INSTRUCTIONS FOR ADDING REVISION 3 TO THE REPORT ON THE REANALYSIS OF SAFETY-RELATED PIPING SYSTEMS

The following listing will serve as a checklist for entering the attached pages into the report. The items listed in the "REMOVE" column should be removed from the report and replaced with the items in the "ENTER" column. Vertical bars (change bars) have been placed in the outside margins of revised text pages and tables to show the location of any technical changes originating with this amendment. Some pages bear a new amendment designation, but no change bars, because revisions on other pages in that section caused a text shift. A few unrevised pages have been reprinted because they fall within a run of closely spaced revised pages. No change bars are used on figures or on new sections, appendices, questions and responses, etc. Change bars from previous amendments have been deleted on pages revised by this amendment. The instruction sheet and cover letter should be filed at the beginning of the report.

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BEAVER VALLEY POWER STATION, UNIT 1

REPORT ON THE REANALYSIS OF SAFETY-RELATED PIPING SYSTEMS

FOR

BEAVER VALLEY UNIT 1
DUQUESNE LIGHT COMPANY

ORIGINAL - JUNE 15, 1979

REVISION 3 - JULY 27, 1979

Stone & Webster Engineering Corporation
Boston, Massachusetts

Problem 270, the discharge from the CC heat exchangers has one support (H-56) out of 13 which has a local overstress in a lug of 78 percent. A new support is being added to the piping system adjacent to this support to correct the condition.

The fuel pool cooling and purification system is presently isolated since there is no spent fuel being stored.

The quench and recirculation spray systems have been completely analyzed for DBE and water hammer loads using NUPIPE and are acceptable. The OBE case will be run in the long term.

3. How have stress intensification factors been applied at branch connections during the reanalysis?

Response

Appropriate stress intensifications from B31.1 have been applied to the run pipe at reduced outlet branch connections. Branches which are uncoupled have been evaluated for the effects of the movements of the run

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Field verified piping fabricator isometric drawings provide the basis for program inputs for the pipe stress reanalysis.

Additionally, in some cases, piping is analyzed utilizing amplified response spectra (ARS) that are developed using soil structure interaction techniques (SSI-ARS). The resultant stresses and loads are used to evaluate piping, supports, nozzles, and penetrations. These techniques are discussed in Section 8.7.

Of the 121 SHOCK 2 problems, 116 have been reanalyzed; 115 are within allowable stress values, and one is presently overstressed. Table 4-1 lists the problems including the peak stress values for the SHOCK 3 and NUPIPE pipe stress runs.

Stresses were computed by the SHOCK 3 or NUPIPE program using different mass models and in some cases different ARS than the original calculations. More importantly, the reanalyses were based on field-verified, as-built conditions which in some cases differ significantly from the original design conditions. For these reasons, the originally calculated stresses are not comparable to the new stresses.

The river water discharge line (Problem 122) in the turbine building has been found to have an overstress condition at two unreinforced branch connections

where a stress intensification factor of 10.45 is used. This line has been analyzed to this point because it provides the terminal anchor to end the problem.

The line is seismically supported and analyzed; however, it is located in a non-seismic building and the consequences of a break at these points would not affect any safety-related piping, components, or equipment and would not result in the loss of function of any safety-related system or equipment. There is no possibility that any flooding that might occur in the turbine building can affect any safety-related areas. Therefore, this condition is considered acceptable for the short term and the branch connections will be reinforced during the next refueling outage.

Table 4-2 summarizes the nozzles and penetrations evaluated under the reanalysis program. Of a total of 131 nozzles on problems within the scope of the interim effort, all have been evaluated and found to be acceptable.

The 14 nozzles in the quench and recirculation spray system have been accepted based on the DBE case only. The fuel pool cooling and purification system has 10 nozzles which have not been reviewed at this time.

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The SHOCK 2 stress problems contained in the overall effort include 58 penetration connections, all of which have been evaluated and found to be acceptable.

Summary

During the period between the initial issue of this report and this revision, 40 additional problems have been rerun on NUPIPE using the SSI-ARS curve. All of the above 40 problems have been reanalyzed and were found to be within allowable stress limits.

TABLE 4-1

PIPE STRESS REEVALUATION SUMMARY

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
Reactor Coolant			
653A	12,547 18,820	7,671 8,189	NUPIPE/SSI-ARS
653B	19,200 28,800	10,084 10,575	NUPIPE/SSI-ARS
653C	19,200 28,800	15,060 17,244	NUPIPE/SSI-ARS
833 & 8	17,220/19,200(1) 25,830/28,200	12,420(2) 17,300	NUPIPE/SSI-ARS
1200	19,200 28,800	12,690 16,424	NUPIPE/SSI-ARS
1201	19,200 28,800	9,711 10,442	NUPIPE/SSI-ARS
Safety Injection			
391A	19,080 28,620	15,425 18,228	SHOCK 3/SSI-ARS
2112	22,500 33,750	20,754 25,002	SHOCK 3
610	18,586 27,878	2,081 2,328	NUPIPE/SSI-ARS
613	21,180 31,770	9,802 14,336	NUPIPE/SSI-ARS
615	19,500/20,280(1) 29,250/30,400	17,585 16,069	NUPIPE/SSI-ARS
15	17,340/19,200(1) 26,010/28,800	7,214 8,123	SHOCK 3/SSI-ARS

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TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
1011	20,850 31,275	8,245 14,087	SHOCK 3/SSI-ARS
301	19,200 28,800	7,722 8,712	NUPIPE/SSI-ARS
213(4)	20,388 30,582	5 7 5 7	NUPIPE/SSI-ARS
2113(4)	20,388 30,582	4,078 4,443	NUPIPE/SSI-ARS
Quench Spray			
211	22,500 33,750	1,807 2,653	SHOCK 3/SSI-ARS
212	22,500 33,750	10,445 11,639	SHOCK 3
228	22,500 33,750	12,149 16,589	SHOCK 3
229	22,500 33,750	11,810 15,987	SHOCK 3
23	(7) 33,750	(7) 6,235	NUPIPE
134	(7) 33,750	(7) 17,667	NUPIPE
135	(7) 33,750	(7) 37,452(8)	NUPIPE
136	(7) 33,750	(7) 25,435	NUPIPE
210	(7) 33,750	(7) 12,667	NUPIPE
218	(7) 33,750	(7) 6,973	NUPIPE

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TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
614	(7) 33,750	(7) 11,343	NUPIPE
617	(7) 33,750	(7) 14,271	NUPIPE
Recirculation Spray			
17	(7) 25,560	(7) 25,158	NUPIPE
18	(7) 25,560	(7) 16,316	NUPIPE
19	(7) 25,560	(7) 15,741	NUPIPE
20	(7) 25,560	(7) 21,895	NUPIPE
22	(7) 25,560	(7) 28,739(8)	NUPIPE
24	(7) 25,560	(7) 16,298	NUPIPE
25	(7) 25,560	(7) 17,260	NUPIPE
27	(7) 25,560	(7) 21,415	NUPIPE
28	(7) 25,560	(7) 14,696	NUPIPE
29	(7) 25,560	(7) 12,991	NUPIPE
130	(7) 25,560	(7) 30,728(8)	NUPIPE
131	(7) 25,560	(7) 29,952(8)	NUPIPE

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TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
132	(2) 25,560	(2) 17,403	NUPIPE
133	(2) 25,560	(2) 24,337	NUPIPE
611	(2) 28,192	(2) 8,210	NUPIPE
612	18,796 28,193	1,366 1,434	NUPIPE/SSI-ARS
Charging and Volume Control			
100	18,660 27,990	15,220 15,463	SHOCK 3
102	18,660 27,990	6,289 6,621	SHOCK 3/SSI-ARS
Residual Heat Removal			
255A	17,940 26,910	5,075 6,041	NUPIPE/SSI-ARS
256	17,160 25,740	11,843 15,063	NUPIPE/SSI-ARS
14	17,940/19,200(1) 26,910/28,800	8,740 10,376	SHOCK 3/SSI-ARS
3011	17,940 26,910	17,656 18,148	NUPIPE

TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
616	18,300 27,450	8,498 11,500	NUPIPE/SSI-ARS
Component Cooling Water			
302	18,000 27,000	6,295 10,271	NUPIPE/SSI-ARS
303	18,000 27,000	6,906 10,377	NUPIPE/SSI-ARS
304	18,000 27,000	7,836 11,108	NUPIPE/SSI-ARS
305	18,000 27,000	5,835 8,330	NUPIPE/SSI-ARS
306	18,000 27,000	4,246 5,077	NUPIPE/SSI-ARS
307	18,000 27,000	6,133 7,780	SHOCK 3/SSI-ARS
180E	18,000 27,000	7,554 7,370	NUPIPE/SSI-ARS
181E	18,000 27,000	7,516 15,168	NUPIPE/SSI-ARS
170C	18,000 27,000	4,539 5,031	NUPIPE/SSI-ARS
171	18,000 27,000	5,472 5,667	NUPIPE/SSI-ARS
172	18,000 27,000	8,319 13,734	NUPIPE/SSI-ARS
173D	18,000 27,000	5,107 5,994	NUPIPE/SSI-ARS
174D	18,000 27,000	3,036 4,115	NUPIPE/SSI-ARS

TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
175B	18,000 27,000	5,197 5,414	NUPIPE/SSI-ARS
176A	18,000 27,000	3,505 3,777	SHOCK 3/SSI-ARS
177	18,000 27,000	,223 13,707	SHOCK 3/SSI-ARS
178C	18,000 27,000	15,703 15,797	NUPIPE/SSI-ARS
179	18,000 27,000	2,081 2,995	NUPIPE/SSI-ARS
183	18,000 27,000	9,320 11,336	NUPIPE/SSI-ARS
184	18,000 27,000	10,1[illegible] 11,734	NUPIPE/SSI-ARS
186A	18,000 27,000	15,703 15,797	NUPIPE/SSI-ARS
270A	18,000 27,000	15,703 15,797	NUPIPE/SSI-ARS
215	18,000 27,000	16,311 26,731	SHOCK 3
217	18,000 27,000	15,751(2) 23,924	NUPIPE/SSI-ARS
930	18,000 27,000	15,751 23,924	NUPIPE/SSI-ARS
931	18,000 27,000	15,751 23,924	NUPIPE/SSI-ARS
214	18,000 27,000	14,740 25,774	NUPIPE/SSI-ARS

TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
River Water			
1	18,000 27,000	10,801 13,759	SHOCK 3
30	18,000 27,000	4,830 7,576	NUPIPE/SSI-ARS
31	18,000 27,000	4,830 7,576	NUPIPE/SSI-ARS
32	18,000 27,000	5,363 8,390	NUPIPE/SSI-ARS
33	18,000 27,000	5,169 8,241	NUPIPE/SSI-ARS
140	18,000 27,000	13,758 16,349	SHOCK 3/SSI-ARS
384	18,000 27,000	6,156 8,512	SHOCK 3(a)
157	18,000 27,000	1,884 2,011	NUPIPE/SSI-ARS
158	18,000 27,000	1,976 2,090	NUPIPE/SSI-ARS
159(b)	18,000 27,000	10,443 17,277	NUPIPE/SSI-ARS
128	18,000 27,000	10,760 12,562	NUPIPE/SSI-ARS
127	18,000 27,000	13,384 15,970	NUPIPE/SSI-ARS
125	18,000 27,000	10,760 12,562	NUPIPE/SSI-ARS
124	18,000 27,000	13,384 15,970	NUPIPE/SSI-ARS

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TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
123	18,000 27,000	10,861 17,797	NUPIPE/SSI-ARS
120	18,000 27,000	(*) 16,471	NUPIPE/SSI-ARS
126	18,000 27,000	13,384 15,970	NUPIPE/SSI-ARS
216	18,000 27,000	6,047 9,989	NUPIPE/SSI-ARS
203	18,000 27,000	2,444 4,189	NUPIPE/SSI-ARS
2031	18,000 27,000	8,260 9,699	NUPIPE/SSI-ARS
152	18,000 27,000	4,950 6,032	NUPIPE/SSI-ARS
121	18,000 27,000	6,068 8,354	NUPIPE/SSI-ARS
122(*)	18,000 27,000	43,256 62,608	NUPIPE/SSI-ARS
165	18,000 27,000	4,950 6,032	NUPIPE/SSI-ARS
652	18,000 27,000	1,231 1,394	NUPIPE/SSI-ARS
653	18,000 27,000	1,495 1,624	NUPIPE/SSI-ARS
Main Steam			
658	22,500 33,750	10,248 12,025	SHOCK 3/SSI-ARS
6590	18,000 27,000	9,977 11,108	SHOCK 3/SSI-ARS

TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method
101	18,000 27,000	16,917 18,277	SHOCK 3
659	22,500 33,750	10,544 12,570	SHOCK 3/SSI-ARS
660	22,500 33,750	11,121 13,304	SHOCK 3/SSI-ARS
3063	22,500 33,750	12,289 16,481	SHOCK 3
Feed Water			
204	18,000 27,000	2,952 3,761	SHOCK 3
783	18,000 27,000	9,361 11,624	SHOCK 3/SSI-ARS
784	18,000 27,000	10,853 13,726	SHOCK 3/SSI-ARS
785	18,000 27,000	14,397 20,232	SHOCK 3
261	18,000 27,000	10,479 13,585	SHOCK 3/SSI-ARS
Diesel Generator Exhaust			
651	12,960 19,440	1,201 1,717	NUPIPE/SSI-ARS

Notes: SSI-ARS = Amplified response spectra developed using soils structure interaction techniques

Stresses shown are Operational Basis Earthquake (OBE) Stresses
Design Basis Earthquake (DBE) Stresses

(1) TP304/TP316 allowables

TABLE 4-1 (Cont)

System and Problem No.	Allowable Stress (psi)	Reanalysis Maximum Stress	Reanalysis Method

(3) After modification

(4) Are acceptable based on water hammer and OBE analysis using 2.4 S_{SH}. For the long term, this will be acceptable based on 1.8 S_{SH}.

(5) Problems 213 and 2113 include $S_{DL} + S_{LP} + S_{OBEI}$ and $S_{DL} + S_{LP} + S_{DBEI}$ only.

(6) Being rerun with SSI-ARS.

(7) Problem 159 includes Problems 160 and 161.

(8) Evaluated for the DBE case only ($S_{DL} + S_{LP} + S_{DBEI}$).

(9) Overstress condition occurs in turbine building; considered acceptable for short term.

TABLE 4-2

NOZZLE AND PENETRATION SUMMARY

System/ Problem No.	Total No. of Nozzles/ Penetrations	No. Acceptable After Pipe Stress Re-analysis	No. Requiring Further Re-Analysis
Reactor Coolant			-
653A	6/0	6/0	0/0
653B	8/0	8/0	0/0
653C	8/0	8/0	0/0
833 & 8	4/0	4/0	0/0
1200	1/0	1/0	0/0
1201	0/0	0/0	0/0
Safety Injection			
391A	1/0	1/0	0/0
2112	0/0	0/0	0/0
610	2/2	2/2	0/0
613	0/0	0/0	0/0
615	2/3	2/3	0/0
15	1/0	1/0	0/0
1011	0/0	0/0	0/0
301	0/2	0/2	0/0
213	0/0	0/0	0/0
2113	0/0	0/0	0/0

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TABLE 4-2 (Cont)

System/ Problem No.	Total No. of Nozzles/ Penetrations	No. Acceptable After Pipe Stress Re-analysis	No. Requiring Further Re-Analysis
Quench Spray			
211	1/0	1/0	0/0
212	1/0	1/0	0/0
228	1/0	1/0	0/0
229	1/0	1/	0/0
23	0/0	0/0	0/0
134	0/0	0/0	0/0
135	0/1	0/1	0/0
136	0/1	0/1	0/0
210	1/0	1/0	0/0
218	1/0	1/0	0/0
614	0/1	0/1	0/0
617	0/1	0/1	0/0
Recirculation Spray			
17	2/0	2/0	0/0
18	2/0	2/0	0/0
19	2/0	2/0	0/0
20	2/0	2/0	0/0
22	0/0	0/0	0/0
24	0/0	0/0	0/0
25	0/0	0/0	0/0
27	1/0	1/0	0/0

TABLE 4-2 (Cont)

System/ Problem No.	Total No. of Nozzles/ Penetrations	No. Acceptable After Pipe Stress Re-analysis	No. Requiring Further Re-Analysis
28	1/0	1/0	0/0
29	0/0	0/0	0/0
130	0/1	0/1	0/0
131	0/1	0/1	0/0
132	0/0	0/0	0/0
133	0/0	0/0	0/0
611	2/2	2/2	0/0
612	2/2	2/2	0/0
Charging & Volume Control			
100	2/0	2/0	0/0
102	1/0	1/0	0/0
Residual Heat Removal			
255A	6/0	6/0	0/0
256	0/0	0/0	0/0
14	1/0	1/0	0/0
3011	0/0	0/0	0/0
616	0/1	0/1	0/0
Component Cooling Water			
302	1/1	1/1	0/0
303	1/1	1/1	0/0

TABLE 4-2 (Cont)

System/ Problem No.	Total No. of Nozzles/ Penetrations	No. Acceptable After Pipe Stress Re-analysis	No. Requiring Further Re-Analysis
304	1/1	1/1	0/0
305	1/1	1/1	0/0
306	0/1	0/1	0/0
307	0/1	0/1	0/0
180E	2/0	2/0	0/0
181E	2/0	2/0	0/0
170C	3/0	3/0	0/0
171	6/0	6/0	0/0
172	0/0	0/0	0/0
173D	1/0	1/0	0/0
174D	1/0	1/0	0/0
175B	0/0	0/0	0/0
176A	0/0	0/0	0/0
177	1/0	1/0	0/0
178C	1/0	1/0	0/0
179	1/0	1/0	0/0
183	3/0	3/0	0/0
184	2/0	2/0	0/0
186A	0/0	0/0	0/0
270A	3/0	3/0	0/0
215	0/4	0/4	0/0
217	0/4	0/4	0/0

TABLE 4-2 (Cont)

System/ Problem No.	Total No. of Nozzles/ Penetrations	No. Acceptable After Pipe Stress Re-analysis	No. Requiring Further Re-Analysis
930	0/1	0/1	0/0
931	0/1	0/1	0/0
214	0/1	0/1	0/0
River Water			
1	4/4	4/4	0/0
30	1/1	1/1	0/0
31	1/1	1/1	0/0
32	1/1	1/1	0/0
33	1/1	1/1	0/0
140	1/0	1/0	0/0
384	1/0	1/0	0/0
157	0/0	0/0	0/0
158	0/0	0/0	0/0
159	3/0	3/0	0/0
128	0/0	0/0	0/0
127	0/0	0/0	0/0
125	0/0	0/0	0/0
124	0/0	0/0	0/0
123	0/4	0/4	0/0
120	0/4	0/4	0/0
126	3/0	3/0	0/0
216	1/1	1/1	0/0

TABLE 4-2 (Cont)

System/ Problem No.	Total No. of Nozzles/ Penetrations	No. Acceptable After Pipe Stress Re-analysis	No. Requiring Further Re-Analysis
203	3/0	3/0	0/0
2031	0/0	0/0	0/0
152	2/0	2/0	0/0
121	3/0	3/0	0/0
122	0/0	0/0	0/0
165	0/0	0/0	0/0
652	2/0	2/0	0/0
653	2/0	2/0	0/0
Main Steam			
658	1/1	1/1	0/0
6590	0/0	0/0	0/0
101	0/0	0/0	0/0
659	1/1	1/1	0/0
660	1/1	1/1	0/0
3063	0/0	0/0	0/0
Feed-water			
204	3/0	3/0	0/0
783	1/1	1/1	0/0
784	1/1	1/1	0/0
785	1/1	1/1	0/0
261	0/0	0/0	0/0

TABLE 4-2 (Cont)

System/ Problem No.	Total No. of Nozzles/ Penetrations	No. Acceptable After Pipe Stress Re-analysis	No. Requiring Further Re-Analysis
Diesel Generator Exhaust			
651	0/0	0/0	0/0

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SECTION 5

PIPE SUPPORT RESULTS

Table 5-1 summarizes the pipe supports evaluated in the reanalysis program. There are 1060 pipe supports on lines within the interim reanalysis effort; of these, 667 have been evaluated and found acceptable and 7 have been modified to be acceptable. A support is considered acceptable if all the load components are lower in magnitude than those for which the support was originally designed. If some load components are greater than the original design load components, the support is reanalyzed using the new loads. Of the total 386 supports requiring reanalysis, 383 have been found to be acceptable based on DBEI+DL, 3 have not been accepted at this time. There is sufficient analytical information available for the remainin 3 supports to exercise engineering judgment in determining whether the unacceptable condition will become acceptable.

1. The use of one time load for snubbers

2. Use of DBEI plus dead load

If a support is unacceptable using any of the above approaches, a modification is re'ired. Table 5-2 identifies those supports where acceptance is based on the future use of the options listed above. Hardware modifications and additions are discussed in Section 6.

Support designs which are not in accordance with either of these criteria will be suitably modified against the acceptance design criteria of Table 3-1 prior to interim plant operation.

Base plate design criteria and anchor bolt pullout and shear allowable loads are addressed in Section 3. The seismic support loadings which will be utilized for the NF evaluation will be the result of either SHOCK3 or NUPIPE evaluations using SSI-ARS.

Summary

The pipe support reanalysis effort which took place between the original issue of this report and this revision includes accepting 377 supports; 190 based on DBEI+DL and 187 based on long-term criteria. Also, one additional modification was necessary for the 14" RHR line off the reactor coolant loop and one additional support is required on the 24 inch header from the component cooling heat exchangers.

TABLE 5-1

PIPE SUPPORTS SUMMARY

System/ Problem No.	Total No. of Supports	No. Presently Acceptable Based on Reanalysis	No. Acceptable for Interim Operation	Modifications or Additions Required
Reactor Coolant				
653A	2	2	0	0
653B	16	12	0	4
653C	8	8	0	0
833&8	15	15	0	1
1200	18	15	3	0
1201	19	19	0	0
Safety Injection				
391A	11	11	0	0
2112	8	8	0	0
610	2	2	0	0
613	5	5	0	0
615(2)	11	6	5	0
15	11	8	3	0
1011	19	19	0	0
301(3)	56	0	56	0
213	16	0	16	0
2113	16	0	16	0

TABLE 5-1 (Cont)

System/ Problem No.	Total No. of Supports	No. Presently Acceptable Based on Reanalysis	No. Acceptable for Interim Operation	Modifications or Additions Required
Quench Spray				
211	5	5	0	0
212	3	3	0	0
228	0	0	0	0
229	0	0	0	0
23	12	0	12	0
134	5	0	5	0
135	9	0	9	0
136	7	0	7	0
210	12	0	12	0
218	9	0	9	0
614	3	0	3	0
617	9	0	9	0
Recirculation Spray				
17	3	0	3	0
18	2	0	2	0
19	4	0	4	0
20	4	0	4	0
22	9	0	9	0
24	9	0	9	0
25	9	0	9	0
27	12	0	12	0

TABLE 5-1 (Cont)

System/ Problem No.	Total No. of Supports	No. Presently Acceptable Based on Reanalysis	No. Acceptable for Interim Operation	Modifications or Additions Required
28	6	0	6	0
29	22	0	22	0
130	2	0	2	0
131	2	0	2	0
132	2	0	2	0
133	35	0	35	0
611	6	0	6	0
612	0	0	0	0
Charging Volume Control				
100	9	9	0	0
102	8	8	0	0
Residual Heat Removal				
255A	8	4	4	0
256	6	6	0	0
14	15	15	0	0
3011	11	10	1	0
616	7	0	7	0
Component Cooling Water				
302	23	23	0	0
303	23	23	0	0
304	33	33	0	0

TABLE 5-1 (Cont)

System/ Problem No.	Total No. of Supports	No. Presently Acceptable Based on Reanalysis	No. Acceptable for Interim Operation	Modifications or Additions Required
305	30	30	0	0
306	11	10	1	0
307	10	10	0	0
180E	5	5	0	0
181E	5	4	1	0
170C	17	16	1	0
171	15	11	4	0
172	13	12	1	0
173D	15	14	1	0
174D	20	16	4	0
175B	6	5	1	0
176A	5	5	0	0
177	9	9	0	0
178C	14	10	4	0
179	8	8	0	0
183	9	8	1	0
184	14	11	3	0
186A	6	3	3	0
270A	10	6	4	1
215	8	8	0	0
217	10	10	0	1
930	3	3	0	0

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TABLE 5-1 (Cont)

System/ Problem No.	Total No. of Supports	No. Presently Acceptable Based on Reanalysis	No. Acceptable for Interim Operation	Modifications or Additions Required
931	2	2	0	0
214	5	5	0	0
River Water				
1	0	0	0	0
30	2	2	0	0
31	2	2	0	0
32	2	1	1	0
33	2	2	0	0
140	2	2	0	0
384	5	5	0	0
157	3	3	0	0
158	2	2	0	0
159(8)	8	8	0	0
128	1	0	1	0
127	10	6	4	0
125	12	12	0	0
124	13	13	0	0
123	15	12	0	3
120	11	5	6	0
126	7	7	0	0
216	2	2	0	0
203	16	15	1	0

TABLE 5-1 (Cont)

System/ Problem No.	Total No. of Supports	No. Presently Acceptable Based on Reanalysis	No. Acceptable for Interim Operation	Modifications or Additions Required
2031	9	9	0	0
121	15	0	15	0
122	19	0	19	0
165	1	0	1	0
152	8	8	0	0
652(8)	1	0	1	0
653(8)	2	0	2	0
Main Steam				
658	6	6	0	0
6590	3	3	0	0
101	4	4	0	0
659	2	2	0	0
660	7	7	0	0
3063	0	0	0	0
Feedwater				
204	15	15	0	0
783	9	9	0	0
784	6	6	0	0
785	3	3	0	0
261	6	6	0	0
Diesel Generator Exhaust				
651	2	0	2	0

TABLE 5-1 (Cont)

NOTES:

(1) Deleted.

(2) Problem 615 contains modifications (NPSH) scheduled for installation during the first refueling outage. Therefore, it will only be analyzed for interim operation.

(3) Problem 159 includes Problems 160 and 161.

(4) Deleted.

(5) Analyzed based on DBEI+DL only.

BEAVER VALLEY POWER STATION, UNIT 1

TABLE 5-2

ENGINEERING EVALUATION OF REMAINING SUPPORTS

Problem No.	Support No.	Overstress Condition	Resolution
RIVER WATER SYSTEM			
120	H307	Snubber Overloaded	Will be Acceptable Based on DBEI+DL
	R6	Vertical Support Installed/ Required Double Acting	Will be Acceptable Based on DBEI+DL
	H306	Member/Weld Overstress/ Bolt Pullout	Will be Acceptable Based on DBEI+DL

Following reanalysis of Problem No. 833, an additional snubber was designed and will be installed to alleviate a pipe overstress occurring under upset (OBE) and faulted (DBE) conditions.

Similarly, an additional snubber was designed and will be installed in Problem No. 217 to alleviate a pipe overstress occurring under the same conditions.

Three supports in Problem No. 123 will be modified, one to make the as-built condition agree with the original design, one to strengthen a marginal original design, and one to alleviate an overstressed weld in the support resulting from seismic uplift forces.

Similarly, four supports in Problem No. 653B will be modified, three to make the as-built condition agree with the original design, and one to alleviate an overstressed member in the support resulting from seismic forces.

A new support is being added adjacent to an existing support in Problem No. 270 in order to relieve a local overstress in a lug.

System	Line Number	Problem No.	FSAR Fig. No.
	6"-SI-29-1502-Q1 6"-SI-20-1502-Q1 6"-SI-19-1502-Q1 6"-SI-32-1502-Q1 6"-SI-33-1502-Q1 6"-SI-40-153W-Q2	2113	6.3-1
	6"-SI-44-153W-Q2	213	6.3-1
Quench Spray (QS)	12"-QS-2-153B-Q3	211	6.4-1
	12"-QS-1-153B-Q3	212	6.4-1
	12"-QS-1-153B-Q3	228	6.4-1
	12"-QS-2-153B-Q3	229	6.4-1
	10"-QS-4-153B-Q3	614	6.4-1
	10"-QS-3-153B-Q3	617	6.4-1
	4"-QS-6-153B-Q3 10"-QS-4-153B-Q3	210	6.4-1
	4"-QS-5-153B-Q3 10"-QS-3-153B-Q3	218	6.4-1
	10"-QS-3-153B-Q3	134	6.4-1
	10"-QS-3-153B-Q3	135	6.4-1
	10"-QS-4-153B-Q3	31	6.4-1
	10"-QS-3-153B-Q3 10"-QS-4-153B-Q3 8"-QS-22-153B-Q3 8"-QS-23-153B-Q3	23	6.4-1
Recirculation Spray (RS)	12"-RS-7-153A-Q2 12"-RS-8-153A-Q2 12"-RS-5-153A-Q2	612	6.4-1
	10"-RS-9-153B-Q2 4"-RS-14-153B-Q2 10"-RS-10-153B-Q2 4"-RS-15-153B-Q2	611	6.4-1

System	Line Number	Problem No.	FSAR Fig. No.
	10"-RS-1-153B-Q2 4"-RS-28-153B 4"-RS-27-153B	27	6.4-1
	10"-RS-1-153B-Q2 12"-RS-3-153B-Q2	20	6.4-1
	10"-RS-2-153B-Q2	28	6.4-1
	10"-RS-2-153B-Q2 12"-RS-4-153B-Q2	18	6.4-1
	10"-RS-25-153B-Q2	131	6.4-1
	10"-RS-26-153B-Q2	130	6.4-1
	10"-RS-25-153B-Q2 12"-RS-11-153B-Q2	19	6.4-1
	10"-RS-26-153B-Q2 12"-RS-12-153B-Q2	17	6.4-1
	12"-RS-3-153B-Q2	133	6.4-1
	12"-RS-4-153B-Q2	25	6.4-1
	12"-RS-11-153B-Q2	24	6.4-1
	12"-RS-12-153B-Q2	29	6.4-1
	12"-RS-12-153B-Q2	132	6.4-1
	8"-RS-21-153B-Q2 8"-RS-22-153B-Q2 8"-RS-23-153B-Q2 8"-RS-24-153B-Q2	22	6.4-1
Charging and Volume Control (CH)	6"-CH-63-153W-Q2 6"-CH-67-153W-Q2 8"-CH-15-153W-Q2	100	9.1-1
	8"-CH-15-153W-Q2 6"-CH-68-153W-Q2	102	
Residual Heat Removal (RH)	12"-RH-6-602-Q2 12"-RH-9-602-Q2 12"-RH-12-602-Q2 10"-RH-4-602-Q2 10"-RH-5-602-Q2	255A	9.3-1

System	Line Number	Problem No.	FSAR Fig. No.
	10"-RH-7-602-Q2 10"-RH-8-602-Q2 10"-RH-10-602-Q2 10"-RH-19-602-Q2		
	12"-RH-9-602-Q2 12"-RH-12-602-Q2 10"-RH-16-602-Q2 10"-RH-17-602-Q2 6"-RH-20-602-Q2 3"-RH-13-602-Q2	256	9.3-1
	10"-RH-16-602-Q2	3011	9.3-1
	14"-RH-1-1502-Q1 14"-RH-2-602-Q2 14"-RH-18-602-Q2	653B	4-1,9.3-1
	10"-RH-24-1502-Q1	653C	6.3-2
	10"-RH-23-1502-Q2	14	9.3-1, 6.3-2
	6"-RH-14-152-Q2	616	9.3-1
Component Cooling	18"-CC-118-151-Q3	302	9.4-4
	18"-CC-116-151-Q3	303	9.4-4
	18"-CC-114-151-Q3	304	9.4-4
	18"-CC-130-151-Q3	305	9.4-4
	8"-CC-255-151-Q3 8"-CC-256-151-Q3 8"-CC-257-151-Q3 6"-CC-261-151-Q3 8"-CC-476-151-Q3	306	9.4-3
	6"-CC-258-151-Q3 6"-CC-265-151-Q3 8"-CC-259-151-Q3 8"-CC-260-151-Q3 8"-CC-517-151-Q3	307	9.4-3
	6"-CC-519-151-Q3 24"-CC-125-151-Q3 18"-CC-489-151-Q2 18"-CC-490-151-Q2	215	9.4-4

System	Line Number	Problem No.	FSAR Fig. No.
	18"-CC-529-151-Q3		
	18"-CC-530-151-Q3		
	6"-CC-488-151-Q2		
	6"-CC-526-151-Q3		
	4"-CC-487-151-Q3		
	4"-CC-525-151-Q2		
	3"-CC-486-151-Q3		
	3"-CC-523-151-Q2		
	2"-CC-485-151-Q2		
	2"-CC-524-151-Q3		
	24"-CC-266-151-Q3		
	6"-CC-518-151-Q3		
	24"-CC-112-151-Q3	217	9.4-3,
	24"-CC-113-151-Q3		9.4-4
	6"-CC-510-151-Q3		9.4-3,
	6"-CC-511-151-Q3		9.4-4
	6"-CC-512-151-Q3		
	6"-CC-482-151-Q3		
	18"-CC-483-151-Q3		
	18"-CC-484-151-Q3		
	18"-CC-527		
	18"-CC-528-151-Q3		
	8"-CC-517-151-Q2	214	9.4-3
	6"-CC-481-151-Q2	930	9.4-4
	6"-CC-511-151-Q3		
	6"-CC-480-151-Q2	931	9.4-4
	6"-CC-510-151-Q3		
	10"-CC-20-151-Q3	172	9.4-1, 9.4-2
	8"-CC-81-151	173D	
	8"-CC-469-151-Q3		
	6"-CC-82-151		
	8"-CC-66-151	174D	
	8"-CC-468-151-Q3		
	6"-CC-55-151		
	8"-CC-58-151-Q3	175B	9.4-1, 9.4-2

System	Line Number	Problem No.	FSAR Fig. No.
	10"-CC-320-151-Q3	176A	9.4-1
	8"-CC-323-151-Q3		
	6"-CC-470-151-Q3		
	6"-CC-83-151		
	12"-CC-46-151-Q3	177	9.4-3
	8"-CC-61-151		
	8"-CC-465-151-Q3		
	6"-CC-65-151		
	6"-CC-92-151-Q3		
	14"-CC-45-151-Q3	178C	9.4-1,
	12"-CC-46-151-Q3		9.4-2
	10"-CC-48-151-Q3		
	8"-CC-8-151-Q3		
	8"-CC-51-151-Q3		
	8"-CC-466-151-Q3		
	8"-CC-80-151		
	6"-CC-84-151		
	6"-CC-23-151	179	9.4-2
	4"-CC-26-151		
	8"-CC-51-151-Q3	180E	9.4-2
	6"-CC-53-151-Q3		
	6"-CC-56-151-Q3		
	8"-CC-58-151-Q3	181E	9.4-2
	6"-CC-54-151-Q3		
	6"-CC-60-151-Q3		
	8"-CC-19-151-Q3	183	9.4-2
	6"-CC-34-151		
	6"-CC-42-141-Q3		
	6"-CC-515-151-Q3		
	3"-CC-38-151-Q3		
	4"-CC-27-151		
	8"-CC-35-151-Q3	184	9.4-2
	6"-CC-41-151-Q3		
	3"-CC-37-151-Q3		
	8"-CC-6-151-Q3	186A	9.4-1,
	8"-CC-8-151-Q3		9.4-2
	6"-CC-513-151-Q3		

System	Line Number	Problem No.	FSAR Fig. No.
	24"-CC-5-151-Q3 24"-CC-112-151-Q3 18"-CC-4-151-Q3 18"-CC-105-151-Q3 18"-CC-109-151-Q3	270	9.4-1
	24"-CC-22-151-Q3 24"-CC-266-151-Q3 18"-CC-101-151-Q3 18"-CC-102-151-Q3 18"-CC-106-151-Q3 8"-CC-469-151-Q3	170C	9.4-1
	24"-CC-2-151-Q3 18"-CC-1-151-Q3 18"-CC-3-151-Q3 18"-CC-103-151-Q3 18"-CC-104-151-Q3 18"-CC-107-151-Q3 18"-CC-108-151-Q3 8"-CC-321-151-Q3 10"-CC-321-151-Q3	171	9.4-1
Chilled Water (CW)	8"-CW-8-151	216	9.4-3
	8"-CW-9-151	214	9.4-3
River Water (WR)	6"-WR-117-151-Q3	203	10.3-5
	14"-WR-64-151-Q2	30	9.9-1A
	14"-WR-82-151-Q2	31	9.9-1A
	14"-WR-89-151-Q2	32	9.9-1A
	14"-WR-87-151-Q2	33	9.9-1A
	8"-WR-228-151-Q3 8"-WR-229-151-Q3 8"-WR-230-151 8"-WR-231-151	140	9.9-1A
	8"-WR-234-151-Q3	214	9.4-3

System	Line Number	Problem No.	FSAR Fig. No.
	14"-WR-63-151-Q2 14"-WR-65-151-Q2 14"-WR-86-151-Q2 14"-WR-88-151-Q2	1	9.9-1A
	14"-WR-25-151-Q3 14"-WR-26-151-Q3 14"-WR-27-151-Q3 14"-WR-28-151-Q3 24"-WR-29-151-Q3	120	9.9-1A
	14"-WR-21-151-Q3 14"-WR-22-151-Q3 14"-WR-23-151-Q3 14"-WR-24-151-Q3 24"-WR-19-151-Q3 24"-WR-20-151-Q3	123	9.9-1A
	24"-WR-19-151-Q3 24"-WR-187-151-Q3	124	9.9-1A
	24"-WR-20-151-Q3 24"-WR-186-151-Q3	125	9.9-1A
	24"-WR-7-151-Q3 24"-WR-8-151-Q3 24"-WR-9-151-Q3 18"-WR-11-151-Q3 18"-WR-12-151-Q3 18"-WR-13-151-Q3	126	9.9-1A
	24"-WR-19-151-Q3	127	9.9-1A
	24"-WR-20-151-Q3	128	9.9-1A
	24"-WR-99-151-Q3	157	9.9-1A
	24"-WR-100-151-Q3	158	9.9-1A,B
	20"-WR-1-151-Q3 20"-WR-2-151-Q3 20"-WR-3-151-Q3 20"-WR-4-151-Q3 20"-WR-5-151-Q3 20"-WR-6-151-Q3 24"-WR-99-151-Q3 24"-WR-100-151-Q3 18"-WR-154-151-Q3 12"-WR-177-151-Q3	159(1)	9.9-1A,B

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System	Line Number	Problem No.	FSAR Fig. No.
	8"-WR-227-151	216	9.4-3, 9.9-1A
	30"-WR-171-151-Q3 30"-WR-172-151-Q3 30"-WR-175-151-Q3	152	9.9-1B
	10"-SWW-14-151-Q3 10"-SWW-1-121	165(a)	9.9-1B
	18"-WR-14-151-Q3 18"-WR-15-151-Q3 18"-WR-16-151-Q3	121	9.9-1A
	30"-WR-17-151-Q3	122	9.9-1A
	6"-WR-155-151-Q3	384	9.9-1B
	6"-WR-214-151-Q3	652	RM-53A
	6"-WR-215-151-Q3	653	RM-53A
Main Steam (MS)	3"-SDHV-1-601-Q2 3"-SDHV-2-601-Q2 3"-SDHV-3-601-Q2	101	10.3-1
	4"-SDHV-4-601-Q2		
	32"-SHP-56-601-Q2	658	10.3-1
	32"-SHP-57-601-Q2	659	10.3-1
	32"-SHP-58-601-Q2	660	10.3-1
	4"-SHP-19-601-Q2 4"-SHP-20-601-Q2 4"-SHP-21-601-Q2 6"-SAE-1-601 6"-SAE-2-601 6"-SAE-3-601	6590	10.3-1
	32"-SHP-56-601-Q2 32"-SHP-57-601-Q2 32"-SHP-58-601-Q2 32"-SHP-22-601-Q2 32"-SHP-23-601-Q2 32"-SHP-24-601-Q2 10"-SSVD-1-601 10"-SSVD-2-601 10"-SSVD-3-601 10"-SSVD-4-601	3063	10.3-1

System	Line Number	Problem No.	FSAR Fig. No.
	10"-SSVD-5-601 10"-SSVD-6-601 10"-SSVD-7-601 10"-SSVD-8-601 10"-SSVD-9-601 10"-SSVD-10-601 10"-SSVD-11-601 10"-SSVD-12-601 10"-SSVD-13-601 10"-SSVD-14-601 10"-SSVD-15-601		
Main and Auxiliary Feedwater (FW)	4"-WAPD-3-601-Q3 4"-WAPD-4-601-Q3 4"-WAPD-5-601-Q3 4"-WAPD-6-601-Q3 6"-WAPD-1-601-Q3 6"-WAPD-2-601-Q3	204	10.3-5
	16"-WFPD-22-601-Q2	783	10.3-5
	16"-WFPD-24-601-Q2	784	10.3-5
	16"-WFPD-23-601-Q2	785	10.3-5
	16"-WFPD-9-601-Q2 16"-WFPD-13-601-Q2 16"-WFPD-17-601-Q2	0261	10.3-5
	6"-WD-23-151-Q3 6"-WD-24-151-Q3 6"-WD-25-151-Q3 6"-WD-26-151-Q3 4"-WD-27-151-Q3 4"-WD-41-151-Q3	203	10.3-5
	8"-WD-22-151-Q3 6"-WD-25-151-Q3 6"-WD-26-151-Q3	2031	10.3-5
Diesel Generator Exhaust (OL)	22"-OL-55-151-Q3	651	RM-53A

NOTES:

(1) Problems 160 and 161 are included within the scope of the reanalysis effort for problem 159.

(2) Problem 165 has been analyzed on NUPIPE as part of the Beaver Valley Unit 2 stress analysis effort.

These lines are identified on the flow diagrams included in Appendix C.

In addition to the problems referenced above, a number of other computer analyses were also performed for Beaver Valley - Unit 1, using the SHOCK2 code. These have been excluded from the scope of the reanalysis for interim startup and are discussed in Appendix B.

APPENDIX B

PROBLEMS TO BE REANALYZED IN THE LONG TERM

The problems described in Tables B-1 and B-2 are the remaining problems run on SHOCK 2, five of which are within the scope of the long term effort. These problems are identified on the flow diagrams included in Appendix D.

1. Other Safety Systems

   Table B-1 identifies the SHOCK 2 problems that are within the scope of the long-term reanalysis effort; these lines are not required for safe shutdown.

2. Hand Calculations

   Table B-2 identifies SHOCK 2 problems that are not within the scope of the long-term reanalysis effort; these SHOCK 2 runs are only check calculations of manual hand calculations. They are identified here only to show the scope of the original SHOCK 2 effort.

3. Superseded Calculations

The following SHOCK 2 runs have been superseded by a problem presently within the interim and long term reanalysis effort.

Superseded SHOCK 2 Run	New Problem Number
122A	122
312	840
657	785
916	217
1012	391
2110	341B
6230	310

4. Seismically Supported Non-Q Lines

The following lines are not safety related but have been seismically supported as designated by an "E" in the line designation table.

2"-CV-1-154

2"-SHPD-5-601

2"-SHPL-6-601

2"-SHPD-7-601

2"-SHPD-8-601

1/4-SS-163-N9

1/4-SS-173-N9

1/4-SS-174-N9

TABLE B-1

SAFETY SYSTEMS TO BE ANALYZED IN THE LONG TERM

System	Line Number	Problem No.	FSAR Fig. No.
Fuel Pool Cooling & Purification System (FC)	6"-FC-4-152-Q3 6"-FC-5-152-Q3 6"-FC-6-152-Q3	104	9.5-1
	6"-FC-8-152-Q3 6"-FC-9-152-Q3	105E	9.5-1
	10"-FC-1-152-Q3 6"-FC-2-152-Q3 6"-FC-31-152-Q3	198B	9.5-1
	4"-FC-10-152 4"-FC-11-152 6"-FC-14-152 6"-FC-17-152 6"-FC-32-152	107	9.5-1
River Water (WR)	30"-WR-175-151-Q3	153	9.9-1B

BEAVER VALLEY POWER STATION, UNIT 1

TABLE B-2

HAND CALCULATIONS CHECKED BY SHOCK2

System	Line Number	Problem No.
High Pressure Steam (SHP)	3"-SHP-26-601-Q2 3"-SHP-31-601-Q2	3043
Steam Generator Auxiliary Feedwater Pump Discharge (WAPD)	3"-WAPD-13-601-Q3	207
	3"-WAPD-11-601-Q3	208
Generator Water Blowdown (WGCB)	3"-WGCB-8-601-Q2 3"-WGCB-12-601-Q2	309, 3017, 6220, 3002, 3018, 6216
	3"-WGCB-4-601-Q2	310
	3"-WGCB-4-601-Q2	3100
Fuel Pool Cooling and Purification System (FC)	6"-FC-12-152-Q2	301
	6"-FC-17-152-Q2	655C
Charging and Volume Control System (CH)	3"-CH-125-1503-Q2	911, 260, 3001
	2"-CH-97-1502-Q1	200
	2"-CH-141-1503-Q1	220
	2"-CH-100-1502-Q2 2"-CH-186-152-Q2	230
	2"-CH-1-1502-Q1	240
	2"-CH-96-1502-Q1	250
	2"-CH-23-1502-Q1	300
	2"-CH-143-1502-Q1 2"-CH-149-1502-Q1 2"-CH-145-602-Q1 2"-CH-2-602-Q1 2"-CH-3-602-Q1	350

TABLE B-2 (Cont)

System	Line Number	Problem No.
	2"-CH-4-602-Q1	
	2"-CH-146-152-Q3	
	3/4"-CH-115-1502-Q2	380
	2"-CH-2-602-Q2	702
	2"-CH-148-602-Q2	703
	3"-CH-106-153W-Q2	901, 3135
	3"-CH-107-153W-Q2	3135
	3"-CH-108-153W-Q2	704, 3135
	3"-CH-110-153W-Q2	704,
	3"-CH-111-153W-Q2	3057
	3"-CH-114-152W-Q2	3129, 3044
	4"-CH-14-153W-Q2	3057
	3"-CH-6-153W-Q2	3122
	3"-CH-226-153W-Q2	
	3"-CH-13-153W-Q2	3125
	4"-CH-72-1503-Q2	3131
	4"-CH-76-1503-Q2	
	3"-CH-71-1503-Q2	
	3"-CH-75-1503-Q2	
	3"-CH-80-1503-Q2	
	3"-CH-69-1503-Q2	3031
	3"-CH-70-1503-Q2	
	3"-CH-73-1503-Q2	
	3"-CH-74-1503-Q2	
	4"-CH-72-1503-Q2	
	4"-CH-76-1503-Q2	
	3"-CH-126-1503-Q1	3035
Safety Injection (SI)	3"-SI-81-1503-Q1&Q2	900, 3004
	3"-SI-140-1503-Q1	902, 3004

TABLE B-2 (Cont)

System	Line Number	Problem No.
	6"-SI-34-1502-Q1 6"-SI-74-1502-Q1	3006
	3"-SI-60-1503-Q2	3124
	3"-SI-57-1503-Q1&Q2	900
	3"-SI-130-1503-Q1&Q2	313, 902
	3"-SI-134-1503-Q2	922
	3"-SI-81-1503-Q2	3120
	3"-SI-56-1503-Q3 3"-SI-60-1503-Q3 3"-SI-133-1503-Q3 4"-SI-75-1503-Q3 3"-SI-134-1503-Q1	3052
	3"-SI-31-153W-Q2 3"-SI-145-153W-Q2	3127
	3"-SI-35-152-Q3	965
Residual Heat Removal System (RH)	6"-RH-14-152-Q2	3012
Reactor Coolant (RC)	3"-RC-13-1502-Q1 3"-RC-23-1502-Q1 3"-RC-33-1502-Q1 3"-RC-160-153W-Q2	6530
	2"-RC-54-1502-Q1	220
	3"-RC-160-153W	917
	4"-RC-112-152-Q3	360
	3"-RC-160-153W	917
	3"-RC-160-153W-Q2	3021
Component Cooling (CC)	6"-CC-512-151-Q3	914
	4"-CC-487-151-Q2	918

TABLE B-2 (Cont)

System	Line Number	Problem No.
	4"-CC-525-151-Q3	
	3"-CC-235-151-Q3 3"-CC-486-151-Q2 3"-CC-523-151-Q3	921
Diesel Generator Oil Line (OL)	3"-OL-46-151-Q3	650
Primary Grade Water (PG)	3"-PG-5-152	917
Quench Spray (QS)	2"-QS-29-152	315X
	6"-QS-30-153B-Q3 6"-QS-31-153B-Q3	840
	6"-QS-16-152	139
	4"-QS-8-152	341B
Neutron Shield Tank Cooling (NSL)	6"-NSL-2-152-Q3	312