21274.	1.000	10637.	>1000000.	54348.	801.4
24	40	21195.		0.5		21197.	1.000	10598.	>1000000.	60000.	840.6
15	42	16052.		54.8		21060.	1.000	10530.	>1000000.	60000.	846.7
9	25	20777.		43.3		21006.	1.000	10503.	>1000000.	53580.	798.3
21	30	20547.		2.4		20643.	1.000	10321.	>1000000.	54348.	792.1
12	16	16674.		21.0		20587.	1.000	10294.	>1000000.	60000.	850.5
5	42	15762.		49.4		20384.	1.000	10192.	>1000000.	60000.	866.8
17	37	13885.		34.4		20319.	1.000	10160.	>1000000.	60000.	833.7
1	18	19670.		3.4		20313.	1.000	10156.	>1000000.	60000.	899.7
19	35	13795.		74.1		20247.	1.000	10124.	>1000000.	58680.	822.5
15	33	14547.		40.7		20241.	1.000	10121.	>1000000.	60000.	845.2
5	15	289.		104.2		20122.	1.000	10061.	>1000000.	60000.	851.3
20	45	19910.		0.6		19930.	1.000	9965.	>1000000.	54348.	817.3
5	33	14258.		63.5		19800.	1.000	9900.	>1000000.	60000.	865.3
18	33	18268.		18.2		19771.	1.000	9885.	>1000000.	60000.	863.0
1	19	19731.		39.4		19748.	1.000	9874.	>1000000.	58680.	868.4
21	36	19151.		3.2		19744.	1.000	9872.	>1000000.	54348.	824.1
7	20	19391.		2.3		19728.	1.000	9864.	>1000000.	54348.	801.4
1	24	19674.		0.7		19726.	1.000	9863.	>1000000.	60000.	885.1
15	37	14893.		25.7		19677.	1.000	9839.	>1000000.	60000.	833.7
19	20	19553.		39.1		19573.	1.000	9786.	>1000000.	54348.	792.1
27	30	19370.		3.0		19567.	1.000	9784.	>1000000.	58680.	813.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1269]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
2	23	19336.		1.4		19416.	1.000	9708.	>1000000.	60000.	878.3
23	24	19336.		0.9		19416.	1.000	9708.	>1000000.	60000.	843.2
23	36	19336.		1.8		19416.	1.000	9708.	>1000000.	60000.	851.6
23	38	19336.		1.4		19416.	1.000	9708.	>1000000.	60000.	878.3
7	25	19041.		43.9		19373.	1.000	9686.	>1000000.	53580.	798.3
13	36	18127.		6.5		19339.	1.000	9670.	>1000000.	60000.	868.4
25	45	19292.		42.2		19306.	1.000	9653.	>1000000.	53580.	814.2
36	44	18638.		3.2		19231.	1.000	9616.	>1000000.	60000.	861.5
19	25	19209.		2.5		19227.	1.000	9613.	>1000000.	53580.	788.7
7	42	18656.		30.9		19197.	1.000	9599.	>1000000.	60000.	846.7
2	21	19151.		0.0		19151.	1.000	9576.	>1000000.	54348.	851.7
21	38	19151.		0.0		19151.	1.000	9576.	>1000000.	54348.	851.7
12	40	17663.		7.9		19143.	1.000	9572.	>1000000.	60000.	850.5
19	42	19013.		10.5		19030.	1.000	9515.	>1000000.	58680.	839.4
16	18	15818.		16.2		18843.	1.000	9422.	>1000000.	60000.	849.0
17	19	12380.		74.1		18832.	1.000	9416.	>1000000.	58680.	822.5
12	39	17350.		7.9		18830.	1.000	9415.	>1000000.	60000.	850.5
42	45	18564.		29.2		18789.	1.000	9394.	>1000000.	60000.	859.2
2	13	18127.		3.3		18746.	1.000	9373.	>1000000.	60000.	903.8
13	38	18127.		3.3		18746.	1.000	9373.	>1000000.	60000.	903.8
11	36	18127.		1.9		18720.	1.000	9360.	>1000000.	60000.	849.0
2	44	18638.		0.0		18638.	1.000	9319.	>1000000.	60000.	888.2
38	44	18638.		0.0		18638.	1.000	9319.	>1000000.	60000.	888.2
8	12	16674.		9.6		18471.	1.000	9235.	>1000000.	60000.	850.5
19	33	18426.		24.7		18443.	1.000	9222.	>1000000.	58680.	837.9
6	12	16674.		9.3		18406.	1.000	9203.	>1000000.	60000.	850.5

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1270]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
12	14	16674.		9.2		18397.	1.000	9198.	>1000000.	60000.	850.5
7	33	17149.		16.7		18376.	1.000	9188.	>1000000.	60000.	845.2
2	11	18127.		1.3		18370.	1.000	9185.	>1000000.	60000.	875.7
11	38	18127.		1.3		18370.	1.000	9185.	>1000000.	60000.	875.7
10	12	16674.		9.1		18368.	1.000	9184.	>1000000.	60000.	850.5
5	7	2894.		80.2		18259.	1.000	9130.	>1000000.	60000.	851.3
15	19	13390.		65.3		18192.	1.000	9096.	>1000000.	58680.	822.5
12	41	16674.		7.9		18154.	1.000	9077.	>1000000.	60000.	850.5
1	35	11620.		34.7		18104.	1.000	9052.	>1000000.	60000.	875.7
33	45	17108.		15.0		18018.	1.000	9009.	>1000000.	60000.	857.7
5	45	2922.		78.5		17971.	1.000	8985.	>1000000.	60000.	863.8
9	36	17262.		2.0		17855.	1.000	8927.	>1000000.	60000.	849.0
5	19	13679.		38.8		17777.	1.000	8888.	>1000000.	58680.	844.0
2	9	17262.		1.2		17476.	1.000	8738.	>1000000.	60000.	875.7
9	38	17262.		1.2		17476.	1.000	8738.	>1000000.	60000.	875.7
18	40	16807.		3.2		17400.	1.000	8700.	>1000000.	60000.	849.0
9	42	16920.		30.3		17359.	1.000	8679.	>1000000.	60000.	846.7
12	35	10909.		26.5		17343.	1.000	8672.	>1000000.	60000.	850.5
18	39	16494.		3.2		17087.	1.000	8543.	>1000000.	60000.	849.0
19	40	16851.		39.7		16868.	1.000	8434.	>1000000.	58680.	822.5
12	17	10337.		26.5		16772.	1.000	8386.	>1000000.	60000.	850.5
8	18	15818.		4.9		16727.	1.000	8364.	>1000000.	60000.	849.0
1	17	10205.		34.7		16689.	1.000	8344.	>1000000.	60000.	875.7
6	18	15818.		4.5		16662.	1.000	8331.	>1000000.	60000.	849.0
14	18	15818.		4.5		16653.	1.000	8327.	>1000000.	60000.	849.0
10	18	15818.		4.3		16625.	1.000	8312.	>1000000.	60000.	849.0

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1271]
Vermont Yankee Feedwater PipingS1 Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
16	35	7752.		47.5		16619.	1.000	8309.	>1000000.	60000.	831.2
25	39	16565.		42.2		16580.	1.000	8290.	>1000000.	53580.	787.5
33	42	16341.		14.1		16565.	1.000	8283.	>1000000.	60000.	860.7
19	39	16541.		39.7		16559.	1.000	8280.	>1000000.	58680.	822.5
36	39	15947.		3.2		16540.	1.000	8270.	>1000000.	60000.	849.0
9	33	15414.		16.2		16539.	1.000	8269.	>1000000.	60000.	845.2
11	42	16052.		30.5		16519.	1.000	8259.	>1000000.	60000.	846.7
18	35	10053.		31.3		16487.	1.000	8244.	>1000000.	60000.	849.0
5	9	1158.		79.7		16421.	1.000	8210.	>1000000.	60000.	851.3
18	41	15818.		3.2		16410.	1.000	8205.	>1000000.	60000.	849.0
36	45	15775.		3.2		16368.	1.000	8184.	>1000000.	60000.	861.5
13	42	16052.		25.8		16276.	1.000	8138.	>1000000.	60000.	866.1
7	36	15533.		1.5		16126.	1.000	8063.	>1000000.	60000.	849.0
1	15	11213.		25.9		16047.	1.000	8023.	>1000000.	60000.	875.7
5	44	964.		78.5		16013.	1.000	8007.	>1000000.	60000.	863.8
2	39	15947.		0.0		15947.	1.000	7974.	>1000000.	60000.	875.7
38	39	15947.		0.0		15947.	1.000	7974.	>1000000.	60000.	875.7
21	37	15918.		0.0		15918.	1.000	7959.	>1000000.	54348.	788.7
17	18	9481.		31.3		15915.	1.000	7958.	>1000000.	60000.	849.0
42	44	15657.		29.2		15881.	1.000	7940.	>1000000.	60000.	859.2
19	41	15861.		39.7		15879.	1.000	7940.	>1000000.	58680.	822.5
6	19	15861.		38.3		15879.	1.000	7939.	>1000000.	58680.	822.5
8	19	15861.		38.0		15879.	1.000	7939.	>1000000.	58680.	822.5
10	19	15861.		38.5		15879.	1.000	7939.	>1000000.	58680.	822.5
14	19	15861.		38.4		15879.	1.000	7939.	>1000000.	58680.	822.5
16	19	15861.		26.6		15879.	1.000	7939.	>1000000.	58680.	822.5

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

D S T C O M P U T E R S E R V I C E S S. A. F-4.1 PAGE NO. 1003

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1272]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
2	7	15533.		1.7		15850.	1.000	7925.	>1000000.	60000.	875.7
7	38	15533.		1.7		15850.	1.000	7925.	>1000000.	60000.	875.7
12	42	14132.		37.1		15836.	1.000	7918.	>1000000.	60000.	866.1
5	21	765.		78.5		15814.	1.000	7907.	>1000000.	54348.	827.0
2	45	15775.		0.0		15775.	1.000	7888.	>1000000.	60000.	888.2
38	45	15775.		0.0		15775.	1.000	7888.	>1000000.	60000.	888.2
11	33	14547.		16.3		15700.	1.000	7850.	>1000000.	60000.	845.2
5	11	289.		79.8		15581.	1.000	7790.	>1000000.	60000.	851.3
13	37	14893.		3.3		15512.	1.000	7756.	>1000000.	60000.	888.0
13	33	14547.		11.7		15457.	1.000	7729.	>1000000.	60000.	864.5
37	44	15404.		0.0		15404.	1.000	7702.	>1000000.	60000.	857.6
25	37	15333.		42.2		15347.	1.000	7673.	>1000000.	53580.	784.2
5	13	289.		75.2		15338.	1.000	7669.	>1000000.	60000.	870.6
21	42	15018.		29.2		15242.	1.000	7621.	>1000000.	54348.	821.2
16	17	6337.		47.5		15204.	1.000	7602.	>1000000.	60000.	831.2
33	44	14277.		15.0		15187.	1.000	7594.	>1000000.	60000.	857.7
11	37	14893.		1.3		15136.	1.000	7568.	>1000000.	60000.	833.7
35	39	8429.		34.4		14863.	1.000	7431.	>1000000.	60000.	831.2
15	16	7347.		38.7		14564.	1.000	7282.	>1000000.	60000.	831.2
8	35	7752.		36.1		14503.	1.000	7251.	>1000000.	60000.	831.2
19	21	14425.		39.7		14443.	1.000	7221.	>1000000.	54348.	792.1
6	35	7752.		35.8		14438.	1.000	7219.	>1000000.	60000.	831.2
25	40	14423.		42.2		14437.	1.000	7218.	>1000000.	53580.	798.3
14	35	7752.		35.8		14429.	1.000	7214.	>1000000.	60000.	831.2
21	33	13510.		15.0		14420.	1.000	7210.	>1000000.	54348.	819.2
10	35	7752.		35.6		14400.	1.000	7200.	>1000000.	60000.	831.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1273]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
25	41	14299.		42.2		14314.	1.000	7157.	>1000000.	53580.	798.3
6	25	14299.		40.8		14314.	1.000	7157.	>1000000.	53580.	798.3
8	25	14299.		40.5		14314.	1.000	7157.	>1000000.	53580.	798.3
10	25	14299.		41.0		14314.	1.000	7157.	>1000000.	53580.	798.3
14	25	14299.		40.8		14314.	1.000	7157.	>1000000.	53580.	798.3
16	25	14299.		29.1		14314.	1.000	7157.	>1000000.	53580.	798.3
9	37	14028.		1.2		14242.	1.000	7121.	>1000000.	60000.	833.7
35	41	7752.		34.4		14186.	1.000	7093.	>1000000.	60000.	831.2
12	15	9327.		17.7		14111.	1.000	7056.	>1000000.	60000.	850.5
18	42	13275.		32.3		14092.	1.000	7046.	>1000000.	60000.	864.5
35	40	7628.		34.4		14063.	1.000	7031.	>1000000.	60000.	831.2
19	44	13999.		39.7		14017.	1.000	7008.	>1000000.	58680.	836.3
16	36	10847.		16.2		13873.	1.000	6936.	>1000000.	60000.	849.0
17	40	7326.		34.4		13761.	1.000	6880.	>1000000.	60000.	831.2
11	19	13390.		41.0		13651.	1.000	6825.	>1000000.	58680.	822.5
17	39	7014.		34.4		13448.	1.000	6724.	>1000000.	60000.	831.2
7	12	11932.		6.2		13411.	1.000	6706.	>1000000.	60000.	850.5
13	19	13390.		36.3		13408.	1.000	6704.	>1000000.	58680.	843.2
12	45	11813.		7.9		13293.	1.000	6647.	>1000000.	60000.	863.0
2	16	10847.		13.1		13280.	1.000	6640.	>1000000.	60000.	875.7
16	38	10847.		13.1		13280.	1.000	6640.	>1000000.	60000.	875.7
15	18	8471.		22.5		13255.	1.000	6627.	>1000000.	60000.	849.0
15	40	8336.		25.7		13120.	1.000	6560.	>1000000.	60000.	831.2
1	25	13083.		41.9		13097.	1.000	6549.	>1000000.	53580.	849.3
8	17	6337.		36.2		13088.	1.000	6544.	>1000000.	60000.	831.2
6	17	6337.		35.8		13023.	1.000	6511.	>1000000.	60000.	831.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1274]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
14	17	6337.		35.8		13014.	1.000	6507.	>1000000.	60000.	831.2
10	17	6337.		35.6		12986.	1.000	6493.	>1000000.	60000.	831.2
15	39	8023.		25.7		12807.	1.000	6404.	>1000000.	60000.	831.2
17	41	6337.		34.4		12771.	1.000	6386.	>1000000.	60000.	831.2
9	19	12522.		40.8		12755.	1.000	6377.	>1000000.	58680.	822.5
36	37	12027.		3.2		12620.	1.000	6310.	>1000000.	60000.	880.1
7	37	12299.		1.7		12616.	1.000	6308.	>1000000.	60000.	833.7
37	45	12541.		0.0		12541.	1.000	6271.	>1000000.	60000.	857.6
8	15	7347.		27.4		12448.	1.000	6224.	>1000000.	60000.	831.2
6	15	7347.		27.0		12382.	1.000	6191.	>1000000.	60000.	831.2
14	15	7347.		27.0		12373.	1.000	6187.	>1000000.	60000.	831.2
10	15	7347.		26.8		12345.	1.000	6173.	>1000000.	60000.	831.2
1	21	12237.		0.3		12287.	1.000	6144.	>1000000.	54348.	851.7
15	41	7347.		25.7		12131.	1.000	6065.	>1000000.	60000.	831.2
19	45	12049.		39.7		12066.	1.000	6033.	>1000000.	58680.	836.3
2	37	12027.		0.0		12027.	1.000	6013.	>1000000.	60000.	970.1
37	38	12027.		0.0		12027.	1.000	6013.	>1000000.	60000.	970.1
1	13	11213.		3.1		11832.	1.000	5916.	>1000000.	60000.	903.8
1	44	11724.		0.3		11774.	1.000	5887.	>1000000.	60000.	888.2
8	36	10847.		4.9		11757.	1.000	5878.	>1000000.	60000.	849.0
6	36	10847.		4.5		11691.	1.000	5846.	>1000000.	60000.	849.0
14	36	10847.		4.5		11682.	1.000	5841.	>1000000.	60000.	849.0
9	12	10196.		6.8		11676.	1.000	5838.	>1000000.	60000.	850.5
7	18	11075.		1.5		11668.	1.000	5834.	>1000000.	60000.	849.0
10	36	10847.		4.3		11654.	1.000	5827.	>1000000.	60000.	849.0
18	45	10961.		3.2		11553.	1.000	5777.	>1000000.	60000.	861.5

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1275]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
1	11	11213.		1.6		11506.	1.000	5753.	>1000000.	60000.	875.7
7	19	11134.		41.4		11469.	1.000	5734.	>1000000.	58680.	822.5
36	41	10847.		3.2		11440.	1.000	5720.	>1000000.	60000.	849.0
12	13	9327.		11.3		11426.	1.000	5713.	>1000000.	60000.	869.9
2	24	11328.		0.5		11330.	1.000	5665.	>1000000.	60000.	885.1
24	36	11328.		2.7		11330.	1.000	5665.	>1000000.	60000.	858.4
24	38	11328.		0.5		11330.	1.000	5665.	>1000000.	60000.	885.1
2	8	10847.		1.7		11164.	1.000	5582.	>1000000.	60000.	875.7
8	38	10847.		1.7		11164.	1.000	5582.	>1000000.	60000.	875.7
2	6	10847.		1.4		11098.	1.000	5549.	>1000000.	60000.	875.7
6	38	10847.		1.4		11098.	1.000	5549.	>1000000.	60000.	875.7
2	14	10847.		1.3		11090.	1.000	5545.	>1000000.	60000.	875.7
14	38	10847.		1.3		11090.	1.000	5545.	>1000000.	60000.	875.7
2	10	10847.		1.2		11061.	1.000	5531.	>1000000.	60000.	875.7
10	38	10847.		1.2		11061.	1.000	5531.	>1000000.	60000.	875.7
2	41	10847.		0.0		10847.	1.000	5423.	>1000000.	60000.	875.7
38	41	10847.		0.0		10847.	1.000	5423.	>1000000.	60000.	875.7
16	21	8383.		13.1		10816.	1.000	5408.	>1000000.	54348.	801.4
11	12	9327.		6.6		10807.	1.000	5404.	>1000000.	60000.	850.5
1	9	10348.		1.4		10612.	1.000	5306.	>1000000.	60000.	875.7
36	40	9867.		3.2		10460.	1.000	5230.	>1000000.	60000.	849.0
12	44	8904.		7.9		10384.	1.000	5192.	>1000000.	60000.	863.0
16	44	7878.		13.1		10311.	1.000	5156.	>1000000.	60000.	843.7
16	37	7613.		13.1		10046.	1.000	5023.	>1000000.	60000.	833.7
11	16	7347.		14.4		10023.	1.000	5011.	>1000000.	60000.	831.2
9	18	9339.		2.0		9932.	1.000	4966.	>1000000.	60000.	849.0

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1276]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
2	40	9867.		0.0		9867.	1.000	4934.	>1000000.	60000.	875.7
38	40	9867.		0.0		9867.	1.000	4934.	>1000000.	60000.	875.7
13	16	7347.		9.7		9780.	1.000	4890.	>1000000.	60000.	850.5
12	21	8294.		7.9		9774.	1.000	4887.	>1000000.	54348.	826.0
13	18	8471.		6.5		9683.	1.000	4841.	>1000000.	60000.	868.4
35	45	3119.		34.4		9554.	1.000	4777.	>1000000.	60000.	843.7
7	35	3009.		32.7		9443.	1.000	4722.	>1000000.	60000.	831.2
21	40	9372.		0.0		9373.	1.000	4686.	>1000000.	54348.	801.4
9	16	6478.		14.2		9126.	1.000	4563.	>1000000.	60000.	831.2
11	18	8471.		1.9		9064.	1.000	4532.	>1000000.	60000.	849.0
21	39	9063.		0.0		9063.	1.000	4531.	>1000000.	54348.	793.6
21	35	2626.		34.4		9060.	1.000	4530.	>1000000.	54348.	801.4
1	36	8346.		3.4		8989.	1.000	4494.	>1000000.	60000.	899.7
1	7	8619.		2.0		8985.	1.000	4493.	>1000000.	60000.	875.7
13	40	8336.		3.3		8955.	1.000	4478.	>1000000.	60000.	850.5
1	45	8861.		0.3		8911.	1.000	4455.	>1000000.	60000.	888.2
40	44	8864.		0.0		8865.	1.000	4432.	>1000000.	60000.	843.7
35	44	2416.		34.4		8850.	1.000	4425.	>1000000.	60000.	843.7
8	21	8383.		1.7		8700.	1.000	4350.	>1000000.	54348.	801.4
18	44	8053.		3.2		8646.	1.000	4323.	>1000000.	60000.	861.5
13	39	8023.		3.3		8643.	1.000	4321.	>1000000.	60000.	850.5
13	35	1582.		37.8		8635.	1.000	4318.	>1000000.	60000.	850.5
6	21	8383.		1.4		8635.	1.000	4317.	>1000000.	54348.	801.4
14	21	8383.		1.3		8626.	1.000	4313.	>1000000.	54348.	801.4
10	21	8383.		1.2		8598.	1.000	4299.	>1000000.	54348.	801.4
11	40	8336.		1.3		8579.	1.000	4289.	>1000000.	60000.	831.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1277]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
39	44	8578.		0.0		8579.	1.000	4289.	>1000000.	60000.	843.7
17	21	2051.		34.4		8485.	1.000	4243.	>1000000.	54348.	801.4
1	2	8346.		0.3		8396.	1.000	4198.	>1000000.	60000.	970.1
1	38	8346.		0.3		8396.	1.000	4198.	>1000000.	60000.	970.1
21	41	8383.		0.0		8383.	1.000	4192.	>1000000.	54348.	801.4
11	39	8023.		1.3		8266.	1.000	4133.	>1000000.	60000.	831.2
17	45	1772.		34.4		8206.	1.000	4103.	>1000000.	60000.	843.7
8	44	7878.		1.7		8195.	1.000	4098.	>1000000.	60000.	843.7
17	44	1760.		34.4		8194.	1.000	4097.	>1000000.	60000.	843.7
6	44	7878.		1.4		8130.	1.000	4065.	>1000000.	60000.	843.7
14	44	7878.		1.3		8121.	1.000	4060.	>1000000.	60000.	843.7
10	44	7878.		1.2		8093.	1.000	4046.	>1000000.	60000.	843.7
13	17	1010.		37.8		8064.	1.000	4032.	>1000000.	60000.	850.5
18	21	7438.		3.2		8031.	1.000	4015.	>1000000.	54348.	824.1
7	17	1594.		32.7		8029.	1.000	4014.	>1000000.	60000.	831.2
11	35	1582.		33.1		8016.	1.000	4008.	>1000000.	60000.	831.2
15	35	1582.		8.8		8016.	1.000	4008.	>1000000.	60000.	831.2
13	41	7347.		3.3		7966.	1.000	3983.	>1000000.	60000.	850.5
6	13	7347.		2.0		7966.	1.000	3983.	>1000000.	60000.	850.5
8	13	7347.		1.6		7966.	1.000	3983.	>1000000.	60000.	850.5
10	13	7347.		2.2		7966.	1.000	3983.	>1000000.	60000.	850.5
13	14	7347.		2.0		7966.	1.000	3983.	>1000000.	60000.	850.5
8	37	7613.		1.7		7930.	1.000	3965.	>1000000.	60000.	833.7
8	11	7347.		3.0		7906.	1.000	3953.	>1000000.	60000.	831.2
41	44	7878.		0.0		7878.	1.000	3939.	>1000000.	60000.	843.7
6	37	7613.		1.4		7865.	1.000	3932.	>1000000.	60000.	833.7

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1278]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
14	37	7613.		1.3		7856.	1.000	3928.	>1000000.	60000.	833.7
17	35	1415.		0.0		7850.	1.000	3925.	>1000000.	60000.	831.2
6	11	7347.		2.7		7841.	1.000	3921.	>1000000.	60000.	831.2
11	14	7347.		2.6		7832.	1.000	3916.	>1000000.	60000.	831.2
10	37	7613.		1.2		7828.	1.000	3914.	>1000000.	60000.	833.7
10	11	7347.		2.5		7804.	1.000	3902.	>1000000.	60000.	831.2
37	40	7746.		0.0		7746.	1.000	3873.	>1000000.	60000.	833.7
9	35	1273.		33.3		7707.	1.000	3854.	>1000000.	60000.	831.2
9	40	7468.		1.2		7683.	1.000	3841.	>1000000.	60000.	831.2
1	39	7602.		0.3		7652.	1.000	3826.	>1000000.	60000.	875.7
37	41	7613.		0.0		7613.	1.000	3807.	>1000000.	60000.	833.7
11	41	7347.		1.3		7589.	1.000	3795.	>1000000.	60000.	831.2
16	39	5128.		13.1		7561.	1.000	3780.	>1000000.	60000.	831.2
7	16	4742.		14.8		7493.	1.000	3746.	>1000000.	60000.	831.2
16	45	5016.		13.1		7449.	1.000	3725.	>1000000.	60000.	843.7
11	17	1010.		33.1		7444.	1.000	3722.	>1000000.	60000.	831.2
15	17	1010.		8.8		7444.	1.000	3722.	>1000000.	60000.	831.2
15	45	2654.		25.7		7438.	1.000	3719.	>1000000.	60000.	843.7
7	15	2604.		24.0		7388.	1.000	3694.	>1000000.	60000.	831.2
9	39	7155.		1.2		7370.	1.000	3685.	>1000000.	60000.	831.2
8	9	6478.		2.9		7010.	1.000	3505.	>1000000.	60000.	831.2
6	9	6478.		2.5		6945.	1.000	3472.	>1000000.	60000.	831.2
9	14	6478.		2.5		6936.	1.000	3468.	>1000000.	60000.	831.2
37	39	6911.		0.0		6911.	1.000	3456.	>1000000.	60000.	833.7
9	10	6478.		2.3		6908.	1.000	3454.	>1000000.	60000.	831.2
9	41	6478.		1.2		6693.	1.000	3347.	>1000000.	60000.	831.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1279]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
9	17	143.		83.3		6577.	1.000	3289.	>1000000.	60000.	831.2
1	16	3933.		12.8		6366.	1.000	3183.	>1000000.	60000.	875.7
39	40	6117.		0.0		6118.	1.000	3059.	>1000000.	60000.	831.2
7	40	5732.		1.7		6049.	1.000	3025.	>1000000.	60000.	831.2
40	45	5998.		0.0		5998.	1.000	2999.	>1000000.	60000.	843.7
15	44	1059.		25.7		5843.	1.000	2921.	>1000000.	60000.	843.7
15	21	1049.		25.7		5833.	1.000	2917.	>1000000.	54348.	801.4
39	45	5775.		0.0		5775.	1.000	2887.	>1000000.	60000.	843.7
7	39	5420.		1.7		5737.	1.000	2869.	>1000000.	60000.	831.2
9	15	868.		24.5		5652.	1.000	2826.	>1000000.	60000.	831.2
8	39	5128.		1.7		5445.	1.000	2722.	>1000000.	60000.	831.2
13	15	0.		29.0		5403.	1.000	2702.	>1000000.	60000.	850.5
6	39	5128.		1.4		5380.	1.000	2690.	>1000000.	60000.	831.2
7	8	4742.		3.4		5377.	1.000	2688.	>1000000.	60000.	831.2
14	39	5128.		1.3		5371.	1.000	2685.	>1000000.	60000.	831.2
10	39	5128.		1.2		5342.	1.000	2671.	>1000000.	60000.	831.2
8	45	5016.		1.7		5333.	1.000	2667.	>1000000.	60000.	843.7
6	7	4742.		3.1		5311.	1.000	2656.	>1000000.	60000.	831.2
7	14	4742.		3.0		5302.	1.000	2651.	>1000000.	60000.	831.2
7	10	4742.		2.9		5274.	1.000	2637.	>1000000.	60000.	831.2
6	45	5016.		1.4		5268.	1.000	2634.	>1000000.	60000.	843.7
14	45	5016.		1.3		5259.	1.000	2630.	>1000000.	60000.	843.7
10	45	5016.		1.2		5231.	1.000	2615.	>1000000.	60000.	843.7
39	41	5128.		0.0		5128.	1.000	2564.	>1000000.	60000.	831.2
7	41	4742.		1.7		5060.	1.000	2530.	>1000000.	60000.	831.2
41	45	5016.		0.0		5016.	1.000	2508.	>1000000.	60000.	843.7

Notes b,d,e,k: Fails
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h,i: Rupture Location
L: Information

++ DST/PIPESTRESS ++ Vermont Yankee Version 3.5.1+026 PC-EXE Release: Jun 2004

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1280]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
11	15	0.		24.4		4784.	1.000	2392.	>1000000.	60000.	831.2
1	8	3933.		1.4		4250.	1.000	2125.	>1000000.	60000.	875.7
1	6	3933.		1.1		4184.	1.000	2092.	>1000000.	60000.	875.7
1	14	3933.		1.0		4176.	1.000	2088.	>1000000.	60000.	875.7
1	10	3933.		0.9		4147.	1.000	2074.	>1000000.	60000.	875.7
1	40	4066.		0.3		4116.	1.000	2058.	>1000000.	60000.	875.7
1	41	3933.		0.3		3983.	1.000	1991.	>1000000.	60000.	875.7
7	21	3643.		1.7		3960.	1.000	1980.	>1000000.	54348.	801.4
1	37	3680.		0.3		3730.	1.000	1865.	>1000000.	60000.	970.1
21	45	3666.		0.0		3666.	1.000	1833.	>1000000.	54348.	0.0
7	13	2604.		5.0		3540.	1.000	1770.	>1000000.	60000.	850.5
7	44	3221.		1.7		3538.	1.000	1769.	>1000000.	60000.	843.7
44	45	3528.		0.0		3528.	1.000	1764.	>1000000.	60000.	0.0
16	40	990.		13.1		3423.	1.000	1712.	>1000000.	60000.	831.2
13	45	2654.		3.3		3273.	1.000	1636.	>1000000.	60000.	863.0
7	11	2604.		0.4		2921.	1.000	1461.	>1000000.	60000.	831.2
11	45	2654.		1.3		2897.	1.000	1448.	>1000000.	60000.	843.7
16	41	0.		13.1		2433.	1.000	1217.	>1000000.	60000.	831.2
6	16	0.		11.7		2433.	1.000	1217.	>1000000.	60000.	831.2
8	16	0.		11.4		2433.	1.000	1217.	>1000000.	60000.	831.2
10	16	0.		11.9		2433.	1.000	1217.	>1000000.	60000.	831.2
14	16	0.		11.8		2433.	1.000	1217.	>1000000.	60000.	831.2
12	18	857.		4.8		2337.	1.000	1168.	>1000000.	60000.	868.4
9	21	1911.		1.2		2126.	1.000	1063.	>1000000.	54348.	801.4
9	45	1887.		1.2		2102.	1.000	1051.	>1000000.	60000.	843.7
7	9	1736.		0.5		2053.	1.000	1027.	>1000000.	60000.	831.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1281]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR		SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
9	44	1642.		1.2		1857.	1.000	929.	>1000000.	60000.	843.7
9	13	868.		4.5		1702.	1.000	851.	>1000000.	60000.	850.5
13	44	1059.		3.3		1678.	1.000	839.	>1000000.	60000.	863.0
13	21	1049.		3.3		1668.	1.000	834.	>1000000.	54348.	826.0
7	45	1057.		1.7		1374.	1.000	687.	>1000000.	60000.	843.7
8	40	990.		1.7		1307.	1.000	654.	>1000000.	60000.	831.2
11	44	1059.		1.3		1301.	1.000	651.	>1000000.	60000.	843.7
11	21	1049.		1.3		1292.	1.000	646.	>1000000.	54348.	801.4
6	40	990.		1.4		1242.	1.000	621.	>1000000.	60000.	831.2
14	40	990.		1.3		1233.	1.000	616.	>1000000.	60000.	831.2
10	40	990.		1.2		1205.	1.000	602.	>1000000.	60000.	831.2
9	11	868.		0.2		1111.	1.000	556.	>1000000.	60000.	831.2
21	44	1018.		0.0		1018.	1.000	509.	>1000000.	54348.	0.0
40	41	990.		0.0		990.	1.000	495.	>1000000.	60000.	831.2
11	13	0.		4.6		862.	1.000	431.	>1000000.	60000.	850.5
2	36	0.		3.2		593.	1.000	296.	>1000000.	60000.	899.7
36	38	0.		3.2		593.	1.000	296.	>1000000.	60000.	899.7
8	41	0.		1.7		317.	1.000	159.	>1000000.	60000.	831.2
6	8	0.		0.4		317.	1.000	159.	>1000000.	60000.	831.2
8	10	0.		0.5		317.	1.000	159.	>1000000.	60000.	831.2
8	14	0.		0.4		317.	1.000	159.	>1000000.	60000.	831.2
6	41	0.		1.4		252.	1.000	126.	>1000000.	60000.	831.2
6	10	0.		0.2		252.	1.000	126.	>1000000.	60000.	831.2
6	14	0.		0.0		252.	1.000	126.	>1000000.	60000.	831.2
14	41	0.		1.3		243.	1.000	121.	>1000000.	60000.	831.2
10	14	0.		0.2		243.	1.000	121.	>1000000.	60000.	831.2

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1282]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR	SN EQN.10	SE EQN.12	DELTA T1 RANGE	EQN.13	SP EQN.11	KE	SALT EQN.14	ALLOW CYCLES	3*SM	ALLOWABLE FOR DELTA T1 RANGE
10 41	0.		1.2		215.	1.000	107.	>1000000.	60000.	831.2
2 38	0.		0.0		0.	1.000	0.	>1000000.	60000.	0.0

Notes b,d,e,k: Fails
g: Weld ISI
h,i: Rupture Location
L: Information

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1283]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET I	PAIR J	SALT EQN.14	OCCURENCES NI	OCCURENCES NJ	NUMBER USED	SETS ELIMINATED DYNAM.	NO. CYCLES TO FAILURE	USAGE FACTOR	REMARKS
28	29	66456.	10	10	10	28,29	1808.	0.0055	
			0	0					
31	32	54146.	10	10	10	31,32	3406.	0.0029	
			0	0					
4	43	49733.	610	300	300	43	4465.	0.0672	
			310	0					
4	34	49533.	310	10	10	34	4523.	0.0022	
			300	0					
3	4	49512.	300	300	300	3, 4	4529.	0.0662	
			0	0					
20	26	45555.	300	10	10	26	5838.	0.0017	
			290	0					
22	27	34161.	300	10	10	27	14370.	0.0007	
			290	0					
22	30	32373.	290	10	10	30	17257.	0.0006	
			280	0					
22	42	26170.	280	300	280	22	33637.	0.0083	
			0	20					
24	42	22860.	300	20	20	42	51538.	0.0004	
			280	0					
5	24	22397.	599	280	280	24	57040.	0.0049	
			319	0					
5	23	21265.	319	300	300	23	73771.	0.0041	
			19	0					
5	36	17029.	19	1	1	36	178513.	0.0000	
			18	0					
2	5	16732.	120	18	18	5	190176.	0.0001	
			102	0					
12	20	16409.	10	290	10	12	205131.	0.0000	
			0	280					

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1284]
Vermont Yankee Feedwater PipingSI Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

INDIVIDUAL STRESS RANGE CHECK

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET I	PAIR J	SALT EQN.14	OCCURENCES NI	OCCURENCES NJ	NUMBER USED	SETS ELIMINATED DYNAM.	NO. CYCLES TO FAILURE	USAGE FACTOR	REMARKS
2	20	16030.	102	280	102	2	228208.	0.0004	
			0	178					
20	38	16030.	178	1	1	38	228208.	0.0000	
			177	0					
18	20	15537.	289	177	177	20	263206.	0.0007	
			112	0					
18	25	15362.	112	10	10	25	277200.	0.0000	
			102	0					
33	37	15167.	10	1	1	37	293826.	0.0000	
			9	0					
1	33	13327.	120	9	9	33	561655.	0.0000	
			111	0					
18	19	11235.	102	300	102	18	>1000000.	0.0000	
			0	198					
19	35	10124.	198	1	1	35	>1000000.	0.0000	
			197	0					
1	19	9874.	111	197	111	1	>1000000.	0.0000	
			0	86					
17	19	9416.	289	86	86	19	>1000000.	0.0000	
			203	0					
16	17	7602.	70	203	70	16	>1000000.	0.0000	
			0	133					
17	40	6880.	133	289	133	17	>1000000.	0.0000	
			0	156					
15	40	6560.	70	156	70	15	>1000000.	0.0000	
			0	86					
21	40	4686.	300	86	86	40	>1000000.	0.0000	
			214	0					
21	39	4531.	214	289	214	21	>1000000.	0.0000	
			0	75					

CALCULATION NUMBER 2 CODE SECTION III CLASS 1 ASME-1998 KRE 2007/07/11 11:35:07 [1285]
Vermont Yankee Feedwater PipingS1 Fatigue Analysis

FATIGUE ANALYSIS AT POINT 155, LR ELBOW 155 TO 160

****
INDIVIDUAL STRESS RANGE CHECK
****

DELTA T1 IN DEGREES F
STRESSES IN PSI

LOAD SET PAIR I	J	SALT EQN.14	OCCURENCES NI	NJ	NUMBER USED	SETS ELIMINATED DYNAM.	NO. CYCLES TO FAILURE	USAGE FACTOR	REMARKS
13	39	4321.	10	75	10	13	>1000000.	0.0000	
			0	65					
39	44	4289.	65	5	5	44	>1000000.	0.0000	
			60	0 45					
11	39	4133.	310	60	60	39	>1000000.	0.0000	
			250	0					
8	11	3953.	10000	250	250	11	>1000000.	0.0000	
			9750	0					
8	9	3505.	9750	2000	2000	9	>1000000.	0.0000	
			7750	0					
7	8	2688.	10000	7750	7750	8	>1000000.	0.0000	
			2250	0					
6	7	2656.	599	2250	599	6	>1000000.	0.0000	
			0	1651					
7	14	2651.	1651	10	10	14	>1000000.	0.0000	
			1641	0					
7	10	2637.	1641	2000	1641	7	>1000000.	0.0000	
			0	359					
10	45	2615.	359	5	5	45	>1000000.	0.0000	
			354	0 45					
44	45	1764.	45	45	45	,45 44	>1000000.	0.0000	DYN. RANGE OF EVENT NO. 1
			0	0					
10	41	107.	354	289	289	41	>1000000.	0.0000	
			65	0					

TOTAL USAGE FACTOR = 0.1661j