SURRY POWER STATION, UNIT 1

REVISED REPORT ON THE REANALYSIS OF SAFETY-RELATED PIPING SYSTEMS

SURRY POWER STATION, UNIT 1
VIRGINIA ELECTRIC AND POWER COMPANY

January 1980

Stone & Webster Engineering Corporation
Boston, Massachusetts

Vepco

VIRGINIA ELECTRIC AND POWER COMPANY, RICHMOND, VIRGINIA 23261

January 15, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Serial No. 048
PSE&C/CMRjr:mac:wang

Docket No. 50-280

License No. DPR-32

Dear Mr. Denton:

COMPLETION OF SHOW CAUSE ORDER REANALYSIS
SURRY POWER STATION UNIT 1

The Virginia Electric and Power Company letter of December 21, 1979 (Serial No. 1158) gave notification of the completion of analysis associated with the 60 day time period designated in the Nuclear Regulatory Commission Order of August 22, 1979. The purpose of this letter is to transmit the results of that analysis in a format similar to our previous reports of June 5 and August 1, 1979. As stated in our December 21, 1979 letter, all modifications associated with the Order of August 22, 1979 will be completed by February 1, 1980.

The attached report concludes our detailed submittals on the design basis earthquake analysis associated with the March 13, 1979 Order to Show Cause for Unit 1. We will notify you when these modifications are completed.

If you have any questions, please contact us.

Very truly yours,

W. L. Spencer
Vice President - Power Station Engineering
and Construction Services

Attachment

cc: Mr. Victor Stello, Director
Office of Inspection & Enforcement

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
Region II

SURRY POWER STATION, UNIT 1

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SECTION 1

INTRODUCTION

The Nuclear Regulatory Commission (NRC) Order to Show Cause of March 13, 1979, required certain piping systems associated with Surry Power Station - Unit 1 to be reanalyzed, using an appropriate piping code to account for seismic loads. VEPCO complied with the order by the shutdown of Surry 1 within 48 hours.

The initial analysis effort to reanalyze these systems began immediately. Major decisions were made by VEPCO concerning the course of reanalysis. These actions had a major influence on the method in which the reanalysis was completed. These actions included:

1. The use of NUPIPE computer code for all dynamic reanalysis.

2. The use of soil structure interaction (SSI) for the development of amplified response spectra (ARS) in dynamic reanalysis.

3. The award of a contract to obtain services of Quadrex (Nuclear Services Corporation) to complete a portion of the piping reanalysis.

4. The use of field-verified input into the pipe stress reanalysis.

On April 2, 1979, a letter was issued by the Nuclear Regulatory Commission clarifying the intent of the March 13, 1979, Show Cause Order. This letter contained specific information concerning exactly what information was required to allow the Show Cause Order to be lifted and the plant's return to operation. Among the requirements of the April 2, 1979, letter was a list of the material required for NRC review of reanalysis results and a plan for verification of dynamic analysis codes. This letter also requested response for the licensee concerning what methods of seismic analysis were employed for other systems within the show cause plants, and also, a listing of all piping systems affected by the Show Cause Order. VEPCO's response to this letter was Serial No. 220/040279, dated May 24, 1979 (Item 22, Appendix B).

The NRC letter of April 13, 1979 (Item 3, Appendix B), informed VEPCO that use of SSI techniques for the development of amplified response spectra utilizing an elastic half-space model would be acceptable for reevaluation of piping at Surry 1 and 2.

As the Show Cause analysis continued, SSI ARS were employed. The acceptability of SSI was obtained on May 25, 1979, in an NRC letter from D. Eisenhut (Item 5, Appendix B). The completion of documentation to support the staff review of SSI was supplied in the report, "Soil Structure

Interaction in Development of Amplified Response Spectra for Surry Power Station - Units 1 and 2." The date of this report is June 8, 1979 (Item 26, Appendix B).

Following the acceptability of the SSI ARS by the NRC, meetings were held both in the offices of Stone & Webster in Boston, Massachusetts, and the NRC in Bethesda, Maryland, to review the reanalysis completed and determine the acceptability of that reanalysis to allow interim plant operation. The reanalysis completed indicated that the computer code in question had no major effect on the ability of the piping systems to withstand earthquakes. Specific understandings were reached during these meetings, including evaluation of the Design Basis Earthquake (DBE), forming the basis for interim lifting of the show cause order and interim operation.

In order to develop a viable basis for interim operation of Surry Unit 1, the scope of reanalysis initially included some problems that used computer codes not addressed by the order to show cause. These were piping problems addressed by USNRC IE Bulletin 79-04 (Velan Valves). Also reanalyzed were SHOCK O/I piping problems. The reanalysis of these piping systems is being completed as part of IE Bulletin 79-14 reanalysis.

By June 5, 1979, the reanalysis had proceeded sufficiently to allow the issuance of "The Report on the Reanalysis of Safety-Related Piping Systems,

Surry Power Station - Unit 1," VEPCO Serial No. 453 (Item 24, Appendix B). This report outlined the pipe stress and pipe support analysis completed to date and requested interim operation of the unit, based on the minor hardware modifications identified as of that time. This submittal also included a summary of the conservatisms that were being factored into the reanalysis. This request for interim operation was refused.

As a result of the June 5, 1979, submittal, additional meetings were held with the NRC to discuss requirement for interim operation. It was then determined that the completion of the pipe stress analysis would be necessary in order to allow interim operation. Upon completion of the pipe stress analysis, a second submittal was issued on August 1, 1979, "Revised Report on the Reanalysis of Safety-Related Piping Systems, Surry Power Station - Unit 1," VEPCO Serial No. 453A (Item 31, Appendix B). Discussions and meetings between Stone & Webster, VEPCO, and the NRC (following this submittal) led to a letter written by VEPCO on August 21, 1979 (Item 32, Appendix B). This letter concluded that typical pipe support analysis was complete within the reactor containment and that certain systems outside the containment, as designated by the NRC, were also complete. This letter resulted in the lifting of the Show Cause Order by the Commission, on August 22, 1979 (Item 15, Appendix B).

Surry Unit 1 was not allowed to start up at this time, based on NRC Inspection and Enforcement (I&E) concerns about the acceptability of embedded anchor bolt

inspections required per I&E Bulletin 79-02 and the work completed to date on I&E Bulletin 79-14. The October 4, 1979, VEPCO letter, Serial No. 817 (Item 35, Appendix B), to the Commission on I&E Bulletins 79-14 and 79-02, was evaluated by I&E and interim start-up was granted following completion of specific activities outlined in that letter. Interim start-up of the plant occurred on October 25, 1979. This was after VEPCO committed to an expedited schedule for the reanalysis of all piping systems in accordance with I&E Bulletin 79-14.

The August 22, 1979, lifting of the Show Cause Order allowed VEPCO 60 days after startup to complete all DBE pipe support reanalysis outside the reactor containment building on the problems specifically addressed by the March 13, 1979, Order to Show Cause. At the end of the 60 day period, December 23, 1979, the provisions of the August 22, 1979, order were met as discussed in the VEPCO letter of December 21, 1979, Serial No. 1158 (Item 40, Appendix B).

The purpose of this report is to document the results of the DBE reanalysis during the 60 day interval in a format similar to the June 5 and August 1, 1979, reports. This report concludes detailed documentation of all aspects of the Design Basis Earthquake Show Cause reanalysis for Surry Power Station, Unit 1.

SECTION 2

PIPE STRESS RESULTS

A total of 63 pipe stress problems were originally analyzed by the PSTRESS/SHOCK 2 computer program that used algebraic summation and are therefore specifically addressed by the Show Cause Order. These stress problems were analyzed by two groups: Stone & Webster Engineering Corporation (S&W) in Boston, Massachusetts, and Nuclear Services Corporation (NSC) or Quadrex in Campbell, California, as indicated in the following table:

PIPE STRESS PROBLEMS

S&W	NSC	TOTAL
42	21	63

Field-verified piping isometric drawings provide the basis for program inputs for the pipe stress reanalysis of the SHOCK 2 problems. The reanalysis is conducted using the NUPIPE computer program. NUPIPE calculates intra-modal seismic forces using a modified square root of the sum of the squares (SRSS)

technique which is always more conservative than the approved SRSS method, and an SRSS technique for inter-modal combination.

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. In accordance with the NRC letter of May 25, 1979 to Virginia Electric and Power Company (VEPCO), the seismic inertial stresses typical loads computed using the SSI-ARS have been increased by a factor of 1.5 for the DBE condition.

All 63 SHOCK 2 problems have been reanalyzed and approved by S&W Engineering Assurance or NSC Quality Assurance. Table 2-1 for the Design Basis Earthquake shows the results for these 63 stress problems. In Table 2-1, the figures for Original Total Stress, at the point of maximum total stress in the pipe, and Original Seismic Stress, at the same point, are extracted from Table 3-1 of the "Seismic Design Review Equipment and Piping, Surry Power Station," dated September 15, 1971. The original calculations for the seismic design review report are no longer available; therefore, correlations were made to the original stresses in Table 3-1 on the basis of the MSK's.

In Table 2-1, the columns for New Total Stress, at the point of maximum total stress in the pipe, and New Seismic Stress, at the same point, were taken from

the NUPIPE computer runs with the seismic inertial stress magnified by a factor of 1.5 for runs using the SSI-ARS, per the NRC letter to VEPCO of May 25, 1979. Of the 63 problems in Table 2-1, 56 used the SSI-ARS and 7 used the original ARS.

The original total and original seismic stresses shown in Table 2-1 were computed using the SHOCK 2 programs for the original design conditions. The new total and new seismic stresses were computed by the NUPIPE program using different mass models and in some cases different ARS's than the original calculations. More importantly, the reanalyses were based on field-verified piping configurations in 1979, which in some cases differ from the original design conditions. For this reason, the new stresses and the original stresses in Table 2-1 are not comparable, as they do not necessarily represent the same physical conditions.

Table 2-2 summarizes the nozzles and penetrations evaluated under the reanalysis program. All of the 84 nozzles on problems originally analyzed by the SHOCK 2 program have been found acceptable by S&W. For those problems in which the SSI-ARS are used, the seismic inertial nozzle loads have been increased by a factor of 1.5 per the NRC letter of 25 May 1979.

The typical SHOCK 2 stress problems include 8 penetrations. The analyses of all penetrations have been completed. Table 2-4 lists all modifications to reduce nozzle and penetration loads.

Table 2-3 lists the hardware modifications necessary to bring the pipe stress analysis to within code allowables. Of the 63 SHOCK 2 problems reanalyzed, hardware modifications were made to 20 problems due to pipe stress. These modifications consisted of 63 added, modified, or deleted supports. No physical modifications to piping were required.

SURRY POWER STATION, UNIT 1

TABLE 2-1

PIPE STRESS REEVALUATION SUMMARY
DESIGN BASIS EARTHQUAKE

Problem No.	System Name	Iso. No.	Line Size (NPS)	Pipe Stress (psi) Original Total*	Original Seismic*	New Total	New Seismic	Allowable
			SHOCK2 Problems					
555	Low Head Safety Injection	122 D1	10" 12"	29290	NA	10733	5311	30882
1555	Low Head Safety Injection	122 L1	12"	25290	NA	10036	3855	30882
706A	Low Head Safety Injection	122 H1	6"	18451	10707	15953	10024	30769
707A	Low Head Safety Injection	122 J1	6"	22436**	19577**	19229	12556	33750(1)
708	Low Head Safety Injection	122 K1	6"	20552**	NA	17489	10941	30769(1)
731A	Low Head Safety Injection	127 E1	8"	22671**	NA	12734	5393	29970(2,5)
731B	Low Head Safety Injection	127 E2	8"	22671	NA	13470	2033	29970(2,5)
743	Low Head Safety Injection	127 F1	10"	24649**	NA	14789	5496	33750
727	Low Head Safety Injection	127 C1 127 C2	6" 10"	28909**	NA	29157	26678	29970
735	High Head Safety Injection	127 G1 127 G2	4", 6" 8", 10"	23011	13220	19296	15708	31104(3)
525A 1525A	Containment & Recirculation Spray	123 A1	8" 10"	11999	10866	6388 5596	3311 4275	33750(4) 33750
546/ 560	Containment & Recirculation Spray	123 D1 123 E1	8" 10"	28209	24753	10751	2291	32616(2)
546/ 5600	Containment & Recirculation Spray	123 F3	8" 10"	28209	24753	21279	2658	32616

TABLE 2-1 (Cont)

PIPE STRESS REEVALUATION SUMMARY
DESIGN BASIS EARTHQUAKE

Problem No.	System Name	Iso. No.	Line Size (NPS)	Pipe Stress (psi) Original Total*	Original Seismic*	New Total	New Seismic	Allowable
546/ 5620	Containment & Recirculation Spray	123 F2	8" 10"	28209	24753	21003	2499	32616
548C	Containment & Recirculation Spray	123 H2	10"	15785**	11241**	5610	2685	32616(5)
547	Containment & Recirculation Spray	123 C1	8" 10"	20953	5688	7451	5634	33750(5)
744/ 754	Containment & Recirculation Spray	123 J1	8"	26721**	NA	28136	16398	33750(9)
548A	Containment & Recirculation Spray	123 B1	8" 10"	11955	11256	14927	11598	33750(5)
548B	Containment & Recirculation Spray	123 H1	10"	28660	26790	17028	15505	32616
544	Containment & Recirculation Spray	123 G1 123 G2	10"	13402	6986	9211	6133	28485
544A	Containment & Recirculation Spray	123 R2	10"	12853	11256	6430	3556	29970
544B	Containment & Recirculation Spray	123 R1	10"	12853	11256	6448	4541	28485
751	Containment & Recirculation Spray	123 N1 123 N2	10"	6010	5169	7085	5206	28485
562	Containment & Recirculation Spray	123 F1 123 E2	10"	12610**	NA	28600	1962	32616(2,5)
745	Containment & Recirculation Spray	123 K1	8"	25702	24579	25394	2148	33750(6)
323A	Main Steam	100 D1	30"	13824	6343	12988	354	27000
322A	Main Steam	101 D1	30"	13031	5548	11546	852	27000
334A	Main Steam	102 D1	30"	18635	11082	15319	463	27000

TABLE 2-1 (Cont)

PIPE STRESS REEVALUATION SUMMARY
DESIGN BASIS EARTHQUAKE

Problem No.	System Name	Iso. No.	Line Size (NPS)	Pipe Stress (psi) Original Total*	Original Seismic*	New Total	New Seismic	Allowable
346	Main Steam	103 A1	30"	19970	12563	31663	14049	33750(7)
323B	Feedwater***	100 G1	14"	15829	590	12899	8061	27000
322B	Feedwater***	101 G1	14"	17927	13521	15432	878	27000
334B	Feedwater	102 G1	14"	16025	12281	17169	10791	27000
417	Auxiliary Feedwater	118 A1 118 A2	3"	8568	NA	24530	14036	27000
607	Auxiliary Feedwater	118 G1 118 G2	4" 6"	18681	NA	18126	5347	27000
636	Pressurizer Spray & Relief	125 A1	4"	17671	9527	20304	13833	28800
630	Pressurizer Spray & Relief	124 A1 124 A2	3", 4" 6", 12"	20500**	NA	29421	24839	30690(8)
540	Residual Heat Removal	117 B1	3", 4" 6", 12"	14746**	3374**	19144	9020	25785
508	Residual Heat Removal	117 A1 117 A2	10", 12", 14"	16627	12375	13203	8757	25785
465	Service Water	119 A1 119 A2 119 A3 119 A4	24"	19101	18285	6935	5826	21600
488/480	Component Cooling	112 C 112 A1	18"	26723**	NA	16263	13680	27000
507/481	Component Cooling	112 F1 112 B1	8" 18"	26695**	NA	21499	19895	27000
614	Component Cooling	112 AE1 112 AE2 112 AE2	12" 18" 10", 6"	25448**	NA	20601	17575	27000
512	Component Cooling	112 AN1	18"	26792**	NA	17748	15621	27000

TABLE 2-1 (Cont)

PIPE STRESS REEVALUATION SUMMARY
DESIGN BASIS EARTHQUAKE

Problem No.	System Name	Iso. No.	Line Size (NPS)	Pipe Stress (psi) Original Total*	Original Seismic*	New Total	New Seismic	Allowable
603A	Component Cooling	112 S1	18"	18710	13461	5396	3554	27000
766	Component Cooling	112 AR 112 T	8"	10449**	NA	19041	17263	27000
605A	Component Cooling	112 AA1 112 AA2	3", 6", 18"	12420	6727	20269	17990	27000
605B	Component Cooling	112 AA1 112 AA2	3", 6", 18"	12420	6727	14775	11004	27000
509A/D	Component Cooling	112 G1	8", 12", 18", 24"	26566**	NA	20374	16992	27000
612	Component Cooling	112 AK1	18"	17958**	NA	14034	9374	27000
1512	Component Cooling	112 J	18"	26792**	NA	21455	19998	27000
2529/ 2527	Component Cooling	112 AH	3", 6", 8", 10", 14", 18"	26701**	NA	18405	16809	27000
2526	Component Cooling	112 AJ	2'2", 6", 8", 10"	NA	NA	24840	16269	27000
517	Component Cooling	112 M1 112 M2 112 M3	4", 6", 8", 10", 14", 18"	17958**	NA	14686	13239	27000
603B	Component Cooling	112 S1	18"	18710	13461	5794	2624	27000
526C	Component Cooling	112 L1 112 L2 112 L3	6", 8"	NA	NA	22573	22258	27000
527A/C	Component Cooling	112 T1 112 T1	4", 6", 8", 10", 14"	10449**	NA	22803	21266	27000
509B	Component Cooling	112 G2	8", 12", 18", 24"	26566**	NA	22705	19319	27000

TABLE 2-1 (Cont)

PIPE STRESS REEVALUATION SUMMARY
DESIGN BASIS EARTHQUAKE

Problem No.	System Name	Iso. No.	Line Size (NPS)	Pipe Stress (psi) Original Total*	Original Seismic*	New Total	New Seismic	Allowable
509C	Component Cooling	112 G3	8", 12", 18", 24"	26566**	NA	18862	16007	27000
CV1	Containment Vacuum	137 A1	8"	25750**	NA	16039	1824	27000
746	3" HP Steam	131 A1 131 B2 131 C3	3" 4"	26766**	NA	18674	11200	27000
CF1	Fire Protection	144 A1	2", 6", 12"	22255**	NA	9911	8353	27000
CF2	Fire Protection	144 B1	1 1/2", 2", 16"	10966**	3733**	5323	1190	27000
1040	Diesel Muffler Exhaust	143 A1	24"	11857**	NA	7340	6756	22500

LEGEND:

* Table 2-1 of Seismic Design Review Equipment and Piping Surry Power Station, September 1971, or

** Subsequent reanalysis.

*** Max stress of feedwater inside reactor containment only. The flow diagram in the June 5, 1979 submittal is correct. The flow diagram in the August 1, 1979 submittal inadvertently included a small portion of feedwater. Piping outside the reactor containment is in error. Feedwater outside the reactor containment is part of the I&E 79-14 effort.

TABLE 2-1 (Cont)

PIPE STRESS REEVALUATION SUMMARY
DESIGN BASIS EARTHQUAKE

Legend:

NA = Not Available

Allowable Stress = 1.8 S

New Total Stress = S + S + 1.5 S + S (for SSI/ARS)

New Seismic = 1.5 S (for SSI/ARS)

New Total Stress = S + S + S + S (original ARS)

New Seismic = S (original ARS)

NOTE:

The original total* and original seismic* stresses shown in Table 2-1 were computed using SHOCK2 for the original design conditions. The new total and new seismic stresses were computed by the NUPIPE program using different mass models and, in some cases, different ARS's than the original calculations. More importantly, the reanalyses were based on field-verified, piping configurations in 1979, which, in some cases, differ significantly from the original design conditions. For this reason, the new stresses and the original stresses in Table 2-1 are not comparable, as they do not necessarily represent the same physical conditions.

DESCRIPTIVE NOTES (To explain differences between the August 1, 1979 table and table submitted in this report):

1. The high stress point occurs on a portion of the piping with a lower temperature therefore the higher allowable.
2. Pipe supports were added or modified to reduce loads on other existing supports. This stress analysis performed since the August 1, 1979 submittal.
3. The high stress point occurs on a portion of the piping with a higher temperature therefore the lower allowable.
4. In the original stress analysis both spray headers were considered as being similar therefore only one analysis made. As-built differences in pipe supports caused two separate pipe stress runs be made. This resulted in different hardware modifications due to pipe support analysis.
5. System operating temperature revised therefore allowable stress changed accordingly.
6. Problem rerun with revised building displacements.

TABLE 2-1 (Cont)

PIPE STRESS REEVALUATION SUMMARY
DESIGN BASIS EARTHQUAKE

7. Pipe stress problem rerun with enveloped ARS for 3-buildings. New run of record made in preparation for OBE support analysis.

8. Since the high stress point occurs at the point where two piping classes join, the lower allowable should be applied.

9. Problem rerun with revised building displacements and modified NUPIPE model.

TABLE 2-2

NOZZLE AND PENETRATION SUMMARY
SHOCK 2 PROBLEMS
DESIGN BASIS EARTHQUAKE

System and Prob. No.	Total No. of Nozzles/ Penetrations	No. Acceptable Evaluation (Complete)	No. Under Evaluation	Modifications or Additions Required	Vendor Confirmation Being Obtained
Low Head Safety Injection					
555	1	1	0	0	Confirmed
1555	1	1	0	0	Confirmed
706A	0	N/A	N/A	N/A	N/A
707A	0	N/A	N/A	N/A	N/A
708	0	N/A	N/A	N/A	N/A
731A	0	N/A	N/A	N/A	N/A
731B	0	N/A	N/A	N/A	N/A
743	0	N/A	N/A	N/A	N/A
727	2	2	0	0	Confirmed
High Head Safety Injection					
735	3	3	0	0	Confirmed
Containment Recirculation Spray					
525A/1525A	0	N/A	N/A	N/A	N/A
546/560	1	1	0	0	N/A
546/5600	0	N/A	N/A	N/A	N/A
546/5620	0	N/A	N/A	N/A	N/A

TABLE 2-2 (Cont)

NOZZLE AND PENETRATION SUMMARY
SHOCK 2 PROBLEMS
DESIGN BASIS EARTHQUAKE

System and Prob. No.	Total No. of Nozzles/ Penetrations	No. Acceptable Evaluation (Complete)	No. Under Evaluation	Modifications or Additions Required	Vendor Confirmation Being Obtained
548C	1	1	0	0	N/A
547	0	N/A	N/A	N/A	N/A
744/754	1	1	0	0	Confirmed
548A	0	N/A	N/A	N/A	N/A
548B	1	1	0	0	N/A
544	2/2	2/2	0/0	0/0	N/A
544A	2	2	0	0	Confirmed
544B	2	2	0	0	Confirmed
751	2	2	0	0	N/A
562	1	1	0	0	N/A
745	1	1	0	0	Confirmed
Main Steam					
323A	1/1	1/1	0/0	0/0	N/A
322A	1/1	1/1	0/0	0/0	N/A
334A	1/1	1/1	0/0	0/0	N/A
346	0/0	N/A	N/A	N/A	N/A
Feedwater					
323B	1/1	1/1	0/0	0/0	N/A
322B	1/1	1/1	0/0	0/0	N/A
334B	1/1	1/1	0/0	0/0	N/A

TABLE 2-2 (Cont)

NOZZLE AND PENETRATION SUMMARY
SHOCK 2 PROBLEMS
DESIGN BASIS EARTHQUAKE

System and Prob. No.	Total No. of Nozzles/ Penetrations	No. Acceptable Evaluation (Complete)	No. Under Evaluation	Modifications or Additions Required	Vendor Confirmation Being Obtained
Aux. Feedwater					
417	0	N/A	N/A	N/A	N/A
607	3	3	0	0	Confirmed
Pressurizer Spray & Relief					
636	1	1	0	0	Confirmed
630	5	5	0	0	Confirmed
Residual Heat Removal					
540	1	1	0	0	Confirmed
508	8	8	0	0	Confirmed
Service Water					
465	4	4	0	0	N/A
Component Cooling					
488/480	4	4	0	0	N/A
507/481	4	4	0	0	N/A
614	0	N/A	N/A	N/A	N/A
512	0	N/A	N/A	N/A	N/A
603A	1	1	0	0	Confirmed
766	2	2	0	0	N/A
605A	3	3	0	0	Confirmed

TABLE 2-2 (Cont)

NOZZLE AND PENETRATION SUMMARY
SHOCK 2 PROBLEMS
DESIGN BASIS EARTHQUAKE

System and Prob. No.	Total No. of Nozzles/ Penetrations	No. Acceptable Evaluation (Complete)	No. Under Evaluation	Modifications or Additions Required	Vendor Confirmation Being Obtained
605B	3	3	0	0	Confirmed
509A/D	3	3	0	0	N/A
612	2	2	0	0	Confirmed
1512	0	N/A	N/A	N/A	N/A
2527/2529	2	2	0	0	Confirmed
2526	0	N/A	N/A	N/A	N/A
527A/C	2	2	0	0	Confirmed
517	4	4	0	0	Confirmed
603B	1	1	0	0	Confirmed
526C	0	N/A	N/A	N/A	N/A
509B	0	N/A	N/A	N/A	N/A
509C	0	N/A	N/A	N/A	N/A
Containment Vacuum					
CV1	0	N/A	N/A	N/A	N/A
3" HP Steam					
746	1	1	0	0	Confirmed
Fire Protection					
CF-1	0	N/A	N/A	N/A	N/A
CF-2	0	N/A	N/A	N/A	N/A

TABLE 2-2 (Cont)

NOZZLE AND PENETRATION SUMMARY
SHOCK 2 PROBLEMS
DESIGN BASIS EARTHQUAKE

System and Prob. No.	Total No. of Nozzles/ Penetrations	No. Acceptable Evaluation (Complete)	No. Under Evaluation	Modifications or Additions Required	Vendor Confirmation Being Obtained
Diesel Muffler Exhaust					
1040	3	3	0	0	N/A

N/A = not applicable

SURRY POWER STATION, UNIT 1

TABLE 2-3

PIPE STRESS HARDWARE MODIFICATION SUMMARY

Problem No.	MKS No.	System	Overstressed Condition	Attributable To:	Resolution
334B	102G1,G2	FW	Thermal overstress	As-Built	Delete U-Bolt**
508	117A1	RHR	DBET overstressed RHR pump Discharge elbows and overloaded nozzles.	Seismic Reanalysis	Six supports added to alleviate overstress condition.
540	117B1	RHR	1. Thermal overstress due to support which was not included in original analysis. 2. Overstress in 2" line which was not included in original analysis.	As-Built	1. Delete NS & RH's. 2. Add Anchor to 2" line.
548A	123B1	C&RS	DBEI overstress condition	As-Built	Addition of a horizontal snubber.
562	123E2	C&RS	DBEI overstress	As-Built	Addition of EW. Replace RH with SH. Replace SH with VC.
727	127C1	LHSI	DBEI overstress	Seismic Reanalysis	Addition of an LSS.
735	127G1	HHSI	DBEI overstress	As-Built	Addition of two guides.
743	127F1	LHSI	DBEI overstress	As-Built	Shim existing constraint to VC/LC.
744/754	123J1	C&RS	DBEI overstress	As-Built	Modification and replacement of constraints to reflect original analysis.
745	123K1	C&RS	DBEI overstress	As-Built	Modification and replacement of constraints to reflect original analysis.
746	131A1 B2 C3	HP Steam	DBEI overstress	As-Built	Modification and addition of constraints to reflect original analysis.

SURRY POWER STATION, UNIT 1

TABLE 2-3 (Cont)

PIPE STRESS HARDWARE MODIFICATION SUMMARY

Problem No.	MKS No.	System	Overstressed Condition	Attributable To:	Resolution
488/480	122A1,C1	CCW	DBEI overstress	As-built *	Add two guides to Problem 480 and two lateral restraints to Problem 488.
507/481	112B1,F1	CCW	DBEI overstress	As-built *	Add two guides to Problem 481.
509A/D	112G	CCW	DBEI overstress	As-built	Added one vertical restraint.
517	112M	CCW	DBEI overstress	As-built Seismic Reanalysis	Seven restraint changes are required.
526C	112L	CCW	DBEI overstress	Seismic Reanalysis	Added a lateral restraint and modify an SH to a rigid vertical constraint.
527A/C	112T	CCW	DBEI overstress	As-built	Delete anchor A36 and shim supports.
605A	112AA	CCW	DBEI overstress	As-built	Add four lateral restraints.
766	112AR	CCW	DBEI overstress and thermal overstress	As-built	Add horizontal guides and delete an axial restraint.
2527/2529	112	CCW	DBEI overstress	As-built	Delete anchor and shim supports.

NOTES:

* The use of ARS curves causes higher acceleration levels than the procedure for below-grade structures formerly used as described in the Seismic Design Review revised September 15, 1971.

** Due to Branch-Line Analysis

FW = Feedwater
RHR = Residual Heat Removal
C&RS = Containment & Recirculating Spray System
LHSI = Low Head Safety Injection
HHSI = High Head Safety Injection
HP Steam = High Pressure Steam
CCW = Component Cooling Water
NS = North-South Constraint
RH's = Rod Hangers
EW = East-West Constraint
RH = Rod Hanger
SH = Spring Hanger
VC = Vertical Constraint
LC = Lateral Constraint

SURRY POWER STATION, UNIT 1

TABLE 2-4

HARDWARE MODIFICATION SUMMARY
DUE TO NOZZLE AND PENETRATION OVERLOADING

Problem No.	Overstress No.	Attributable To:	Resolution
746	1-FW-P-2 inlet nozzle	As-Built/ thermal	Add vertical shock suppressor
746	1-FW-P-2 inlet nozzle	As-Built/ thermal	Add vertical shock suppressor
746	1-FW-P-2 inlet nozzle	As-Built/ thermal	Add spring hanger
746	1-FW-P-2 inlet nozzle	As-Built/ thermal	Add north/south shock suppressor
746	1-FW-P-2 inlet nozzle	As-Built/ thermal	Replace LC by spring hanger
746	1-FW-P-2 inlet nozzle	As-Built/ thermal	Add spring hanger
322B	Feedwater penetration	Seismic reanalysis	Add guide
323B	Feedwater penetration	Seismic reanalysis	Add guide
334B	Feedwater penetration	Seismic reanalysis	Add guide

SECTION 3

PIPE SUPPORT RESULTS

Tables 3-1A and 3-1B summarize the pipe supports evaluated in the reanalysis program. There are 944 supports (487 inside containment, 457 outside containment) on lines originally analyzed by SHOCK 2. All 944 pipe supports have been reanalyzed, and 137 pipe support hardware modifications have been identified. The modifications identified, due to pipe support analysis, are listed in Table 3-2.

In cases where SSI-ARS was used, the DBE seismic inertial reactions on supports are multiplied by 1.5. Anchor movements are not considered in the calculation of support stresses for the DBE conditions.

SURRY POWER STATION, UNIT 1

TABLE 3-1A

PIPE SUPPORT STATUS SUMMARY
INSIDE CONTAINMENT - SHOCK 2

System and Prob. No.	Total No. of Supports	No. Acceptable (Evaluation Complete)	No. Under Evaluation	Modifications or Additions Required	Comment
Low Head Safety Injection					
555	14	14	-	4	
706A	10	10	-	-	
707A	9	9	-	-	
708	22	22	-	3	
1555	9	9	-	-	
Containment and Recirculation Spray					
525A/1525A	35	35	-	5	
544	12	12	-	2	
544A	6	6	-	-	
544B	6	6	-	1	
546/560	18	18	-	6	
546/5600	11	11	-	2	
546/5620	11	11	-	1	
547	13	13	-	-	
548A	2	2	-	-	
548B	22	22	-	4	
548C	25	25	-	2	
562	19	19	-	5	

SURRY POWER STATION, UNIT 1

TABLE 3-1A (Cont)

PIPE SUPPORT STATUS SUMMARY
INSIDE CONTAINMENT - SHOCK 2

System and Prob. No.	Total No. of Supports	No. Acceptable (Evaluation Complete)	No. Under Evaluation	Modifications or Additions Required	Comment
Main Steam					
322A	5	5	-	-	
323A	17	17	-	-	
334A	3	3	-	-	
Feedwater					
322B	8	8	-	-	
323B	14	14	-	-	
334B	8	8	-	1	
Auxiliary Feedwater					
417	26	26	-	-	
Pressurizer Spray and Relief					
630	27	27	-	-	
636	33	33	-	1	
Residual Heat Removal					
508	50	50	-	3	
540	10	10	-	-	
Service Water					
465	8	8	-	1	

TABLE 3-1A (Cont)

PIPE SUPPORT STATUS SUMMARY
INSIDE CONTAINMENT - SHOCK 2

System and Prob. No.	Total No. of Supports	No. Acceptable (Evaluation Complete)	No. Under Evaluation	Modifications or Additions Required	Comment
Component Cooling					
603A	7	7	-	3	
603B	5	5	-	2	
605A	17	17	-	3	
605B	10	10	-	2	

SURRY POWER STATION, UNIT 1

TABLE 3-1B

PIPE SUPPORT STATUS SUMMARY
OUTSIDE CONTAINMENT - SHOCK 2

System and Prob. No.	Total No. of Supports	No. Acceptable (Evaluation Complete)	No. Under Evaluation	Modifications or Additions Required	Comment
Low Head Safety Injection					
727	21	21	-	-	
731A	4	4	-	3	
731B	4	4	-	2	
743	5	5	-	-	
High Head Safety Injection					
735	43	43	-	4	
Containment and Recirculation Spray					
744/754	10	10	-	-	
745	8	8	-	1	
751	6	6	-	-	
Main Steam					
346	54	54	-	-	
Auxiliary Feedwater					
607	15	15	-	1	

SURRY POWER STATION, UNIT 1

TABLE 3-1B (Cont)

PIPE SUPPORT STATUS SUMMARY
OUTSIDE CONTAINMENT - SHOCK 2

System and Prob. No.	Total No. of Supports	No. Acceptable (Evaluation Complete)	No. Under Evaluation	Modifications or Additions Required	Comment
Component Cooling					
488/480	26	26	-	5	
507/481	20	20	-	4	
509A/D	27	27	-	9	
509B	6	6	-	3	
509C	2	2	-	-	
512	5	5	-	3	
517	34	34	-	7	
526C	11	11	-	3	
527A/C	13	13	-	3	
612	15	15	-	1	
614	14	14	-	8	
766	17	17	-	6	
1512	6	6	-	3	
2526	11	11	-	5	
2527/2529	14	14	-	4	
Containment Vacuum					
CV1	3	3	-	1	
3" HP Steam					
746	19	19	-	-	

SURRY POWER STATION, UNIT 1

TABLE 3-1B (Cont)

PIPE SUPPORT STATUS SUMMARY
OUTSIDE CONTAINMENT - SHOCK 2

System and Prob. No.	Total No. of Supports	No. Acceptable (Evaluation Complete)	No. Under Evaluation	Modifications or Additions Required	Comment
Fire Protection					
CF1	10	10	-	5	
CF2	4	4	-	2	
Diesel Muffler					
1040	18	18	-	3	

NOTES:

The number in the "Modifications" or "Additions" column are already included in the status shown in the "Acceptable (Complete)" column.

The number in the "Total Supports" column equals the number in the "Acceptable" plus the number in the "Under Evaluation" column.

The number in the "modifications" or "additions" columns does not include "modifications" or "additions" due to stress, nozzle/penetration, branch line analysis.

TABLE 3-2

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
334B	PT 90	Snubber modification	No	Seismic Reanalysis	Add horizontal shock suppressor.
465	H-21	Support member overstressed	No	As-built	Removed Support H-21.
508	H-42A	Snubbers over allowable	No	Seismic Reanalysis	Add horizontal snubber.
508	PT 26	Snubbers over allowable	No	Seismic Reanalysis	Add horizontal and vertical snubbers.
508	H-20	Weld over allowable	No	As-built	Modify support.
525A	H14	Prevents growth in one direction	No	As-built	Modify support.
525A	H70	Support overloaded	No	As-built	Modify support.
544	H34A	Overstressed with new loads	No	As-built	Redesigned and modified to VC-LC.
544	H37A	Overstressed with new loads	No	As-built	Redesigned and modified to VC-LC.
544B	H46	Weld over stress allowable	No	As-built	Support modified.
548B	H87	No lateral restraint capability	No	As-built	Redesigned and modified support to receive lateral load.
548B	H72A H72B	6-way restraint not properly functioning	No	As-built	Redesigned (modified to 3-way restraint).
548B	H84	No lateral movement due to thermal and seismic	No	As-built	Restore to original configuration.
548B	H18A H18B	U-bolts overstressed	No	As-built	Redesigned and modified support by adding bracing member.
548C	H17A H17B H17C	Lugs overstressed on gang hanger - anchor	No	As-built	Redesigned and modified by removing attachments to relieve pipe overstress conditions.
548C	H75	U-bolt subjected to lateral loads over allowable loads	No	As-built	Replace U-bolt with framed member.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
555	H10	Integral attachment overstressed	No	Seismic Reanalysis	Add lateral shock suppressor.
555	H28	Horizontal and vertical structural member restraining pipe movement	No	Thermal Movement	Restore to original intent.
555	H29	Vertical member restraining pipe motion	No	Thermal movement	Restore to original intent.
555	H30	Vertical member restraining pipe motion	No	Thermal movement	Restore to original intent.
546/560	H39A H39B	Integral attachment over-stressed for support H39A	No	As-built	Replace anchor by a 3-way restraint.
546/560	PT-185	Added due to H39A	No	As-built	Add vertical shock suppressor to reduce loads.
546/560	PT-208	Added due to H39A	No	As-built	Add lateral constraint.
546/560	PT-130	Added due to H39A	No	As-built	Add lateral constraint and vertical constraint.
546/560	PT-216	Added due to H39A	No	As-built	Add lateral constraint.
546/560	PT-310	Added due to H39A	No	As-built	Add lateral constraint.
562	H26	Modified due to H39B. Inte-gral attachment overstressed for H39B.	No	As-built	Modify support by adding U-bolt.
562	H29A H29B	Modified due to H39B. Inte-gral attachment overstressed for H39B.	No	As-built	Modify 2-way support to 3-way support.
562	PT-265	Added due to H39B. Integral attachment overstressed for H39B.	No	As-built	Add lateral constraint. Reduce loads at anchor point.
562	PT-340	Modified due to H39B. Inte-gral attachment overstressed for H39B.	No	As-built	Modify vertical constraint.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
562	PT-183	Added due to H39B. To reduce load on hanger H39B.	No	As-built	Add 2-way support.
546/5600	H15B	U-bolt modified to reduce loads on H17B	No	Seismic Reanalysis	Redesigned and modified ganghanger from 1-way (LC).
546/5600	PT-155	Added to reduce anchor loads	No	Seismic Reanalysis	Add LC-VC to reduce loads at anchor.
546/5620	PT-230	Added to reduce anchor loads	No	Seismic Reanalysis	Add LC-VC to reduce loads.
636	H36	Plate overstressed	No	As-built	Modify anchor by adding gusset.
708	PT-1	Lateral load on U-bolt overstressed	No	As-built	Add lateral restraint.
708	H127	Member overstressed	No	As-built	Modify support to vertical and lateral constraint.
708	PT-380	Lateral restraint over-stressed	No	As-built	Modify support to vertical and lateral constraint.
1525A	PT-5000	Delete due to H-2	No	Seismic Reanalysis	Delete axial support and 1-way LC to reduce anchor load.
1525A	PT-8000	U-bolt and frame over-stressed	No	Seismic Reanalysis	Modify frame.
1525A	PT-5802	Hanger overloaded	No	Seismic Reanalysis	Modify support.
603A	3,	Pipe straps overstressed	No	As-built	Add gussets to all and increase weld size.
603A	7	Pipe straps overstressed	No	As-built	Add gussets to all and increase weld size.
603A	5	Vertical restraint only re-quired, but support had zero lateral clearance.	No	As-built	Modify support to provide lateral clearance.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
603B	13	Uplift restraint is required, but support had negative vertical restraint only.	No	As-built	Modify support to provide uplift restraint.
603B	10	Vertical support only required, but support is a vertical restraint and lateral restraint.	No	As-built	Remove top and side members of support.
605B	4	Support members overstressed	No	As-built	Replace two W4x13 members with TS4x4x1/2.
605B	H-2	Lateral clearance insufficient	No	Thermal movement	Modify restraint.
605A	PT-13	Need vertical restraint	No	As-built	Modify vertical support.
605A	2020	Delete lateral restraint	No	As-Built	Modify support.
605A	2005	Delete lateral restraint	No	As-Built	Modify support.
607	PT 335	U-Bolt overstressed	No	As-Built	Delete U-Bolt.
731A	SI-C-90	Support member overstressed	No	Seismic Reanalysis	Add structural brace.
731A	PT 46	Integral attachment overstressed	No	Seismic Reanalysis	Add N-S restraint. Gang Hanger Problem #731B Point #44.
731B	SI-C-91	Support member overstressed	No	Seismic Reanalysis	Add structural brace.
745	PT 45	Support overstressed	No	As-Built	Modify support.
731A	PT 38	Support overstressed	No	Seismic Reanalysis	Modify support.
731B	PT 36	Support overstressed	No	Seismic Reanalysis	Modify support.
735	PT 20	Support overstressed	No	As-Built	Modify support.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
735	PT 35	Support overstressed	No	As-Built	Modify support.
735	PT 50	Support overstressed	No	As-Built	Modify support.
735	PT 60	Ganged support overstressed	Note 2. Yes	As-Built	Modify support.
480/488	1	Integral attachment	Note 1. Yes	Seismic Reanalysis	Modify support by adding welds.
480/488	2,10,16 Gang	Weld overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by adding welds.
480/488	3,11,17 Gang	Integral attachment overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by increasing trunnion size.
507	1	Integral attachment overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by remoding trunnion and adding frame.
507	4,9,15 Gang	Support overstressed	Note 1. Yes	As-Built	Modify support by replacing u-bolt and adding new members.
507	5,10,16 Gang	U-bolt overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by adding stiffners.
507	6,11,17 Gang	Support members and weld overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by replacing U-bolt and adding new members.
509AD	5	U-bolt and weld over-stressed	Note 1. Yes	As-Built	Modify support by replacing U-bolt and adding frame.
509AD	7	U-bolt and support overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by redesigning.
509AD	8,9,13	Support overstressed (ganged with H5, Pro. #517, H5, Pro. #1512)	Note 1. Yes	Seismic Reanalysis	Modify support by replacing vs with vc.
509AD	15	U-bolt and support overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by adding strut.
509AD	4,20, 24,42	Uplift restraint required	Note 1. Yes	Seismic Reanalysis	Modify support by vs with vc.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
509AD	22	Support overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by removing trunnion and providing frame.
509AD	47	Support overstressed	Note 1. Yes	As-Built	Modify support by adding new sliding plate.
509AD	44	Uplift restraint required	Note 1. Yes	Thermal Movement	Modify vc to vs.
509AD	45,46	Support overstressed	Note 1. Yes	Seismic Reanalysis	Modify support to provide uplift restraint.
517	1	Integral welded attachments overstressed	Note 1. Yes	Seismic Reanalysis	Add pad, add braces.
517	16	Integral attachments overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by relocating trunnion.
517	21	Support overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by adding stiffeners.
517	22	Support member over-stressed.	Note 1. Yes	Seismic Reanalysis	Modify support.
517	25	Support overstressed	Note 1. Yes	Seismic Reanalysis	Replace RM with strut.
517	27	Support overstressed	Note 1. Yes	Seismic Reanalysis	Replace rod hanger by sway strut.
517	28,35	Weld overstressed	Note 1. Yes	As-Built	Modify support by adding brace.
526C	4	Support overstressed (ganged with H8 Pro. #527AC)	Note 1. Yes	As-Built	Modify support by adding stiffeners.
526C	6	Integral attachment overstressed	Note 1. Yes	Seismic Reanalysis	Replace support by clamp anchor assembly.
526C	11	Integral attachment overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by relocating trunnion.
527AC	1	Support member over-stressed	Note 1. Yes	Seismic Reanalysis	Modify support by adding base plates.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
527AC	3	U-bolt overstressed	Note 1. Yes	As-Built	Modify support by replacing u-bolt and adding frame.
527AC	4	Support overstressed	Note 1. Yes	Seismic Reanalysis	Modify support.
1512	3	Support overstressed	Note 1. Yes	Seismic Reanalysis	Add sway strut for side load.
1512	6	Support overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by replacing U-bolt.
1512	7	Support overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by adding plates.
2527	3	U-bolt overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by replacing U-bolt and adding welded frame.
2527	5	Support overstressed	Note 1. Yes	Seismic Reanalysis	Replaced with new support.
2527	7	U-bolt overstressed	Note 1. Yes	Seismic Reanalysis	Modify support by replacing U-bolt.
2529	13	Clevis overstressed	Note 1. Yes	Seismic Reanalysis	Replace clevis with rod and clamp.
1040	PT 57	Additional support	Note 1. Yes	As-Built	Add 1 vertical snubber Diesel 1.
	PT 57	Additional support	Note 1. Yes	As-Built	Add 1 vertical snubber Diesel 2.
	PT 57	Additional support	Note 1. Yes	As-Built	Add 1 vertical snubber Diesel 3.
CVI	PT 38	Support overstressed	Note 1. Yes	As-Built	Modify support.
CF-1	1	Bolts and structure overstressed	Note 1. Yes	Seismic Reanalysis	Add brace (S&W) increase weld size.
	2	Support overstressed	Note 1. Yes	Seismic Reanalysis	Sway struts added.
	5	Uplift problem	Note 1. Yes	Seismic Reanalysis	Remove angle, add sway strut.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
	13	Uplift problem	Note 1. Yes	Seismic Reanalysis	Replace rod hanger with sway strut.
	14	Uplift problem	Note 1. Yes	Seismic Reanalysis	Replace rod hanger with sway strut.
CF-2	2	U-bolt overstressed	Note 1. Yes	Seismic Reanalysis	Replace with frame.
	4	Weld overstressed	Note 1. Yes	Seismic Reanalysis	Added weld and gusset plater.
488	21	Improper support	Note 1. Yes	Seismic Reanalysis	Add baseplate and shims.
	22	Weld and bolts overstressed	Note 1. Yes	Seismic Reanalysis	Increase weld, add brace (S&W).
509B	6	Weld overstressed	Note 1. Yes	Seismic Reanalysis	Increase weld.
	19	Integral welded attachment overstressed	Note 1. Yes	Seismic Reanalysis	Add pad, brace (S&W).
	28	U-bolt overstressed	Note 1. Yes	Seismic Reanalysis	
512	3	Structure, weld and U-bolt overstressed	Note 1. Yes	Seismic Reanalysis	Remove support, add frame w/brace.
	6	Structure, weld and U-bolt overstressed	Note 1. Yes	Seismic Reanalysis	Modify support, remove support, add frame.
	8	Integral welded attachment overstressed	Note 1. Yes	Seismic Reanalysis	Add pad, add braces.
612	4	Structure and weld over-stressed	Note 1. Yes	Seismic Reanalysis	Shorten stanchion.
614	1	Structure overstressed ganged with H27 Pro. #509B	Note 1. Yes	Seismic Reanalysis	
	2	Structure and U-bolt	Note 1. Yes	Seismic	Replace U-bolt w/frame, add brace.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
		overstressed		Reanalysis	
	5	Support structure overstressed (ganged with H31, Pro. #509B, H7 Pro. #512)	Note 1. Yes	Seismic Reanalysis	Revise IWA; add lateral brace and closure plate to column.
	7	Structure and U-bolt overstressed	Note 1. Yes	Seismic Reanalysis	Replace U-bolt w/beams, add brace.
	8	Improper support	Note 1. Yes	As-Built	Restrain pipe in correct direction.
	9	Structure overstress	Note 1. Yes	Seismic Reanalysis	Add gussets.
	10	Integral welded attachment overstressed	Note 1. Yes	Seismic Reanalysis	Replace exist. support w/1WA and frame to floor.
	13	Uplift restraint required	Note 1. Yes	Seismic Reanalysis	Replace vs by vc.
766	5	Support structure and weld overstressed (ganged with H39, Pro. #517)	Note 1. Yes	Support Reanalysis	Modify support.
	7	Support, structure overstress (ganged with H32, Pro. #517)	Note 1. Yes	Support Reanalysis	Modify support.
	8	Support uplift overstress problem (ganged with H33, Pro. #517)	Note 1. Yes	Support Reanalysis	Modify support.
	9	Support weld overstressed and uplift (ganged with H34, Pro. #517)	Note 1. Yes	Support Reanalysis	Reanalyzed and restrain uplift.
	14	U-bolt, welds and structure overstressed	Note 1. Yes	Support Reanalysis	Remove U-bolt, add frame and brace.
	15	Structure and weld overstress	Note 1. Yes	Support Reanalysis	Add braces.

TABLE 3-2 (Cont)

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

Problem No.	Support No.	Description of Modification or Overstressed Condition	Modified Since August 21, 1979 Submittal	Attributable To:	Resolution
2526	1	Support overstress (ganged with H4, Pro. #512, H2, Pro. #2529)	Note 1. Yes	Seismic Reanalysis	Modify support.
	6	Integral welded attachment overstressed	Note 1. Yes	Seismic Reanalysis	Add pad.
	9	Uplift problem	Note 1. Yes	Seismic Reanalysis	Replace rod hanger with sway strut.
	18	Vertical, lateral, axial restraint required by pipe stress due to H20 overstress	Note 1. Yes	Seismic Reanalysis	Replace rod hanger w/frame, add lugs to modified support.
	20	Integral welded attachment overstressed	Note 1. Yes	Seismic Reanalysis	Rerun NUPIPE revise H18, and replace IWA w/(2) IWAs.

NOTES:

1. Modification outside containment.
2. Modified prior to interim operation as required per August 22, 1979 order.

APPENDIX A

CROSS REFERENCE OF MKS, FM, FP, PROBLEM NO., SYSTEM

SURRY POWER STATION, UNIT 1

APPENDIX A

CROSS REFERENCE OF MKS, FM, FP, PROBLEM NO., SYSTEM

MKS	FM	FP	Problem	System
100D1	1148-FM-14	11448-FP-1	323A	Main Steam
101D1	11448-FP-1	11448-FP-1	322A	Main Steam
102D1	11448-FM-14	11448-FP-1	334A	Main Steam
103A1	11448-FM-14	11448-PP-1	346	Main Steam
103A2	11448-FM-14	11448-PP-1	346	Main Steam
131A1	11448-FM-14	11448-FP-5	746	3" High Press Steam
131B2	11448-FM-14	11448-FP-5	746	3" High Press Steam
131C3	11448-FM-14	11448-FP-5	746	3" High Press Steam
100G1	11448-FM-18	11448-FP-2	323B	Feedwater
101G1	11448-FM-18	11448-FP-2	322B	Feedwater
102G1	11448-FM-18	11448-FP-2	334B	Feedwater
118A1	11448-FM-18	11448-FP-2	417	Aux Feedwater
118A2	11448-FM-18	11448-FP-2	417	Aux Feedwater
118G1	11448-FM-18	11448-FP-2	607	Aux Feedwater
118G2	11448-FM-18	11448-FP-2	607	Aux Feedwater
119A1	11448-FM-21	11448-FP-4	465	Service Water
119A2	11448-FM-21	11448-FP-4	465	Service Water
119A3	11448-FM-21	11448-FP-4	465	Service Water
119A4	11448-FM-21	11448-FP-4	465	Service Water
112A1	11448-FM-22	11448-FP-16	480	Component Cooling
112B1	11448-FM-22	11448-FP-16	481	Component Cooling
112C1	11448-FM-22	11448-FP-16	448	Component Cooling
112F1	11448-FM-22	11448-FP-16	507	Component Cooling
112G1	11448-FM-22	11448-FP-16	509AD	Component Cooling
112G2	11448-FM-22	11448-FP-16	509B	Component Cooling
112G3	11448-FM-22	11448-FP-16	509C	Component Cooling
112G4	11448-FM-22	11448-FP-16	509AD	Component Cooling
112J1	11448-FM-22	11448-FP-16	1512	Component Cooling
112L1	11448-FM-22	11448-FP-16	526C	Component Cooling
112L2	11448-FM-22	11448-FP-16	526C	Component Cooling
112L3	11448-FM-22	11448-FP-16	526C	Component Cooling
112M1	11448-FM-22	11448-FP-16	517	Component Cooling
112M2	11448-FM-22	11448-FP-16	517	Component Cooling
112M3	11448-FM-22	11448-FP-16	517	Component Cooling
112S1	11448-FM-22	11448-FP-16	603A&B	Component Cooling
112T1	11448-FM-22	11448-FP-16	527A/C	Component Cooling
112T2	11448-FM-22	11448-FP-16	527A/C	Component Cooling
112T3	11448-FM-22	11448-FP-16	527A/C	Component Cooling
112AA1	11448-FM-22	11448-FP-16	605A&B	Component Cooling
112AA2	11448-FM-22	11448-FP-16	605A&B	Component Cooling

APPENDIX A (Cont)

CROSS REFERENCE OF MKS, FM, FP, PROBLEM NO., SYSTEM

MKS	FM	FP	Problem	System
112AE1	11448-FM-22	11448-FP-16	614	Component Cooling
112AE2	11448-FM-22	11448-FP-16	614	Component Cooling
112AH1	11448-FM-22	11448-FP-16	2529	Component Cooling
112AH2	11448-FM-22	11448-FP-16	2529	Component Cooling
112AJ1	11448-FM-22	11448-FP-16	2526	Component Cooling
112AJ2	11448-FM-22	11448-FP-16	2526	Component Cooling
112AK1	11448-FM-22	11448-FP-16	617	Component Cooling
112AL1	11448-FM-22	11448-FP-16	2527	Component Cooling
112AN1	11448-FM-22	11448-FP-16	512	Component Cooling
112AB1	11448-FM-22	11448-FP-16	766	Component Cooling
112AR2	11448-FM-22	11448-FP-16	766	Component Cooling
122D1	11448-FM-106	11448-FP-11	555	Low Head Safety INJ
122H1	11448-FM-106	11448-FP-3, 10	706A	Low Head Safety INJ
122J1	11448-FM-106	11448-FP-3, 10	707A	Low Head Safety INJ
122K1	11448-FM-106	11448-FP-3, 10	708	Low Head Safety INJ
122L1	11448-FM-106	1448-FP-11	1555	Low Head Safety INJ
127C1	11448-FM-106	11448-FP-60	727	Low Head Safety INJ
127C2	11448-FM-106	11448-FP-60	727	Low Head Safety INJ
127E1	11448-FM-106	11448-FP-5, 10	731A	Low Head Safety INJ
127E2	11448-FM-106	11448-FP-5, 10	731B	Low Head Safety INJ
127F1	11448-FM-106	11448-FP-5, 10	743	Low Head Safety INJ
127G1	11448-FM-105, 106	11448-FP-10	735	High Head Safety INJ
127G2	11448-FM-105, 106	11448-FP-10	735	High Head Safety INJ
123A1	11448-FM-101A	11448-FP-13	525A	Cont&Recirc Spray
123A2	11448-FM-101A	11448-FP-13	1525A	Cont&Recirc Spray
123B1	11448-FM-101A	11448-FP-13	548A	Cont&Recirc Spray
123C1	11448-FM-101A	11448-FP-13	547	Cont&Recirc Spray
123D1	11448-FM-101A	11448-FP-13	546/560	Cont&Recirc Spray
123E1	11448-FM-101A	11448-FP-13	546/560	Cont&Recirc Spray
123E2	11448-FM-101A	11448-FP-13	562	Cont&Recirc Spray
123F1	11448-FM-101A	11448-FP-13	562	Cont&Recirc Spray
123F2	11448-FM-101A	11448-FP-13	546/5620	Cont&Recirc Spray
123F3	11448-FM-101A	11448-FP-13	546/6500	Cont&Recirc Spray
123G1	11448-FM-101A	11448-FP-13	544	Cont&Recirc Spray
123G2	11448-FM-101A	11448-FP-13	544	Cont&Recirc Spray
123H1	11448-FM-101	11448-FP-13	548B	Cont&Recirc Spray
123H2	11448-FM-101	11448-FP-13	548C	Cont&Recirc Spray
123J1	11448-FM-101	11448-FP-5, 60	744/754	Cont&Recirc Spray
123K1	11448-FM-101	11448-FP-5, 60	745	Cont&Recirc Spray
123N1	11448-FM-101	11448-FP-60	751	Cont&Recirc Spray
123N2	11448-FM-101	11448-FP-60	751	Cont&Recirc Spray
123R1	11448-FM-101	11448-FP-13	544B	Cont&Recirc Spray
123R2	11448-FM-101	11448-FP-13	544A	Cont&Recirc Spray

APPENDIX A (Cont)

CROSS REFERENCE OF MKS, FM, FP, PROBLEM NO., SYSTEM

MKS	FM	FP	Problem	System
117A1	11448-FM-104	11448-FP-12	508	Residual Heat RMVL
117A2	11448-FM-104	11448-FP-12	508	Residual Heat RMVL
117B1	11448-FM-104	11448-FP-3, 12	540	Residual Heat RMVL
124A1	11448-FM-103	11448-FP-9	630	Pressurizer Spray/Relief
124A2	11448-FM-103	11448-FP-9	630	Pressurizer Spray/Relief
125A1	11448-FM-103	11448-FP-9	636	Pressurizer Spray/Relief
137A1	11448-FM-85	11448-FP-19, 20, 74	CV1	Containment Vacuum
137A2	11448-FM-85	11448-FP-19, 20, 74	CV1	Containment Vacuum
143A1	Not Applicable	11448-FB-25	1040	Diesel Muffler Exhaust
144A	11448-FB-45A	11448-FB-3	CF1	Fire Protection
144B	11448-FB-45A	11448-FB-3	CF2	Fire Protection

SURRY POWER STATION, UNIT 1

APPENDIX B

CORRESPONDENCE WITH NRC

SURRY POWER STATION, UNIT 1

APPENDIX B

CORRESPONDENCE WITH NRC

The following is a listing of correspondence with the NRC related to the reanalysis effort.

Item No.	Date	Signature	Addressee	Letter No./Subject
			NRC TO VEPCO	
1	3/13/79	Denton	Proffitt	Show Cause Order
2	4/2/79	Stello	Proffitt	Addendum to Show Cause Order
3	4/13/79	Stello	Proffitt	Use of Soil Structure Interaction Techniques
4	5/18/79	Stello	Proffitt	Request for Further SSI Information
5	5/25/79	Eisenhut	Proffitt	Factor Adjustment to SSI Calculated Stresses
6	7/18/79	O'Reilly	Proffitt	Information Pertaining to I.E. Bulletin No. 79-14, Revision 1
7	8/15/79	O'Reilly	Proffitt	Letter of Guidance on I.E. Bulletin No. 79-14
8	8/27/79	Denton	Proffitt	Lifting of Suspension Required by the Order to Show Cause
9	10/5/79	O'Reilly	Proffitt	Confirmation of Concurrence
10	10/23/79	Murphy	Proffitt	Refers to NRC Inspection of Sept. 10-13 and Sept. 19-21, 1979
11	10/24/79	Murphy	Proffitt	Refers to NRC Inspection of Sept. 13-14, 1979
12	10/25/79	Murphy	Proffitt	Refers to NRC Inspection of Sept. 26-28, 1979
13	11/15/79	Eisenhut	Proffitt	Refers to Soil Structure Interaction
			VEPCO TO NRC	
14	3/30/79	Spencer	Denton/ Stello	198/Initial Response to Show Cause Order

APPENDIX B (CONT)

CORRESPONDENCE WITH NRC

Item No.	Date	Signature	Addressee	Letter No./Subject
15	4/19/79	Stallings	O'Reilly	270/LER 79-010/013L-0
16	4/23/79	Spencer	O'Reilly	289/Response to I.E. Bulletin No. 79-07
17	4/24/79	Spencer	O'Reilly	288/Response to I.E. Bulletin No. 79-07
18	4/27/79	Spencer	Denton/ Stello	311/Transmittal to Two Sample Problems to EG&G
19	5/2/79	Stallings	Denton	Observations on Reanalysis Effort
20	5/2/79	Spencer	Stello	260/Submittal of SSI Information
21	5/22/79	Ragone	Hendrie	Comments on Moratorium/Surry Reanalysis
22	5/24/79	Spencer	Stello	Response to NRC Letter of 4/2/79
23	5/24/79	Spencer	Stello	Response to NRC Letter of 5/18/79
24	6/5/79	Spencer	Denton	Submittal of Report on Reanalysis
25	6/8/79	Spencer	Denton	Additional Information, Report on Reanalysis of Piping
26	6/8/79	Spencer	Stello	Soil Structure Interaction Report
27	6/12/79	Spencer	Denton	Modification Information, Reanalysis of Piping Systems
28	6/15/79	Spencer	Denton	Schedule and Support Information
29	6/19/79	Spencer	Denton	Support Modifications
30	6/25/79	Spencer	Denton	Support Information, Reanalysis of Piping Systems
31	8/1/79	Spencer	Denton	Submittal of Revised Report on Analysis
32	8/21/79	Spencer	Denton	Analysis Completion of Designated Supports - Outside Containment

APPENDIX B (CONT)

CORRESPONDENCE WITH NRC

Item No.	Date	Signature	Addressee	Letter No./Subject
33	10/4/79	Spencer	O'Reilly	Response to NRC Letter of 7/2/79
34	10/3/79	Proffitt	Denton	Seismic Analysis of Piping Systems
35	10/4/79	Spencer	O'Reilly	Response to I.E. Letter Dated 9/7/79
36	10/15/79	Spencer	O'Reilly	Extension of I.E. Bulletin 79-14 Deadline
37	11/28/79	Spencer	Denton	Seismic Analysis of Piping Systems
38	12/7/79	Spencer	O'Reilly	Response to NRC Letter of 11/8/79
39	12/13/79	Spencer	Denton	Show Cause Order Reanalysis
40	12/21/79	Spencer	O'Reilly	Show Cause 60 Days Analysis Completion
			S&W TO NRC	
41	3/22/79	Kennedy	Denton	Transmittal of S&W Computer Programs
42	3/30/79	Jacobs	Herring	Submittal of Computer Outputs
43	4/3/79	Jacobs	Bezler	Submittal of Benchmark Problem to Brookhaven National Laboratory
44	4/6/79	Kennedy	Denton	Transmittal of S&W Computer Programs
45	4/6/79	Jacobs	Stello	Plan for Verification of Dynamic Analysis Codes
46	4/11/79	Jacobs	Bezler	Submittal of Computer Outputs
47	4/13/79	Jacobs	Stello	Update and Status of Verification Plan for Dynamic Analysis Codes
48	4/18/79	Jacobs	Hartman	Submittal of Computer Outputs
49	4/27/79	Jacobs	Bezler	Submittal of Benchmark Problems
50	4/27/79	Jacobs	Stello	Status of Verification Plan for Dynamic Analysis Codes
51	5/8/79	Rossier	Neighbors	Draft Outline of SSI-ARS Report

APPENDIX B (CONT)

CORRESPONDENCE WITH NRC

Item No.	Date	Signature	Addressee	Letter No./Subject
52	5/9/79	Kennedy	Stello	Reference SHOCK 0 Program
53	5/11/79	Kennedy	Stello	Reference SHOCK 0 Program
54	5/14/79	Kennedy	Denton	Proprietary Computer Codes
55	6/4/79	Jacobs	Bezler	Submittal of Benchmark Problems
56	6/12/79	Jacobs	Bezler	Submittal of Benchmark Problems
57	9/6/79	Allen	Stello	Response to NRC Letter of 8/10/79