# REPORT ON THE

# REANALYSIS OF SAFETY-RELATED PIPING SYSTEMS

# SURRY POWER STATION-UNIT 2

## VIRGINIA ELECTRIC AND POWER COMPANY

REVISION 1

EBASCO SERVICES INCORPORATED
JERICHO, NEW YORK

# EBASCO SERVICES
INCORPORATED

ENGINEERS - CONSTRUCTORS - CONSULTANTS

ONE JERICHO PLAZA
JERICHO, N. Y. 11753

CABLE ADDRESS "EBASCOE"


June 12, 1980
NRC-1

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

Dear Mr Denton:

Subject: SHOW CAUSE ORDER REANALYSIS REPORT
REVISION NO. 1
SURRY POWER STATION UNIT 2

References: Serial No.: 138B
Docket No.: 50-281
License No.: DPR-37

Ebasco Services, Inc is resubmitting forty-five (45) copies of Revision 1 of the "Report on the Reanalysis of Safety-Related Piping Systems, Surry Power Station Unit 2, Virginia Electric and Power Company," originally hand delivered April 11, 1980.

Please replace the forty-five (45) copies submitted on April 11, 1980 (white cover) with those enclosed (beige cover).

The resubmittal is for two (2) reasons:

1) General illegibility of Appendix B flow diagrams

2) Errata on Appendix B, Page B-2

Main Steam Drawing No. 11548-FM-14A
Feedwater Drawing No. 11548-FM-18A

are Revision 1 but were not indicated as such.

We apologize for any inconvenience this may have caused.

Very truly yours,

H W Nelson
Project Manager

HWN/JNR/bfl
Enclosures

cc: Mr Victor Stello, Director
Office of Inspection and Enforcement

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

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

April 11, 1980

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

Serial No. 138B
PSE&C/GLS:mac:wang

Docket No. 50-281

License No. DPR-37

Dear Mr. Denton:

SHOW CAUSE ORDER REANALYSIS REPORT
REVISION NO. 1
SURRY POWER STATION UNIT 2

In the letter of February 22, 1980 (Serial No. 138), Vepco requested start-up of Surry Power Station Unit 2 based on the "Report on the Reanalysis of Safety Related Piping Systems, Surry Power Station, Unit 2" of the same date. The report reflected the results of the pipe stress and pipe support analyses subject to final verification and modification installation.

The purpose of this submittal is to update the original report to reflect revisions necessitated during modification installation and to make minor typographical corrections to the text to enhance clarity and consistency. The subject changes, which are noted in the margins, in no way alter our original conclusion that the analytical work completed and the modifications installed at the time of start-up provides a high degree of confidence that the integrity of safety systems for Unit 2 can be assured during the DBE or OBE events.

This revised report also incorporates our recent commitment to the NRC Staff (Vepco letter of March 21, 1980, Serial No. 138A) to complete the installation of all modifications associated with the Order to Show Cause prior to start-up of the unit. The additional commitments to complete certain portions of the work associated with I.E. Bulletins 79-02 and 79-14 are firm as outlined in the February 22 letter.

If you have any questions with regard to this submittal, please contact us.

Very truly yours,

W. C. 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 & Enforcement, Region II

# REPORT ON THE

# REANALYSIS OF SAFETY-RELATED PIPING SYSTEMS

# SURRY POWER STATION-UNIT 2

## VIRGINIA ELECTRIC AND POWER COMPANY

REVISION 1

EBASCO SERVICES INCORPORATED

JERICHO, NEW YORK

SURRY POWER STATION - UNIT 2

# REPORT ON THE REANALYSIS OF SAFETY-RELATED PIPING SYSTEMS SURRY POWER STATION - UNIT 2 VIRGINIA ELECTRIC AND POWER COMPANY

FEBRUARY 22, 1980

REVISION 1

APRIL 11, 1980

EBASCO SERVICES INCORPORATED
JERICHO, NEW YORK

TABLE OF CONTENTS

LIST OF TABLES

SURRY POWER STATION - UNIT 2

SECTION 1

SUMMARY AND CONCLUSIONS

In response to the Nuclear Regulatory Commission's Order to Show Cause, dated March 13, 1979, a reanalysis was conducted of safety related piping systems for Surry Power Station Unit 2 which were originally dynamically analyzed using the SHOCK 2 computer program. The SHOCK 2 program, which used an earlier load combination methodology, is no longer considered acceptable by the NRC.

This report discusses the details of the analysis work and results of the pipe and support analyses within the scope of the reanalysis for Surry Unit 2. Further, this reanalysis is consistent with the methods used on Surry Power Station Unit 1, which were discussed in earlier reports submitted on June 5, 1979 (Vepco Serial No. 453) and on August 1, 1979 (Vepco Serial No. 453A) and on January 15, 1980 (Vepco Serial No. 048). This report summarizes the total reanalysis effort for all aspects of the March 13, 1979 Order to Show Cause for Surry Power Station Unit 2.

All piping systems affected by the Order to Show Cause, both inside and outside the containment, have been reanalyzed using the NUPIPE program, which is acceptable to the NRC. Table 3-3 (Pipe Stress Hardware Modification Summary) and Table 3-4 (Hardware Modification Summary Due to Nozzle and Penetration Overloading) identifies all modifications to the piping systems which have resulted from this reanalysis. While some of these modifications are attributable to the seismic analysis method, the majority of modifications result from differences in the as-built conditions and other miscellaneous reasons. All of these modifications have been or will be made prior to startup of the unit following the steam generator replacement outage. With the installation of these modifications, all Surry Unit 2 piping within the scope of this report will meet the Final Safety Analysis Report (FSAR) allowables for both the Operating Basis Earthquake and Design Basis Earthquakes (OBE and DBE) conditions.

All pipe supports both inside and outside containment affected by the Order to Show Cause have been evaluated for the revised support loads from the pipe stress reanalysis. All of these hardware modifications have been or will be installed prior to start up of the Unit following the steam generator replacement outage. Table 4-2 (Pipe Support Hardware Modification Summary) reports all the modifications resulting from the support reanalysis. As was the case in the piping system reanalysis, most of the modifications are the result of differences between the original design conditions and the actual field as-built condition. 1

During the reanalysis of Surry Unit 2, 79 stress modifications (22 due to pipe stress, 57 due to nozzle overload) and 258 pipe support modifications were identified; while 63 pipe stress and 66 pipe support modifications were identified on Surry Unit 1. The differences in the number of modifications is not considered significant, due to the conduct of the reanalysis applied to Surry Unit 2. Modifications on Surry Unit 1 were 1

identified after many analytical iterations; whereas, on Surry Unit 2 modifications were designed based on fewer iterations. The conduct of the reanalysis in this manner served to identify modifications faster so that systems could be upgraded more quickly in order not to substantially interfere with the completion of the Steam Generator Replacement Project. In addition, the Surry Unit 2 reanalysis included the OBE condition. Further, all pipe supports were as-built in the field and QC verified prior to reanalysis. Lastly, to limit the interface problems between the Show Cause scope and other piping, supports were added to facilitate the NUPIPE reanalysis.

1

SURRY POWER STATION - UNIT 2

SECTION 2

SCOPE OF REANALYSIS

As described in the NRC Order to Show Cause, March 13, 1979, some piping systems in the Surry Power Station, Unit 2 were dynamically analyzed with a SHOCK 2 computer program that is not currently acceptable to the NRC.

All systems or portions of systems that were analyzed by the SHOCK 2 computer program have been identified in Appendix A. These systems were reanalyzed by Stone & Webster Engineering Corporation (Stone & Webster) and Ebasco Services Incorporated (EBASCO) using a NUPIPE computer code. Responsibility for the reanalysis is also identified in Appendix A by system and problem number.

The results of the reanalysis are compared with code allowable pipe stresses, allowable loads for nozzles and penetrations, and are used in the evaluation of pipe supports.

SECTION 3

PIPE STRESS RESULTS

A total of 62 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 are being analyzed by two groups: Stone & Webster Engineering Corporation (Stone & Webster) in Boston, Massachusetts, and Ebasco Services Incorporation (EBASCO) in Jericho, New York, as indicated in the following table:

PIPE STRESS PROBLEMS

| Stone & Webster | EBASCO | Total |
|---|---|---|
| 13 | 49 | 62 |

Responsibility for the reanalysis is identified by system and problem number in Appendix A of this report.

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

Piping is analyzed in most cases 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 letters of May 25, 1979 and November 15, 1979 to Virginia Electric and Power Company (VEPCO), the seismic inertial stresses and loads computed using the SSI-ARS have been increased by a factor of 1.5 for the DBE and 1.25 for OBE conditions.

All 62 problems have been reanalyzed. Table 3-1, Pipe Stress Re-Evaluation Summary, presents the results for these 62 stress problems. In Table 3-1, 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 original design stress isometrics (MSK's).

In Table 3-1, 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 multiplied by a factor of 1.5 and then added to the Seismic Anchor Movement (SAM) Stress for runs using the SSI-ARS. Even though Table 3-1 reports DBE results, stress analysis is performed for OBE also and modifications designed wherever necessary.

The Original Total and Original Seismic Stresses shown in Table 3-1 were computed using the SHOCK 2 programs for the original design conditions. The New Total and New Seismic stresses were computed by the NUPIPE pro-

gram using different mass models and in most cases different ARS's than the original calculations. More importantly, the reanalyses were based on as-built conditions, field verified in 1979, which in some cases differ from the original design conditions. For these reasons, the new stresses and the original stresses in Table 3-1 are not comparable, as they do not necessarily represent the same physical conditions.

Table 3-2, Nozzle and Penetration Summary, summarizes the nozzles and penetrations evaluated under the reanalysis program. For all the problems in which the SSI-ARS are used, the seismic inertial nozzle loads have been increased by a factor of 1.5 for DBE per the NRC letter of May 25, 1979, and by a factor of 1.25 for OBE per the NRC letter of November 15, 1979.

Table 3-3, Pipe Stress Hardware Modification Summary, lists the hardware modifications necessary to bring the pipe stress analysis to within code allowables. Of the 62 problems reanalyzed, hardware modifications were made to 17 problems due to pipe stress. These modifications consisted of 22 added, modified, or deleted supports. The modifications include those necessary to the flexibility analysis of the branch lines. A branch line (Problem No. 2508B) was rerouted as a result of thermal reanalysis, not as a result of seismic reanalysis. | 1 | 1

Table 3-4, Hardware Modification Summary due to Nozzle and Penetration Overloading, lists all modifications to reduce nozzle and penetration loads. Of the 62 problems reanalyzed, hardware modifications were made to 17 problems due to nozzle overload. These modifications consisted of 57 added, modified, or deleted supports.

Those modifications which result from the piping reanalysis are identified in Section 3. Only the modifications which result from the pipe support reanalysis are reported in Table 4-2, Pipe Support Hardware Modification Summary. Final verification of piping and support stresses and Engineering Assurance review has yet to be completed for a few problems. It is expected, however, that the number and type of modifications due to the stress and support analysis are correct and final.

SURRY POWER STATION - UNIT 2

TABLE 3-1



PIPE STRESS RE-EVALUATION SUMMARY

| System Name and Problem Number+ | Reanalysis Responsibility | HKS Number | Line Size NPS (Inches) | Pipe Stress (psi) Original Total | Original Seismic | New Total | New Seismic | Allowable |
|---|---|---|---|---|---|---|---|---|
| Low Head Safety Injection | | | | | | | | |
| 2555 | E | 122D1 | 10,12 | 12043 | NA | 7974 | 2449 | 30690 |
| 2709 | E | 122L1 | 12 | NA | NA | 19173 | 11427 | 33750 |
| 2537/2540/2540B | E | 122A1, 117B1 | 4,6, 10,12 | 12350 | NA | 2739 | 883 | 33750 |
| 2539 | E | 122J1 122K1 | 6 | 30368 | NA | 14771 | 7330 | 32985 |
| 2727 | S&W | 127C1 127C2 | 6 8,10 | 21179 | NA | 24352 | 17453 | 33750 |
| 2681 | E | 127K1 | 8 | 1677 | 307 | 1220 | 185 | 28485 |
| 2682 | E | 127K2 | 8 | 1677 | 307 | 1174 | 164 | 28485 |
| 2695 | E | 127D1 | 8 | 21179 | NA | 2094 | 1103 | 28485 |
| 2697 | E | 127D2 | 8 | 21179 | NA | 1981 | 1022 | 28485 |
| High Head Safety Injection | | | | | | | | |
| 2689 | E | 127F1 | 10 | 24649 | NA | 11773 | 9571 | 33750 |
| 2735 | E | 127G1 127G2 | 3,4,6, 8,10 | NA | NA | 26660 | 17772 | 33750 |
| Containment and Recirculation Spray | | | | | | | | |
| 2521 | S&W | 123A1 | 8,10 | 14904 | NA | 7790 | 4276 | 33561 |
| 2523 | S&W | 123A2 | 8,10 | 14904 | NA | 7977 | 6013 | 33561 |
| 2547 | S&W | 123C1 | 8,10 | 12713 | NA | 23532 | 19739 | 33561 |
| 2546 | E | 123D1 | 8,10 | 3528 | 1576 | 8892 | 7328 | 28800 |
| 2541 | E | 123D2 | 8,10 | 3528 | 1576 | 18338 | 16636 | 28800 |
| 2542 | E | 123D3 | 8,10 | 3528 | 1576 | 18931 | 17252 | 28800 |

SURRY POWER STATION - UNIT 2

TABLE 3-1



PIPE STRESS RE-EVALUATION SUMMARY

| System Name and Problem Number | Reanalysis Responsibility | MKS Number | Line Size NPS (Inches) | Pipe Stress (psi) Original Total | Original Seismic | New Total | New Seismic | Allowable |
|---|---|---|---|---|---|---|---|---|
| Containment and Re-circulation Spray (Cont'd) | | | | | | | | |
| 2543 | E | 123D4 | 8,10 | 3528 | 1576 | 8498 | 6988 | 29970 |
| 2560 | E | 123E1 | 10 | 7334 | NA | 12775 | 10995 | 29970 |
| 2561 | E | 123E2 | 10 | 7334 | NA | 6587 | 3576 | 29970 |
| 2544 | E | 123G1 | 10 | 11605 | 7922 | 2912 | 1181 | 28485 |
| 2533 | E | 123G2 | 10 | 11605 | 7922 | 5874 | 3813 | 28485 |
| 2548 | E | 123H1 | 10 | 15785 | 11241 | 3904 | 2437 | 29970 |
| 2545 | E | 123H2 | 10 | 15785 | 11241 | 2397 | 676 | 29970 |
| 2744 | E | 123J1 | 8 | 7966 | 5118 | 16143 | 15187 | 35820 |
| 2745 | E | 123K1 | 6 | 24843 | 22577 | 15621 | 12559 | 33750 |
| 2753 | E | 123L1 | 12 | 6136 | 2818 | 1344 | 394 | 33750 |
| 2754 | E | 123M1 | 12 | 5649 | NA | 1999 | 949 | 33750 |
| 2751 | E | 123N1 | 10 | 6010 | NA | 21234 | 13842 | 28485 |
| 2752 | E | 123N2 | 10 | 6010 | NA | 18613 | 13934 | 28485 |
| 2549 | S&W | 123C2 | 8 | 11955 | 10125 | 10081 | 8397 | 33561 |
| 2755 | E | 123P1 | 4,8 | 10369 | 6324 | 14311 | 7340 | 33750 |
| 2756 | E | 123Q1 | 10 | NA | NA | 5705 | 2686 | 28485 |
| 2757 | E | 123Q2 | 10 | 5810 | NA | 3847 | 2381 | 28485 |
| Main Steam | | | | | | | | |
| 2577 | S&W | 100D1 | 30 | 13824 | NA | 10763 | 2883 | 33750 |
| 2588 | S&W | 101D1 | 30 | 18635 | NA | 12513 | 3041 | 33750 |
| 2579 | S&W | 102D2 | 30 | 13031 | NA | 11434 | 4120 | 33750 |
| 2346* | S&W | 103A1<br>103A2 | 30 | 19970 | NA | 32568 | 25477 | 33750 |

SURRY POWER STATION - UNIT 2

TABLE 3-1



PIPE STRESS RE-EVALUATION SUMMARY

| System Name and Problem Number | Reanalysis Responsibility | MKS Number | Line Size NPS (Inches) | Pipe Stress (psi) Original Total | Original Seismic | New Total | New Seismic | Allowable |
|---|---|---|---|---|---|---|---|---|
| Feedwater | | | | | | | | |
| 2569 | S&W | 100G1 | 14 | 14499 | NA | 13681 | 9360 | 27000 |
| 2573 | S&W | 101G1 | 14 | 16025 | NA | 12970 | 8376 | 27000 |
| 2571 | S&W | 102G1 | 14 | 17927 | NA | 14230 | 8443 | 27000 |
| Auxiliary Feedwater | | | | | | | | |
| 2473 | E | 118A1<br>118A2 | 3,6 | 8568 | 2407 | 20963 | 17736 | 27000 |
| 2683 | E | 118G1<br>118G2 | 4,6 | 21230 | NA | 12988 | 9188 | 27000 |
| Pressurizer Spray | | | | | | | | |
| 2771 | E | 125A1 | 4 | 18560 | NA | 8013 | 3088 | 30690 |
| Pressurizer Safety and Relief | | | | | | | | |
| 2000 | E | 124A1<br>124A2 | 3,4<br>6,12 | 9093 | NA | 8824 | 5421 | 30636 |
| Residual Heat Removal | | | | | | | | |
| 2540/2540B | E | Listed Under Low Head Safety Injection System | | | | | | |
| 2508A/2508B | E | 117A1 | 10,12,14 | NA | NA | 13112 | 8461 | 24570 |
| 2554 | E | 117C1 | 6 | NA | NA | 12008 | 8824 | 29970 |
| Service Water | | | | | | | | |
| 2465 | E | 119A1 | 24 | NA | NA | 6529 | 6212 | 21600 |
| 2467 | E | 119A2 | 24 | NA | NA | 6561 | 6214 | 21600 |

SURRY POWER STATION - UNIT 2

TABLE 3-1



PIPE STRESS RE-EVALUATION SUMMARY

| System Name and Problem Number | Reanalysis Responsibility | MKS Number | Line Size NPS (Inches) | Pipe Stress (psi) Original Total | Original Seismic | New Total | New Seismic | Allowable |
|---|---|---|---|---|---|---|---|---|
| Service Water (Cont'd) | | | | | | | | |
| 2469 | E | 119A3 | 24 | NA | NA | 14687 | 13730 | 21600 |
| 2471 | E | 119A4 | 24 | NA | NA | 12459 | 11614 | 21600 |
| Component Cooling | | | | | | | | |
| 2601/2603 | E | 112S1<br>112S2 | 18 | 9696 | NA | 7043 | 5246 | 21600 |
| 2604/2605 | E | 112AA1<br>112AB1 | 18 | 9696 | NA | 7074 | 5204 | 21600 |
| Containment Vacuum | | | | | | | | |
| 2650 | S&W | 137A1 | 8 | 25,750 | NA | 13659 | 13037 | 21600 |
| HP Steam to Auxiliary Feedwater Pump | | | | | | | | |
| 2869/2862/2864 | E | 131A1<br>131B1<br>131C1 | 3,4 | 22609 | NA | 24229 | 19559 | 27000 |

SURRY POWER STATION - UNIT 2

TABLE 3-1



PIPE STRESS RE-EVALUATION SUMMARY

Legend:

E = EBASCO

S&W = Stone & Webster

NA = Not Available | 1

Allowable Stress = 1.8 $S_h$

New Total Stress (for SSI/ARS) = $S_{LP} + S_{DW} + 1.5\ S_{DBEI} + S_{DBEA}$

New Seismic (for SSI/ARS) = $1.5\ S_{DBEI} + S_{DBEA}$

New Total Stress (original ARS) = $S_{LP} + S_{DW} + S_{DBEI} + S_{DBEA}$ = Original Total Stress | 1

New Seismic (original ARS) = $S_{DBEI} + S_{DBEA}$ = Original Seismic Stress | 1

Where $S_{LP}$ = Longitudinal Pressure Stress

$S_{DW}$ = Dead Load Stress

$S_{DBEI}$ = Seismic Inertial Stress, Design Basis Earthquake

$S_{DBEA}$ = Seismic Stress due to Anchor Movements, Design Basis Earthquake

$S_h$ = Allowable stress at maximum (hot) temperature

Note:

The original total and original seismic stresses shown in Table 3-1 were computed using SHOCK 2 for the original design conditions. The new total and new seismic stresses were computed by the NUPIPE program using different mass models and, in most cases, different ARS's than the original calculations. More importantly, the reanalyses were based on field-verified, as-built conditions 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 3-1 are not comparable, as they do not necessarily represent the same physical conditions

* Soil Structure Interaction (SSI) Amplified Response Spectras (ARS) were used in the new analysis for all problems except Problem 2346 which utilizes a combination of SSI-ARS and the original ARS.

+ Problems having / are counted as separate problems example: 2869/2862/2864 are counted as three problems. Using this method of counting the total number of pipe stress problems equal 62.

TABLE 3-2



NOZZLE AND PENETRATION SUMMARY
SHOCK 2 Problems

| System and Problem No. | Responsibility For Analysis | Total No. of Nozzles/ Penetrations | No. Acceptable (Evaluation Complete) | Nozzle Modification Required | Vendor Confirmation Being Obtained |
|---|---|---|---|---|---|
| Low Head Safety Injection | | | | | |
| 2555 | E | 1/0 | 1 | 0 | 1 |
| 2709 | E | 1/0 | 1 | 0 | 0 |
| 2537/2540 | E | 1/0 | 1 | 0 | 1 |
| 2539 | E | 0/0 | NA | NA | NA |
| 2727 | S&W | 2/0 | 2 | 0 | 2 |
| 2681 | E | 0/0 | NA | NA | NA |
| 2682 | E | 0/0 | NA | NA | NA |
| 2695 | E | 0/0 | NA | NA | NA |
| 2697 | E | 0/0 | NA | NA | NA |
| High Head Safety Injection | | | | | |
| 2689 | E | 0/0 | NA | NA | NA |
| 2735 | E | 3/0 | 3 | 0 | 3 |
| Containment and Recirculation Spray | | | | | |
| 2521 | S&W | 0/0 | NA | NA | NA |
| 2523 | S&W | 0/0 | NA | NA | NA |
| 2547 | S&W | 0/0 | NA | NA | NA |
| 2546 | E | 0/0 | NA | NA | NA |

TABLE 3-2

NOZZLE AND PENETRATION SUMMARY
SHOCK 2 Problems

| System and Problem No. | Responsibility For Analysis | Total No. of Nozzles/ Penetrations | No. Acceptable (Evaluation Complete) | Nozzle Modification Required | Vendor Confirmation Being Obtained |
|---|---|---|---|---|---|
| Containment and Recirculation Spray (Cont'd) | | | | | |
| 2541 | E | 0/0 | NA | NA | NA |
| 2542 | E | 0/0 | NA | NA | NA |
| 2543 | E | 0/0 | NA | NA | NA |
| 2560 | E | 1/0 | 1 | 0 | 0 |
| 2561 | E | 1/0 | 1 | 0 | 0 |
| 2544 | E | 1/0 | 1 | 0 | 0 |
| 2533 | E | 1/0 | 1 | 0 | 0 |
| 2548 | E | 1/0 | 1 | 0 | 0 |
| 2545 | E | 1/0 | 1 | 0 | 0 |
| 2744 | E | 0/0 | NA | NA | NA |
| 2745 | E | 0/0 | NA | NA | NA |
| 2753 | E | 1/0 | 1 | 0 | 0 |
| 2754 | E | 1/0 | 1 | 0 | 1 |
| 2751 | E | 2/0 | 2 | 0 | 0 |
| 2752 | E | 2/0 | 2 | 0 | 0 |
| 2549 | S&W | 0/0 | NA | NA | NA |
| 2755 | E | 2/0 | 2 | 0 | 2 |
| 2756 | E | 2/0 | 2 | 0 | 0 |
| 2757 | E | 2/0 | 2 | 0 | 0 |

SURRY POWER STATION - UNIT 2

TABLE 3-2



NOZZLE AND PENETRATION SUMMARY
SHOCK 2 Problems

| System and Problem No. | Responsibility For Analysis | Total No. of Nozzles/ Penetrations | No. Acceptable (Evaluation Complete) | Nozzle Modification Required | Vendor Confirmation Being Obtained |
|---|---|---|---|---|---|
| Main Steam | | | | | |
| 2577 | S&W | 1/1 | 1/1 | 0/0 | 0/0 |
| 2588 | S&W | 1/1 | 1/1 | 0/0 | 0/0 |
| 2579 | S&W | 1/1 | 1/1 | 0/0 | 0/0 |
| 2346 | S&W | 0/0 | NA | NA | NA |
| Feedwater | | | | | |
| 2569 | S&W | 1/1 | 1/1 | 0/0 | 0/0 |
| 2573 | S&W | 1/1 | 1/1 | 0/0 | 0/0 |
| 2571 | S&W | 1/1 | 1/1 | 0/0 | 0/0 |
| Auxiliary Feedwater | | | | | |
| 2473 | E | 0/0 | NA | NA | NA |
| 2683 | E | 3/0 | 3 | 0 | 3 |
| Pressurizer Spray | | | | | |
| 2771 | E | 1/0 | 1 | 0 | 1 |
| Pressurizer Safety and Relief | | | | | |
| 2000 | E | 5/0 | 5 | 0 | 1 |
| Residual Heat Removal | | | | | |
| 2540 | E | (Listed under Low Head Safety Injection System) | | | |

1

SURRY POWER STATION - UNIT 2

TABLE 3-2



NOZZLE AND PENETRATION SUMMARY
SHOCK 2 Problems

| System and Problem No. | Responsibility For Analysis | Total No. of Nozzles/ Penetrations | No. Acceptable (Evaluation Complete) | Nozzle Modification Required | Vendor Confirmation Being Obtained |
|---|---|---|---|---|---|
| Residual Heat Removal (Cont'd) | | | | | |
| 2540B | E | 0/0 | NA | NA | NA |
| 2508A/2508B | E | 8/0 | 8 | 0 | 8 |
| 2554 | E | 0/0 | NA | NA | NA |
| Service Water | | | | | |
| 2465 | E | 1/0 | 1 | 0 | 0 |
| 2467 | E | 1/0 | 1 | 0 | 0 |
| 2469 | E | 1/0 | 1 | 0 | 0 |
| 2471 | E | 1/0 | 1 | 0 | 0 |
| Component Cooling | | | | | |
| 2601/2603 | E | 2/0 | 2 | 0 | 1 |
| 2604/2605 | E | 2/0 | 2 | 0 | 1 |
| Containment Vacuum | | | | | |
| 2650 | S&W | 0 | NA | NA | NA |
| HP Steam to Auxiliary Feedwater Pump | | | | | |
| 2862/2864/2869 | E | 1/0 | 1 | 0 | 0 |

NOTES: NA = Not Applicable
E = EBASCO
S&W = Stone & Webster

SURRY POWER STATION - UNIT 2

TABLE 3-3



PIPE STRESS HARDWARE MODIFICATION SUMMARY

| System Name and Problem No. | Reanalysis Responsibility | MKS No. | Overstressed Condition | Attributed To: | Resolution | No. of Modifications |
|---|---|---|---|---|---|---|
| Low Head Safety Injection | | | | | | |
| 2709 | E | 122L1 | Seismic overstress | Seismic Reanalysis | Spring hanger replaced by rigid restraint. | 1 |
| 2537/2540 | E | 122A1<br>117B1 | Thermal overstress | As-built | Removed a restraint, anchor replaced by restraints and a snubber. | 2 |
| 2539 | E | 122J1<br>122K1 | Thermal overstress (Branch Line) | As-built | Removed a restraint | 1 |
| Containment and Recirculation Spray | | | | | | |
| 2549 | S&W | 123C2 | Pipe contacts crane wall during seismic condition. | Seismic Reanalysis | Lateral support added. | 1 |
| 2544 | E | 123G1 | Thermal overstress | As-built | Removed a restraint. | 1 |
| 2745 | E | 123K1 | Seismic anchor movement overstress | As-built | Vertical restraints replaced by spring hangers at two locations | 2 |
| 2752 | E | 123N2 | Thermal overstress (Branch Line) | As-built | Removed a restraint. | 1 |
| Pressurizer Spray | | | | | | |
| 2771 | E | 125A1 | Seismic overstress | As-built | Two restraints added. | 2 |
| Residual Heat Removal | | | | | | |
| 2508B | E | 117A1 | Thermal overstress Branch line | As-built | Rerouting of 1-1/2 in. pipe | 1 |
| 2540 | (Listed under Low Head Safety Injection System) | | | | | |

SURRY POWER STATION - UNIT 2

TABLE 3-3



PIPE STRESS HARDWARE MODIFICATION SUMMARY

| System Name and Problem No. | Reanalysis Responsibility | MKS No. | Overstressed Condition | Attributed To: | Resolution | No. of Modifications |
|---|---|---|---|---|---|---|
| Residual Heat Removal (Cont'd) | | | | | | |
| 2540B | E | 117B | Thermal and seismic overstress | As-built | Anchor replaced by vertical restraint, horizontal restraint removed. | 2 |
| Component Cooling | | | | | | |
| 2604/ 2605 | E | 112AA1 112AB1 | Seismic overstress | Seismic Reanalysis | Two restraints added. | 2 |
| HP Steam to Auxiliary Feedwater Pump | | | | | | |
| 2862/ 2864/ 2869 | E | 131A1 131B1 131C1 | Thermal and seismic overstress | As-built/ Seismic Reanalysis | Two anchors replaced by restraints, two snubbers and a spring added. | 5 |
| Feedwater | | | | | | |
| 2569 | S&W | 100G1 | Insufficient branch line flexibility | As-built | Remove existing U-bolt on 3/4 in. line | 1 |

Notes:

E = EBASCO
S&W = Stone & Webster

SURRY POWER STATION - UNIT 2

TABLE 3-4



HARDWARE MODIFICATION SUMMARY
DUE TO NOZZLE AND PENETRATION OVERLOADING

| System Name and Problem No. | Reanalysis Responsibility | Equipment No. | Attributed To: | Resolution | No. of Modifications |
|---|---|---|---|---|---|
| Low Head Safety Injection | | | | | |
| 2555 | E | 2-SI-TK-1B | As-built/ Seismic Reanalysis | One restraint added, One spring hanger replaced by a two direction restraint | 2 |
| High Head Safety Injection | | | | | |
| 2735 | E | 2-CH-P-1A<br>2-CH-P-1B<br>2-CH-P-1C | Seismic Reanalysis | Ten restraints added, one vertical restraint replaced by spring hanger, two anchors added | 13 |
| Containment and Recirculation Spray | | | | | |
| 2544 | E | 2-RS-E-1D | As-built | One restraint removed | 1 |
| 2533 | E | 2-RS-E-1C | As-built | Two restraints added | 2 |
| 2753 | E | 2-CS-P-1B | As-built/ Seismic Reanalysis | One vertical restraint replaced by spring hanger, two restraints added | 3 |
| 2754 | E | 2-CS-P-1A | As-built/ Seismic Reanalysis | One vertical restraint replaced by spring one horizontal restraint added. | 2 |
| 2751 | E | 2-RS-P-2A | Seismic Reanalysis | One restraint added | 1 |
| 2752 | E | 2-RS-P-2B | Seismic Reanalysis | One restraint added | 1 |
| 2755 | E | 2-CS-P-1B<br>2-CS-P-1A | As-built/ Seismic Reanalysis | One restraint added two vertical restraints removed. | 3 |
| 2756 | E | 2-RS-E-1A<br>2-RS-P-1A | As-built | One anchor and one restraint removed | 2 |

1

SURRY POWER STATION - UNIT 2

TABLE 3-4



HARDWARE MODIFICATION SUMMARY
DUE TO NOZZLE AND PENETRATION OVERLOADING

| System Name and Problem No. | Reanalysis Responsibility | Equipment No. | Attributed To | Resolution | No. of Modifications |
|---|---|---|---|---|---|
| Containment and Recirculation Spray (Cont'd) | | | | | |
| 2757 | E | 2-RS-E-1B<br>2-RS-P-1B | As-built | One anchor removed | 1 |
| Auxiliary Feedwater | | | | | |
| 2683 | E | 2-FW-P-2<br>2-FW-P-3B<br>2-FW-P-3A | Seismic Reanalysis | Three horizontal and two vertical restraints added. | 5 |
| Pressurizer Safety & Relief | | | | | |
| 2000 | E | 2-RC-TK-2 | As-built | A spring replaced by a rigid hanger and a horizontal snubber, two restraints replaced by snubbers, lateral restraint deleted. | 4 |
| Residual Heat Removal | | | | | |
| 2508B | E | 2-RH-P-1A<br>2-RH-P-1B | Seismic Reanalysis | Six snubbers added, two springs replaced by restraints, one spring hanger added, one vertical restraint added. | 10 |
| Service Water | | | | | |
| 2471 | E | 2-RS-E-1D | As-built | One restraint removed | 1 |
| Component Cooling | | | | | |
| 2601/2603 | E | 2-RH-E-1B | As-built<br>Seismic Reanalysis | Four vertical restraints replaced by springs and snubbers, two restraints added. | 6 |

Note: E = EBASCO

SURRY POWER STATION - UNIT 2

SECTION 4

PIPE SUPPORT RESULTS

Table 4-1, Pipe Support Analysis Summary, summarizes the pipe support reanalysis program. Six hundred ninety four (694) supports (467 inside the containment, 218 outside the containment) on lines originally analyzed using Shock 2, were reanalyzed as part of this Show Cause effort. Two hundred fifty eight (258) hardware modifications (175 inside the containment, 83 outside the containment) have been identified. The modifications identified due to the pipe support reanalysis are listed in Table 4-2, Pipe Support Hardware Modification Summary. 1

Those modifications which result from the piping reanalysis are identified in Section 3. Only the modifications which result from the pipe support reanalysis are reported in Table 4-2. Of the modifications identified, only 109 were the result of seismic reanalysis of the piping systems identified in the Show Cause Order, while 149 were the result of differences identified between the as-built conditions and the original design. These conditions are identified in the table for each problem. 1

For all the problems in which the SSI-ARS are used, the seismic inertial loads have been increased by a factor of 1.5 for DBE per the NRC letter of May 25, 1979, and by a factor of 1.25 for OBE per the NRC letter of November 15, 1979.

SURRY POWER STATION - UNIT 2

TABLE 4-1



PIPE SUPPORT ANALYSIS SUMMARY

| System Name and Problem Number | Analysis Responsibility | Location | Total Number of Supports | Evaluation Complete | Modifications or Additions Required | |
|---|---|---|---|---|---|---|
| Low Head Safety Injection System | | | | | | |
| 2537/2540 | E | IC | 33 | 33 | 17 | |
| 2555 | E | IC | 17 | 17 | 9 | 1 |
| 2539 | E | IC | 7 | 7 | 5 | |
| 2681 | E | OC | 4 | 4 | 3 | |
| 2682 | E | OC | 4 | 4 | 3 | |
| 2695 | E | OC | 10 | 10 | 4 | 1 |
| 2697 | E | OC | 9 | 9 | 6 | |
| 2709 | E | IC | 9 | 9 | 3 | |
| 2727 | S&W | OC | 17 | 17 | 8 | 1 |
| High Head Safety Injection System | | | | | | |
| 2689 | E | OC | 5 | 5 | 4 | |
| 2735 | E | OC | 52 | 52 | 23 | 1 |
| Containment and Recirculation Spray | | | | | | |
| 2521 | S&W | IC | 15 | 15 | 4 | |
| 2523 | S&W | IC | 16 | 16 | 5 | |
| 2547 | S&W | IC | 13 | 13 | 6 | |
| 2549 | S&W | IC | 4 | 4 | 1 | |
| 2546 | E | IC | 12 | 12 | 6 | 1 |

SURRY POWER STATION - UNIT 2

TABLE 4-1



PIPE SUPPORT ANALYSIS SUMMARY

| System Name and Problem Number | Analysis Responsibility | Location | Total Number of Supports | Evaluation Complete | Modifications or Additions Required | |
|---|---|---|---|---|---|---|
| Containment and Recirculation Spray (Cont'd) | | | | | | |
| 2541 | E | IC | 11 | 11 | 6 | |
| 2542 | E | IC | 11 | 11 | 4 | |
| 2543 | E | IC | 12 | 12 | 6 | 1 |
| 2560 | E | IC | 4 | 4 | 1 | |
| 2561 | E | IC | 5 | 5 | 3 | |
| 2544 | E | IC | 6 | 6 | 2 | 1 |
| 2533 | E | IC | 5 | 5 | 1 | |
| 2548 | E | IC | 15 | 15 | 6 | 1 |
| 2545 | E | IC | 17 | 17 | 9 | |
| 2744 | E | OC | 4 | 4 | 3 | |
| 2745 | E | OC | 4 | 4 | 2 | 1 |
| 2753 | E | OC | 4 | 4 | 1 | |
| 2754 | E | OC | 3 | 3 | 1 | |
| 2751 | E | OC | 5 | 5 | 1 | |
| 2752 | E | OC | 4 | 4 | 0 | |
| 2755 | E | OC | 8 | 8 | 4 | 1 |
| 2756 | E | IC | 7 | 7 | 2 | |
| 2757 | E | IC | 9 | 9 | 3 | |

SURRY POWER STATION - UNIT 2

TABLE 4-1



PIPE SUPPORT ANALYSIS SUMMARY

| System Name and Problem Number | Analysis Responsibility | Location | Total Number of Supports | Evaluation Complete | Modifications or Additions Required | |
|---|---|---|---|---|---|---|
| Main Steam | | | | | | |
| 2577 | S&W | IC | 9 | 9 | 2 | |
| 2588 | S&W | IC | 2 | 2 | 0 | |
| 2579 | S&W | IC | 5 | 5 | 3 | |
| 2346 | S&W | OC | 41 | 41 | 6 | |
| Feedwater | | | | | | |
| 2569 | S&W | IC | 9 | 9 | 4 | |
| 2573 | S&W | IC | 3 | 3 | 0 | |
| 2571 | S&W | IC | 6 | 6 | 1 | |
| Auxiliary Feedwater | | | | | | |
| 2473 | E | IC | 34 | 34 | 12 | 1 |
| 2683 | E | OC | 22 | 22 | 8 | |
| Pressurizer Spray and Relief | | | | | | |
| 2771 | E | IC | 32 | 32 | 7 | |
| 2000 | E | IC | 29 | 29 | 15 | 1 |
| Residual Heat Removal | | | | | | |
| 2508A/B | E | IC | 45 | 45 | 4 | 1 |
| 2540B | E | IC | 5 | 5 | 4 | |
| 2554 | E | OC | 1 | 1 | 1 | |

SURRY POWER STATION - UNIT 2

TABLE 4-1



PIPE SUPPORT ANALYSIS SUMMARY

| System Name and Problem Number | Analysis Responsibility | Location | Total Number of Supports | Evaluation Complete | Modifications or Additions Required | |
|---|---|---|---|---|---|---|
| Service Water | | | | | | |
| 2465 | E | IC | 2 | 2 | 1 | |
| 2467 | E | IC | 2 | 2 | 1 | |
| 2469 | E | IC | 1 | 1 | 0 | 1 |
| 2471 | E | IC | 1 | 1 | 1 | |
| Component Cooling | | | | | | |
| 2601 | E | IC | 16 | 16 | 5 | |
| 2603 | E | IC | 13 | 13 | 5 | 1 |
| 2604 | E | IC | 17 | 17 | 7 | |
| 2605 | E | IC | 17 | 17 | 4 | |
| Containment Vacuum | | | | | | |
| 2650 | S&W | OC | 3 | 3 | 3 | 1 |
| High Pressure Steam to Aux Feedwater Pump | | | | | | |
| 2862 | E | OC | 8 | 8 | 1 | 1 |
| 2864 | E | OC | 3 | 3 | 0 | |
| 2869 | E | OC | 7 | 7 | 1 | |

Notes: E = EBASCO
S&W = Stone & Webster
IC = Inside Containment
OC = Outside Containment

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Low Head Safety Injection System | | | | | | | |
| 2537/2540 | E | IC | | | | | |
| 2537 | E | IC | 2,4 | Local pipe wall stress over allowable | Seismic Reanalysis | Modify support | 1 |
| | | | 6 | Support member over allowable | As-built | Modify support | |
| | | | 9 | Support does not allow lateral movement | As-built | Modify support | 1 |
| 2540 | E | IC | 5 | Insufficient clearance | Seismic Reanalysis | Modify support | |
| | | | 7,8,9,10,13,26 | Support member over allowable | As-built | Modify support | 1 |
| | | | 12,28 | Pipe clamp over allowable | As-built | Modify support | 1 |
| | | | 17,19 | U-bolt over allowable | As-built | Modify support | |
| | | | 1 | Weld over allowable | As-built | Add weld | 1 |
| | | | 8A | Upward vertical restraint required | Seismic Reanalysis | Modify restraint for uplift load | |
| 2555 | E | IC | 8 | Support member over allowable | As-built | Modify support | 1 |
| | | | 3 | Weld over allowable | As-built | Add weld | |
| | | | 4,5 | Local pipe wall stress over allowable | Seismic Reanalysis | Modify support | 1 |
| | | | 9,12 | Support member over allowable | Seismic Reanalysis | Modify support | 1 |
| | | | 12A | Upward vertical restraint required | Seismic Reanalysis | Modify restraint for uplift load | |
| | | | 13,14 | Insufficient lateral clearance | As-built | Modify support | 1 |
| 2539 | E | IC | 2 | Upward vertical restraint required | Seismic Reanalysis | Modify restraint for uplift load | |
| | | | 1 | Upward vertical restraint required | Seismic Reanalysis | Modify restraint for uplift load | |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Low Head Safety Injection System (Cont'd) | | | | | | | |
| 2539 (Cont'd) | E | IC | H-1** | Support member over allowable | As-built | Modify support | 1 |
| | | | 3,4 | Support member over allowable | As-built | Modify support | |
| 2709 | E | IC | 7 | Support member over allowable | As-built | Modify support | |
| | | | 2,3 | Local pipe wall stresses over allowable | Seismic Reanalysis | Modify support | |
| 2727 | S&W | OC | 8 | Support over allowable | Seismic Reanalysis | Modify Support | |
| | | | 13 | Support and weld over allowable | Seismic Reanalysis | Modify Support | |
| | | | 11 | Loads out of range of spring | As-built | Replace spring | |
| | | | 14 | Loads out of spring range | Seismic Reanalysis | Replace spring | |
| | | | 15 | Loads out of spring range | Seismic Reanalysis | Replace spring | |
| | | | 16 | Loads out of spring range | Seismic Reanalysis | Replace spring | 1 |
| | | | 18 | Loads out of spring range | Seismic Reanalysis | Replace spring | |
| | | | 19 | Supports restraint lateral movement | As-built | Modify Support | |
| 2695 | E | OC | H-50 | Support member over allowable | As-built | Modify support | 1 |
| | | | A-16 | Support member over allowable | As-built | Modify support | |
| | | | C-53 | Support member over allowable | As-built | Modify support | |
| | | | A-17 | Support member over allowable | As-built | Modify support | |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Low Head Safety Injection System (Cont'd) | | | | | | | |
| 2697 | E | OC | H-49 | Support member over allowable | As-built | Modify support | |
| | | | C-7 | Support not acting | As-built | Removed support | |
| | | | C-17,C-18 | Support member over allowable | As-built | Modify support | |
| | | | A-14 | Support member over allowable | As-built | Modify support | |
| | | | A-15 | Support member over allowable | As-built | Modify support | |
| 2681 | E | OC | 2,4 | Support member over allowable | As-built | Modify support | |
| | | | 5 | U-bolt over allowable | As-built | Modify support | |
| 2682 | E | OC | 4 | Support member over allowable | As-built | Modify support | |
| | | | 2 | Support member over allowable | As-built | Modify support | |
| | | | 5 | U-bolt over allowable | As-built | Modify support | |
| ligh Head Safety njection System | | | | | | | |
| 2689 | E | OC | C-38,C-39 | Support member over allowable | As-built | Modify support | |
| | | | C-40,C-41. | Support member over allowable | As-built | Modify support | |
| 2735 | E | OC | 19,34,42 22,37,45,28 36,21,23,44 | Support member over allowable | As-built | Modify support | 1 |
| | | | 1,3,16,31,39,24 | Weld over allowable | As-built | Add weld | |
| | | | 4,6,18,33,41 | U-bolt over allowable | Seismic reanalysis | Modify support | 1 |
| | | | 26 | Local pipe will stress over allowable | Seismic reanalysis | Modify support | 1 |
| ontainment and ecirculation Spray | | | | | | | |
| 2521 | S&W | IC | 2 | U-bolt capacity for side-load in insufficient | Seismic Reanalysis | Add members to resist sideload | |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Containment and Recirculation Spray (Cont'd) | | | | | | | |
| 2521 (Cont'd) | S&W | IC | 3 | Frame overstressed with new loads out of springs range | Seismic Reanalysis | Modify existing frame and replace springs | 1 1 |
| | | | 4 | U-strap has insufficient capacity | Seismic Reanalysis | Replace existing strap with new framing | |
| | | | 5 | Local stress | Seismic Reanalysis | Eliminate anchor and add vert/lat restraint | |
| 2523 | S&W | IC | 1 | U-bolt capacity for side-load is insufficient | Seismic Reanalysis | Add members to resist sideload | |
| | | | 2 | Frame overstressed | Seismic Reanalysis | Replace existing frame | 1 |
| | | | 3 | Capacity of springs in-sufficient | Seismic Reanalysis | Replace springs | |
| | | | 4 | U-strap has insufficient capacity | Seismic Reanalysis | Replace existing strap with new framing | |
| | | | 5 | Local stress | Seismic Reanalysis | Eliminate anchor and add vert/lat restraint | |
| 2547 | S&W | IC | 2 | Lateral load fails U-bolt | As-built | Add lateral restraint | |
| | | | 4 | Rod hanger cannot resist upward load | Seismic Reanalysis | Replace with sway strut | |
| | | | 6 | Insufficient clearance for thermal movement | As-built | Remove lateral stop | |
| | | | 8 | Insufficient lateral clearance for thermal movement | As-built | Remove lateral stops (angle) | |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | NRS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Containment and Recirculation Spray (Cont'd) | | | | | | | |
| 2547 (Cont'd) | S&W | IC | 10 | Insufficient lateral clearance for thermal movement | As-built | Remove lateral stops (angle) | 1 |
| | | | 11 | Local stress and support frame overstressed | As-built | Modify structure | |
| 2549 | S&W | IC | 2 | U-bolt failure | As-built | Add lateral restraint | |
| 2546 | E | IC | 6 | Support member over allowable | As-built | Modify support | |
| | | | 9 | Insufficient lateral & vertical clearance | Seismic Reanalysis | Modify restraint | |
| | | | 7,8 | Insufficient lateral clearance | Seismic Reanalysis | Modify restraint | |
| | | | 2 | U-bolt restricts lateral movement | As-built | Modify support | 1 |
| | | | 22A | Anchor stress over allowable | Seismic Reanalysis | Relocate adjacent restraint | |
| 2541 | E | IC | 6,21 | Support member over allowable | As-built | Modify support | |
| | | | 7,9 | Insufficient lateral clearance | Seismic Reanalysis | Modify support | |
| | | | 2,8 | U-bolt restricts lateral movements | As-built | Modify support | 1 |
| 2542 | E | IC | 15,23 | Support member over allowable | As-built | Modify support | 1 |
| | | | 13,17 | Insufficient lateral clearance | Seismic Reanalysis | Modify support | |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Containment and Recirculation Spray | | | | | | | |
| 2543 | E | IC | 15,23 | Support member over allowable | As-built | Modify support | |
| | | | 12,13,14 | Insufficient lateral clearance | Seismic Reanalysis | Modify restraint | |
| | | | 24A | Support member over allowable | Seismic Reanalysis | Relocate adjacent restraint | 1 |
| 2560 | E | IC | H-50 | U-bolt over allowable | Seismic Reanalysis | Modify support | |
| 2561 | E | IC | H-91 | Upward vertical restraint required | Seismic Reanalysis | Modify for uplift load | |
| | | | H-50 | U-bolt over allowable | Seismic Reanalysis | Modify support | 1 |
| | | | H-98A | Support member over allowable | As-built | Remove vertical restraint | |
| 2544 | E | IC | H-67 | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | |
| | | | H-68 | Support member over allowable | As-built | Modify support | |
| 2533 | E | IC | H-3 | Support member over allowable | As-built | Modify support | |
| 2548 | E | IC | 7 | Support member over allowable | As-built | Modify support | |
| | | | 10 | Support member over allowable | As-built | Modify support | |
| | | | 12 | U-bolt over allowable | As-built | Modify support | |
| | | | 9A | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | |
| | | | 11 | Support member over allowable | As-built | Modify support | |

PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Containment and Recirculation Spray (Cont'd) | | | | | | | |
| 2548 (Cont'd) | E | IC | 8 | Support member over allowable | As-built | Modify support | 1 |
| 2545 | E | IC | 3 | Support member over allowable | As-built | Modify support | |
| | | | 14 | Upward vertical restraint required | Seismic Reanalysis | Modify restraint for uplift load | |
| | | | 2 | U-bolt over allowable | As-built | Modify support | |
| | | | 4 | Support member over allowable | As-built | Modify support | |
| | | | 7 | Support member over allowable | As-built | Modify support | |
| | | | 10,15 | Weld over allowable | As-built | Add weld | |
| | | | 6,8 | Support member over allowable | As-built | Modify support | |
| 2744 | E | OC | 2,3 | Loads out of spring range | As-built | Two rigid restraints replaced by springs | |
| | | | 1 | Local pipe wall stress over allowable | Seismic Reanalysis | Modify support | 1 |
| 2745 | E | OC | 4 | Upward vertical restraint required | Seismic Reanalysis | Modify support | |
| | | | 3 | Support does not allow lateral movement | As-built | Modify support | 1 |
| 2751 | E | OC | 2 | Local pipe wall stress over allowable | Seismic Reanalysis | Modify support | |
| 2753 | E | OC | 1 | Support member over allowable | As-built | Modify support | |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION |
|---|---|---|---|---|---|---|
| Containment and Recirculation Spray (Cont'd) | | | | | | |
| 2754 | E | OC | 1 | Support member over allowable | As-built | Modify support |
| 2755 | E | OC | 7,8 | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load |
| | | | 9 | Upward vertical restraint required | Seismic Reanalysis | Redesign support for uplift load |
| | | | 11 | Weld over allowable | As-built | Add weld |
| 2756 | E | IC | 54,55 | Support member over allowable | As-built | Modify support |
| 2757 | E | IC | H-90 | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load |
| | | | H-63, H-88 | Support member over allowable | As-built | Modify support |
| Main Steam | | | | | | |
| 2577 | S&W | IC | 1 | Local stress exceeds allowable | As-built | Modify lug |
| | | | 9 | Local stress exceeds allowable | As-built | Replace lug with clamp |
| 2579 | S&W | IC | 1 | Spring variability ratio exceeded | Seismic Reanalysis | Replace spring |
| | | | 4 | Loads outside spring range | Seismic Reanalysis | Replace spring |
| | | | 5 | Spring variability ratio exceeded. Local stress over allowable. | Seismic Reanalysis | Replace spring Replace pipe lug with clamp. |
| 2346 | S&W | OC | 1,2,3 | Loads outside spring range, local overstress in lug | Seismic Reanalysis | Replace springs, modify lug |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Main Steam (Cont'd) | | | | | | | |
| 2346 (Cont'd) | S&W | OC | 5,7,9 | Snubbers, local stress, and support members are overstressed | Seismic Reanalysis | Modify snubbers and lugs | 1 |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION |
|---|---|---|---|---|---|---|
| Feedwater | | | | | | |
| 2569 | S&W | IC | 2,3 | Loads outside spring range | Seismic Reanalysis | Replace springs |
| | | | 6 | Thermal movement | As-built | Reduce pin-to pin dimension |
| | | | 7 | Insufficient clearance for lateral movement | Seismic Reanslysis | Modify support |
| 2571 | S&W | IC | 5 | Loads outside spring range | Seismic Reanalysis | Replace springs |
| Auxiliary Feedwater | | | | | | |
| 2473 | E | IC | 8,18 | Lateral clearance insufficient | Seismic Reanalysis | Modify restraint |
| | | | 14 | Upward vertical restraint required | Seismic Reanalysis | Modify restraint for uplift load |
| | | | 16 | Upward vertical restraint required | Seismic Reanalysis | Modify restraint for uplift load |
| | | | 11,13,26,29,32 | Weld over allowable | As-built | Modify support |
| | | | 22 | Support member over allowable | As-built | Modify support |
| | | | 28,31 | Support member over allowable | As-built | Modify support |
| 2683 | E | OC | H-8A | U-bolt over allowable | As-built | Modify support |
| | | | H-11 | U-bolt over allowable | As-built | Modify support |
| | | | H-9 | Support member over allowable | As-built | Modify support |
| | | | H-1(118G1), H-5(118G1) | Local pipe wall stress over allowable | Seismic Reanalysis | Modify support |
| | | | H-4 | U-bolt over allowable | As-built | Modify support |
| | | | H-5(118G2) | Upward vertical restraint required | Seismic Reanalysis | Modify support |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Auxiliary Feedwater (Cont'd) | | | | | | | |
| 2683 (Cont'd) | E | OC | H-1(118G2) | Support does not allow lateral movement | As-built | Modify support | 1 |
| Pressurizer Spray and Relief | | | | | | | |
| 2771 | E | IC | 33 | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | |
| | | | 5,23 | Weld over allowable | As-built | Add weld | |
| | | | 6,24 | Support member over allowable | As-built | Modify support | 1 |
| | | | 26,27 | Upward vertical restraint required | Seismic Reanalysis | Modify for uplift load | |
| 2000 | E | IC | 4,12,H-5,8,10,17 | Local pipe wall stress over allowables | Seismic Reanalysis | Modify support | 1 |
| | | | 15 | Insufficient vertical clearance | Seismic Reanalysis | Modify support | |
| | | | 13 | Support restraints lateral movement | As-built | Modify support | |
| | | | 4A,7,H-1A, 11,21A,113 | Support member over allowable | As-built | Modify support | |
| | | | H-2 | Weld over allowable | As-built | Add weld | 1 |
| Residual Heat Removal | | | | | | | |
| 2508A/2508B | E | IC | H-36,H-15,H-17 | Support member over allowable | As-built | Modify support | |
| | | | H-12 | Vertical support not required | Seismic Reanalysis | Remove support | |
| 2540B | E | IC | 20,21 | Upward vertical restraint required | Seismic Reanalysis | Modify for uplift load | 1 |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Residual Heat Removal (Cont'd) | | | | | | | |
| 2540B (Cont'd) | E | IC | 23 | Insufficient lateral clearance | Seismic Reanalysis | Modify support | 1 |
| | | | 22 | Support member over allowable | As-built | Modify support | |
| 2554 | E | OC | H-31 | Insufficient lateral clearance | Seismic Reanalysis | Modify support | 1 |
| Service Water | | | | | | | |
| 2465 | E | IC | 1 | Support member over allowable | As-built | Modify support | |
| 2467 | E | IC | 1 | Support member over allowable | As-built | Modify support | |
| 2471 | E | IC | 2 | Local pipe wall stress over allowable | Seismic Reanalysis | Modify support | |
| Component Cooling | | | | | | | |
| 2601 | E | IC | H-32A,H-28,H-44 | Uplift vertical restraint required | Seismic Reanalysis | Modify support for uplift | |
| | | | H-30 | Insufficient lateral clearance | Seismic Reanalysis | Modify support | |
| | | | H-31 | Weld over allowable | As-built | Add weld | |
| 2603 | E | IC | 4 | Insufficient lateral clearance | Seismic Reanalysis | Modify support | |
| | | | 6,8 | Support member over allowable | As-built | Modify support | 1 |
| | | | 9 | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | |
| | | | 10 | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | |
| 2604 | E | IC | H-38A | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | |

SURRY POWER STATION - UNIT 2

TABLE 4-2



PIPE SUPPORT HARDWARE MODIFICATION SUMMARY

| SYSTEM NAME AND PROBLEM NUMBER | ANALYSIS RESPONSIBILITY | LOCATION | MKS SUPPORT NUMBER | REASON FOR MODIFICATION | ATTRIBUTABLE TO | RESOLUTION | |
|---|---|---|---|---|---|---|---|
| Component Cooling (Cont'd) | | | | | | | |
| 2604 (Cont'd) | E | IC | H-38B | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | 1 |
| | | | H-35,H-36,H-38C | Weld over allowable | As-built | Add weld | 1 |
| | | | H-38 | Support member over allowable | As-built | Modify support | |
| | | | H-38D | Local pipe wall stress over allowable | Seismic Reanalysis | Modify support | 1 |
| 2605 | E | IC | H-25 | Support member over allowable | As-built | Modify support | |
| | | | H-25B | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | |
| | | | H-25A | Upward vertical restraint required | Seismic Reanalysis | Modify support for uplift load | |
| | | | H-23 | Weld over allowable | As-built | Add weld | 1 |
| Containment Vacuum | | | | | | | |
| 2650 | S&W | OC | 1 | Support restraint lateral movement | As-built | Modify support | |
| | | | 2 | Local stress at attachment on pipe exceeds allowable | As-built | Move support above elbow and use trunnion | 1 |
| | | | 3 | Local stress | Seismic Reanalysis | Modify support | 1 |
| High Pressure Steam To Aux. Feedwater Pump | | | | | | | |
| 2862 | E | OC | 3 | Support member over allowable | As-built | Modify support | |
| 2869 | E | OC | 5 | Support member over allowable | As-built | Modify support | |

Notes:

** Originally Problem No. 2708

SURRY POWER STATION - UNIT 2

TABLE 5-1

SCHEDULE FOR COMPLETION

| Location of Problem | Reanalysis Responsibility | Status | | |
|---|---|---|---|---|
| | | Stress Reanalysis | Support/Restraint Reanalysis | Modification Installation |
| Inside Containment Systems | E/S&W | Complete | Complete | Prior to start-up following SGR outage |
| Outside Containment Systems | | | | |
| Low Head Safety Injection | E/S&W | Complete | Complete | Prior to start-up following SGR outage |
| High Head Safety Injection | E | Complete | Complete | Prior to start-up following SGR outage |
| Containment Recirculation Spray | E | Complete | Complete | Prior to start-up following SGR outage |
| Auxiliary Feedwater | E | Complete | Complete | Prior to start-up following SGR outage |
| Balance of Systems | E/S&W | Complete | Complete | Prior to start-up following SGR outage |

1

NOTES: E = EBASCO
S&W = Stone & Webster
SGR = Steam Generator Replacement

## SECTION 5

## SCHEDULE FOR COMPLETION

The status of the reanalysis of those systems subject to Show Cause and the installation of modifications identified as being required by the reanalysis is shown in Table 5-1, Schedule for Completion.

Reanalysis on all systems is complete pending final review. Required modifications on all lines will be installed prior to start up of the Unit following the Steam Generator Replacement Outage. 1

SURRY POWER STATION - UNIT 2

SECTION 6

HIGH ENERGY LINE BREAKS

For the high energy lines outside the containment addressed in Appendix D of the Final Safety Analysis Report (FSAR), only the main steam lines are included in this stress reanalysis.

Each of the main steam lines has two terminal break locations, one at the containment penetration and the other at the main steam manifold. Each of the risers to the main steam relief valve headers has two terminal break locations, one at the main steam lines, the other at the tee into the main steam header. These terminal breakpoints are predetermined and are not changed as a result of the stress reanalysis.

Two intermediate break locations were originally determined based upon maximum primary plus secondary stresses. Upon reanalysis, two additional breakpoints on each of the steam lines were located. One of these points is located immediately upstream of the check valve (TV-MS201A, TV-MS201B, TV-MS201C) and the other point is at the elbow just downstream of the check valve. All of these points will be included in the augmented inservice inspection program. 1

SURRY POWER STATION - UNIT 2

SECTION 7

CONSERVATISMS

The conservatisms applied to the design of the piping systems for Surry Power Station Units 1 and 2 were extensively delineated in Section 7 of the VEPCO June 5, 1979 submittal (Serial Number 453). The seismic capability of nuclear piping and the seismic event probability at the Surry Power Station were discussed in that submittal. The design of Unit 2 closely follows the design of Unit 1, applying the same conservative criteria with respect to safety systems and system redundancies.

Similiarly, the reanalysis efforts on Surry Power Station Unit 2 closely follows that of Unit 1, applying the same stress limits and soil structure interaction amplified response spectra (SSI-ARS).

Paragraphs 7.1, 7.2, 7.3 and 7.4 describe the differences in the conservatisms applied to the Unit 2 reanalysis.

## 7.1 FIELD VERIFICATION OF AS-BUILT CONDITIONS

To ensure that the pipe stress and pipe support reanalysis is performed as accurately as possible, field verification of as-built conditions has been performed. The field verification produced detailed piping isometric drawings and pipe support sketches for each support upon which reanalysis is based. All field-verified piping isometrics and pipe support sketches are independently verified by Surry Power Station quality control personnel.

## 7.2 QUALITY ASSURANCE/ENGINEERING ASSURANCE

### 7.2.1 EBASCO QUALITY ASSURANCE

The EBASCO QA Topical Report ETR-1001, Revision 7, as approved by the Nuclear Regulatory Commission on December 15, 1978, is being applied to the Surry Unit 2 reanalysis activities.

### 7.2.2 STONE & WEBSTER QUALITY ASSURANCE/ENGINEERING ASSURANCE

The Stone & Webster Quality Assurance program described in the VEPCO June 5, 1979 submittal to NRC, is being applied to the Surry Unit 2 reanalysis activities.

## 7.3 USE OF AMPLIFIED RESPONSE SPECTRA

The use of amplified response spectra was extensively discussed in the June 5, 1979 submittal. The soil structure interaction amplified response Spectra (SSI-ARS) are being used in the reanalysis in most cases.

For pipe runs extending over a range of elevations S&W and EBASCO utilized an amplified response spectra enveloping the acceleration of the mass points spanning the elevation of the piping run.

## 7.4 CONSERVATISMS APPLIED TO INERTIAL STRESSES

In accordance with the NRC letters of May 25, 1979 and November 15, 1979 to VEPCO, the seismic inertial stresses and loads computed using the SSI-ARS have been increased by a factor of 1.5 for the DBE and 1.25 for OBE conditions.

SURRY POWER STATION - UNIT 2

SECTION 8

SYSTEM OPERABILITY EVALUATION

This section has been deleted. Since all modifications will be installed prior to startup following the Steam Generator Replacement Outage, a system operability evaluation is no longer necessary. 1

# SECTION 9

## BRANCH LINE SUMMARY

Branch lines are evaluated to assure that sufficient flexibility exists between the run pipe and the first few restraints on the branch piping. The flexibility of the branch pipe must be evaluated separately in each of the three translational directions and must be sufficient to prevent overstresses in the branch/run pipe interface due to thermal and seismic displacements imposed on the branch pipe. The procedure is intended to provide a secondary stress check based on run pipe displacements resulting from the current analysis. If a branch line is part of the scope of work under IE Bulletin 79-14, a detailed evaluation is performed as part of the IE 79-14 effort.

S&W has performed evaluation of branch lines in accordance with Section 6 of the August 1, 1979 report for Unit 1 (Vepco Serial No. 453A).

EBASCO has performed evaluation of some of the branch lines by coding for the NUPIPE program and analyzing it for seismic anchor movement and thermal analysis. Engineering judgement is used in qualifying the branch lines with small displacements in the remaining cases. Thermal analysis is conducted by applying the thermal displacements from the run pipe and the operating temperature of the branch line. The seismic anchor movement analysis is performed by applying seismic inertia displacements. The applicable stress intensification factor (SIF) at the branch connection is included in the analysis. The stresses from both analyses are combined by absolute sum. Allowable stress is considered to be $S_A$.

SURRY POWER STATION - UNIT 2

SECTION 10

# RESPONSE TO NRC STAFF CONCERNS

A meeting was held with the Nuclear Regulatory Commission at Ebasco Services, Jericho Offices on October 24, 1979, to review pipe stress analyses within EBASCO's scope of work. As a result of the discussions, four staff concerns were identified as delineated in the NRC Summary of Meeting Notes dated November 13, 1979. These concerns were:

1) The validity of support stiffness used in the piping reanalysis when, for example, a vertical trunion is welded onto a horizontal wide flange.

2) The pertinence of the version of B31.1 Code implemented in Control Data Corporations' NUPIPE program, which was used in the EBASCO reanalysis program.

3) The identification of the original loads on support H-15 in problem 2538.

4) The verification of the NUPIPE computer program (benchmark problems).

These concerns are addressed in the following sections.

## 10.1 SUPPORT STIFFNESS

The original piping analysis of Surry Unit 2 did not consider the actual stiffness of the supports. Representative support stiffness was considered during the current reanalysis.

During the pipe support reanalysis effort it has been observed that certain anchor type supports expose wide flange members to torsional moments. This type of loading condition results in a very flexible support. As a part of the pipe support reanalysis effort, anchors have been reviewed for this type of loading and members modified to resist torsion as required.

## 10.2 NUPIPE COMPUTER CODE

At EBASCO's request, Nuclear Services Corporation (NSC) conducted a thorough review of the NUPIPE program against the source codes, NSC has determined that all values utilized by the program, but not specified by the user as input, are pertinent to the 1967 and earlier versions of the B31.1 Power Piping Code. The code of record for Surry Unit 2 is B31.1 1955 with code class N-7.

## 10.3 PROBLEM 2538 - SUPPORT H-15

Problem 2538, a portion of the Low Head Safety Injection System (LHSIS) was originally analyzed as a hand calculation by S&W; SHOCK 2 was not used, therefore, problem 2538 is not within the scope of the Show Cause Order. In the original analysis, decal loads were applied to the restraints in this problem. These decal loads did not include moments.

In the EBASCO NUPIPE analysis of the portion of the LHSIS within problem 2538, the system was not overstressed. However, the loads identified by the NUPIPE analysis as existing at hanger 15 caused local pipe wall and support anchor stresses to exceed allowables by an order of magnitude. Support H-15 has been modified so that it will relieve the local overstress conditions.

## 10.4 BENCHMARK PROBLEMS

EBASCO has performed four pipe stress problems supplied by the NRC to verify the NUPIPE computer program. The results were submitted to the staff in the EBASCO letter to Dr M Hartzman dated January 3, 1980 (Letter Number VEP/NRC/002).

SURRY POWER STATION - UNIT 2

# APPENDIX A

# SYSTEMS AFFECTED

SURRY POWER STATION - UNIT 2

The reanalysis included those safety related lines originally computer-analyzed with the SHOCK2 program. The systems line numbers, the associated computer problem numbers, and the flow diagram numbers are listed below. The following table includes all seismically analyzed lines. The figure numbers refer to the FSAR drawings, and the Surry Unit 2, FM and FP drawings included in Appendix B. | 1

| System | Line No. | Responsibilities for Analysis | Problem No. | MKS No. | Flow Diagram No. |
|---|---|---|---|---|---|
| Low Head Safety Injection | 8-SI-214-153 | E | 2695 | 127D1 | FM-106A |
| | 8-SI-292-153 | E | 2697 | 127D2 | FM-106A |
| | 8-SI-214-153 | E | 2681 | 127K1 | FM-106A |
| | 8-SI-292-153 | E | 2682 | 127K2 | FM-106A |
| | 10-SI-284-152 | S&W | 2727 | 127C1 | FM-106A |
| | 10-SI-216-153 | S&W | 2727 | 127C1 | FM-106A |
| | 8-SI-292-153 | S&W | 2727 | 127C1 | FM-106A |
| | 10-SI-351-153 | S&W | 2727 | 127C1 | FM-106A |
| | 6-SI-249-1502 | S&W | 2727 | 127C1 | FM-106A |
| | 10-SI-349-153 | S&W | 2727 | 127C1 | FM-106A |
| | 8-SI-214-152 | S&W | 2727 | 127C1 | FM-106A |
| | 10-SI-283-152 | S&W | 2727 | 127C2 | FM-106A |
| | 10-SI-213-153 | S&W | 2727 | 127C2 | FM-106A |
| | 6-SI-248-1502 | S&W | 2727 | 127C2 | FM-106A |
| | 10-SI-352-1502 | S&W | 2727 | 127C2 | FM-106A |
| | 10-SI-350-153 | S&W | 2727 | 127C2 | FM-106A |
| | 10-SI-349-153 | S&W | 2727 | 127C2 | FM-106A |
| | 10-SI-348-153 | S&W | 2727 | 127C2 | FM-106A |
| | 8-SI-214-153 | S&W | 2727 | 127C2 | FM-106A |
| | 12-SI-247-602 | E | 2537 | 122A1 | FM-106B |
| | 12-SI-247-1502 | E | 2537 | 122A1 | FM-106B |
| | 12-RC-324-1502 | E | 2537 | 122A1 | FM-106B |
| | 10-RH-117-1502 | E | 2537 | 122A1, 117B1 | FM-106B, 104A |
| | 12-SI-246-602 | E | 2555 | 122D1 | FM-106B |
| | 12-SI-246-1502 | E | 2555 | 122D1 | FM-106B |
| | 12-RC-323-1502 | E | 2555 | 122D1 | FM-106B |
| | 10-RH-116-1502 | E | 2555 | 122D1 | FM-106B |
| | 6-SI-248-1502 | E | 2539 | 122K1 | FM-106B |
| | 6-SI-249-1502 | E | 2539 | 122K1 | FM-106B |
| | 6-SI-250-1502 | E | 2539 | 122J1 | FM-106B |
| | 6-RC-321-1502 | E | 2539 | 122J1 | FM-106B |
| | 6-SI-343-1502 | E | 2539 | 122K1 | FM-106B |
| | 12-SI-245-602 | E | 2709 | 122L1 | FM-106B |
| | 12-SI-245-1502 | E | 2709 | 122L1 | FM-106B |
| | 12-RC-322-1502 | E | 2709 | 122L1 | FM-106B |
| High Head Safety Injection | 10-SI-206-153 | E | 2689 | 127F1 | FM-106A |
| | 6-CH-372-152 | E | 2735 | 127G1 | FM-105B |
| | 4-CH-412-152 | E | 2735 | 127G1 | FM-105B |
| | 3-CH-373-152 | E | 2735 | 127G1 | FM-105B |
| | 8-SI-214-153 | E | 2735 | 127G2 | 106A |

SURRY POWER STATION - UNIT 2

| System | Line No. | Responsibilities for Analysis | Problem No. | MKS No. | Flow Diagram No. | |
|---|---|---|---|---|---|---|
| High Head Safety Injection (Cont'd) | 8-CH-504-152 | E | 2735 | 127G1, G2 | 105B | |
| | 8-CH-317-152 | E | 2735 | 127G1, G2 | 105B | |
| | 8-SI-217-152 | E | 2735 | 127G1, G2 | 106A | |
| | 3-SI-292-153 | E | 2735 | 127G1 | 106A | |
| | 6-SI-218-152 | E | 2735 | 127G1, G2 | 105B, 106A | |
| | 6-SI-219-152 | E | 2735 | 127G1, G2 | 105B, 106A | |
| | 6-SI-278-152 | E | 2735 | 127G1, G2 | 105B, 106A | |
| | 6-CH-501-152 | E | 2735 | 127G1 | 105B | |
| | 6-CH-502-152 | E | 2735 | 127G1 | 105B | |
| | 6-CH-503-152 | E | 2735 | 127G1 | 105B | |
| | 8-CH-505-152 | E | 2735 | 127G2 | 105B | |
| | 8-CH-506-152 | E | 2735 | 127G1, G2 | 105B | |
| | 8-SI-207-152 | E | 2735 | 127G2 | 106A | |
| | 8-SI-302-152 | E | 2735 | 127G2 | 106A | |
| | 8-SI-170-153 | E | 2735 | 127G2 | 106A | |
| | 8-SI-172-153 | E | 2735 | 127G2 | 106A | |
| | 10-SI-206-153 | E | 2735 | 127G2 | 106A | |
| | 6-CH-318-152 | E | 2735 | 127G1 | 105B | |
| | 6-CH-319-152 | E | 2735 | 127G1 | 105B | |
| Residual Heat Removal | 14-RH-101-1502 | E | 2508B | 117A1 | FM-104A | 1 |
| | 14-RH-102-602 | E | 2508B | 117A1 | FM-104A | |
| | 10-RH-104-602 | E | 2508B | 117A1 | FM-104A | |
| | 10-RH-105-602 | E | 2508B | 117A1 | FM-104A | |
| | 12-RH-106-602 | E | 2508B | 117A1 | FM-104A | |
| | 10-RH-107-602 | E | 2508B | 117A1 | FM-104A | |
| | 10-RH-108-602 | E | 2508B | 117A1 | FM-104A | |
| | 10-RH-109-602 | E | 2508A | 117A1 | FM-104A | |
| | 10-RH-110-602 | E | 2508A | 117A1 | FM-104A | |
| | 12-RH-112-602 | E | 2508B | 117A1 | FM-104A | |
| | 14-RH-118-602 | E | 2508B | 117A1 | FM-104A | |
| | 12-RH-119-602 | E | 2508A | 117A1 | FM-104A | |
| | 12-RH-112-602 | E | 2540 | 117B1 | FM-104A | |
| | 3-RH-113-602 | E | 2540B | 117B1 | FM-104A | |
| | 4-RH-115-152 | E | 2540B | 117B1 | FM-104A | 1 |
| | 10-RH-116-1502 | E | 2540 | 117B1 | FM-104A | |
| | 10-RH-117-1502 | E | 2540 | 117B1 | FM-104A | |
| | 6-RH-120-152 | E | 2540 | 117B1 | FM-104A | |
| | 10-RH-137-602 | E | 2540 | 117B1 | FM-104A | |
| | 6-RH-120-152 | E | 2554 | 117C1 | FM-104A, 101A | |

SURRY POWER STATION - UNIT 2

| System | Line No. | Responsibilities for Analysis | Problem No. | MKS No. | Flow Diagram No. | |
|---|---|---|---|---|---|---|
| Main Steam | 30-SHP-101-601 | S&W | 2577 | 100D | FM-14A | 1 |
| | 30-SHP-102-601 | S&W | 2588 | 101D | FM-14A | |
| | 30-SHP-103-601 | S&W | 2579 | 102D | FM-14A | |
| | 30-SHP-101-601 | S&W | 2346 | 103A | FM-14A | |
| | 30-SHP-102-601 | S&W | 2346 | 103A | FM-14A | |
| | 30-SHP-103-601 | S&W | 2346 | 103A | FM-14A | |
| | 30-SHP-124-601 | S&W | 2346 | 103A | FM-14A | |
| | 30-SHP-123-601 | S&W | 2346 | 103A | FM-14A | |
| | 30-SHP-122-601 | S&W | 2346 | 103A | FM-14A | |
| Feedwater | 14-WFPD-117-601 | S&W | 2569 | 100G | FM-18A | |
| | 14-WFPD-113-601 | S&W | 2573 | 101G | FM-18A | |
| | 14-WFPD-109-601 | S&W | 2571 | 102G | FM-18A | |
| Auxiliary Feedwater | 6-WAPD-101-601 | E | 2473 | 118A1, A2 | FM-18A,18B | |
| | 6-WAPD-102-602 | E | 2473 | 118A2 | FM-18A,18B | |
| | 3-WAPD-109-601 | E | 2473 | 118A1, A2 | FM-18A | |
| | 3-WAPD-110-601 | E | 2473 | 118A1, A2 | FM-18A | |
| | 3-WAPD-111-601 | E | 2473 | 118A1, A2 | FM-18A | |
| | 3-WAPD-112-601 | E | 2473 | 118A1, A2 | FM-18A | |
| | 3-WAPD-113-601 | E | 2473 | 118A1, A2 | FM-18A | |
| | 3-WAPD-114-601 | E | 2473 | 118A1, A2 | FM-18A | |
| | 6-WAPD-150-601 | E | 2473 | 118A1, A2 | FM-18A,18B | |
| | 6-WAPD-151-601 | E | 2473 | 118A1, A2 | FM-18A,18B | |
| | 6-WAPD-101-601 | E | 2683 | 118G2 | FM-18A,18B | |
| | 6-WAPD-102-601 | E | 2683 | 118G1 | FM-18A,18B | |
| | 6-WAPD-103-601 | E | 2683 | 118G1, G2 | FM-18A | |
| | 6-WAPD-104-601 | E | 2683 | 118G1, G2 | FM-18A | |
| | 4-WAPD-105-601 | E | 2683 | 118G1, G2 | FM-18A | |
| | 4-WAPD-106-601 | E | 2683 | 118G1, G2 | FM-18A | |
| | 4-WAPD-107-601 | E | 2683 | 118G1, G2 | FM-18A | |
| | 4-WAPD-108-601 | E | 2683 | 118G1, G2 | FM-18A | |
| | 6-WAPD-50-601 | E | 2683 | 118G1, G2 | FM-18A,18B | |
| | 6-WAPD-52-601 | E | 2683 | 118G1, G2 | FM-18A,18B | |
| Service Water | 24-WS-126-10 | E | 2465 | 119A1 | FM-21A | |
| | 24-WS-128-10 | E | 2467 | 119A2 | FM-21A | |
| | 24-WS-130-10 | E | 2469 | 119A3 | FM-21A | |
| | 24-WS-132-10 | E | 2471 | 119A4 | FM-21A | |

SURRY POWER STATION - UNIT 2

| System | Line No. | Responsibilities for Analysis | Problem No. | MKS No. | Flow Diagram No. |
|---|---|---|---|---|---|
| Pressurizer Safety and Relief | 4-RC-334-1502 | E | 2000 | 124A1 | FM-103B |
| | 3-RC-335-1502 | E | 2000 | 124A1 | FM-103B |
| | 3-RC-361-1502 | E | 2000 | 124A1 | FM-103B |
| | 6-RC-320-602 | E | 2000 | 124A1, A2 | FM-103B |
| | 6-RC-362-602 | E | 2000 | 124A1, A2 | FM-103B |
| | 12-RC-336-602 | E | 2000 | 124A1, A2 | FM-103B |
| | 6-RC-337-1502 | E | 2000 | 124A1, A2 | FM-103B |
| | 6-RC-338-1502 | E | 2000 | 124A1 | FM-103B |
| | 6-RC-339-1502 | E | 2000 | 124A1 | FM-103B |
| | 6-RC-340-602 | E | 2000 | 124A1, A2 | FM-103B |
| | 6-RC-341-602 | E | 2000 | 124A1, A2 | FM-103B |
| | 6-RC-342-602 | E | 2000 | 124A1, A2 | FM-103B |
| Pressurizer Spray | 4-RC-314-1502 | E | 2771 | 125A1 | FM-103B |
| | 4-RC-315-1502 | E | 2771 | 125A1 | FM-103B |
| | 2-CH-368-1502 | E | 2771 | 125A1 | FM-103B |
| HP Steam to Auxiliary Feedwater Pump | 4-SHP-125-601 | E | 2862 | 131A1 | FM-14A |
| | 3-SHP-132-601 | E | 2862 | 131A1 | FM-14A |
| | 3-SHP-128-601 | E | 2862 | 131A1 | FM-14A |
| | 3-SHP-131-601 | E | 2862 | 131A1 | FM-14A |
| | 3-SHP-157-601 | E | 2862 | 131A1 | FM-14A |
| | 4-SHP-126-601 | E | 2864 | 131B1 | FM-14A |
| | 3-SHP-129-601 | E | 2864 | 131B1 | FM-14A |
| | 4-SHP-127-601 | E | 2869 | 131C1 | FM-14A |
| | 3-SHP-130-601 | E | 2869 | 131C1 | FM-14A |
| | 3-SHP-135-601 | E | 2869 | 131C1 | FM-14A |
| Containment and Recirculation Spray | 10-CS-104-153 | S&W | 2521 | 123A1 | FM-101A |
| | 8-CS-123-153 | S&W | 2521 | 123A1 | FM-101A |
| | 10-CS-103-153 | S&W | 2523 | 123A1 | FM-101A |
| | 8-CS-122-153 | S&W | 2523 | 123A1 | FM-101A |
| | 10-CS-103-153 | S&W | 2547 | 123C1 | FM-101A |
| | 8-CS-133-153 | S&W | 2547 | 123C1 | FM-101A |
| | 10-CS-104-153 | S&W | 2549 | 123C2 | FM-101A |
| | 8-CS-134-153 | S&W | 2549 | 123C2 | FM-101A |
| | 10-RS-112-153 | E | 2546 | 123D1 | FM-101A |
| | 8-RS-123-153 | E | 2546 | 123D1 | FM-101A |
| | 10-RS-104-153 | E | 2541 | 123D2 | FM-101A |
| | 8-RS-121-153 | E | 2541 | 123D2 | FM-101A |
| | 10-RS-103-153 | E | 2542 | 123D3 | FM-101A |
| | 8-RS-120-153 | E | 2542 | 123D3 | FM-101A |
| | 10-RS-111-153 | E | 2543 | 123D4 | FM-101A |
| | 8-RS-122-153 | E | 2543 | 123D4 | FM-101A |

1

SURRY POWER STATION - UNIT 2

| System | Line No. | Responsibilities for Analysis | Problem No. | MKS No. | Flow Diagram No. |
|---|---|---|---|---|---|
| Containment and Recirculation Spray (Cont'd) | 10-RS-112-153 | E | 2560 | 123E1 | FM-101A |
| | 10-RS-104-153 | E | 2561 | 123E2 | FM-101A |
| | 10-RS-110-153 | E | 2544 | 123G1 | FM-101A |
| | 10-RS-109-153 | E | 2533 | 123G2 | FM-101A |
| | 10-RS-103-153 | E | 2548 | 123H1 | FM-101A |
| | 10-RS-111-153 | E | 2545 | 123H2 | FM-101A |
| | 8-CS-134-153 | E | 2744 | 123J1 | FM-101A |
| | 8-CS-133-153 | E | 2745 | 123K1 | FM-101A |
| | 12-CS-102-153 | E | 2753 | 123L1 | FM-101A |
| | 12-CS-101-153 | E | 2754 | 123M1 | FM-101A |
| | 10-RS-109-153 | E | 2751 | 123N1 | FM-101A |
| | 4-RS-114-153 | E | 2751 | 123N1 | FM-101A |
| | 10-RS-110-153 | E | 2752 | 123N2 | FM-101A |
| | 4-RS-115-153 | E | 2752 | 123N2 | FM-101A |
| | 8-CS-133-153 | E | 2755 | 123P1 | FM-101A |
| | 8-CS-134-153 | E | 2755 | 123P1 | FM-101A |
| | 4-CS-135-153 | E | 2755 | 123P1 | FM-101A |
| | 4-CS-136-153 | E | 2755 | 123P1 | FM-101A |
| | 4-CS-105-152 | E | 2755 | 123P1 | FM-101A |
| | 1/2-CS-108-153 | E | 2755 | 123P1 | FM-101A |
| | 4-CS-106-152 | E | 2755 | 123P1 | FM-101A |
| | 10-RS-101-153 | E | 2756 | 123Q1 | FM-101A |
| | 10-RS-102-153 | E | 2757 | 123Q2 | FM-101A |
| Component Cooling | 18-CC-15-121 | E | 2604 | 112AA1 | FM-22A |
| | 18-CC-9-121 | E | 2605 | 112AB1 | FM-22A |
| | 18-CC-7-121 | E | 2601 | 112S1 | FM-22A |
| | 18-CC-14-121 | E | 2603 | 112S2 | FM-22A |
| Containment Vacuum | 8-CV-108-151 | S&W | 2650 | 137A | FM-102A |

Note: E = EBASCO
S&W = Stone & Webster

# APPENDIX B

## FLOW DIAGRAMS - IDENTIFICATION OF PROBLEMS REANALYZED

SURRY POWER STATION - UNIT 2

APPENDIX B

FLOW DIAGRAMS - IDENTIFICATION
OF PROBLEMS REANALYZED

| Title | Drawing No. | |
|---|---|---|
| Main Steam | 11548-FM-14A | 1 |
| Feedwater | 11548-FM-18A | |
| Cross-Connects for Auxiliary Feed | 11448-FM-18B | |
| Circulating and Service Water | 11548-FM-21A | |
| Component Cooling | 11548-FM-22A | |
| Containment and Recirculating Spray | 11548-FM-101A | |
| Containment Vacuum and Leakage Monitor | 11548-FM-102A | |
| Reactor Coolant Sheet 1 | 11548-FM-103A | |
| Reactor Coolant Sheet 2 | 11548-FM-103B | |
| Residual Heat Removal | 11548-FM-104A | |
| Chemical and Volume Control Sheet 2 | 11548-FM-105B | |
| Safety Injection Sheet 1 | 11548-FM-106A | |
| Safety Injection Sheet 2 | 11548-FM-106B | |
| Refueling Water Storage Tank Crosstie | 11448-FM-106C | |

11548-FM-14A

| ISSUE | DESCRIPTION | DRWD | CONF | APPR | DATE |
|---|---|---|---|---|---|
| 8 | ADDED VALVES, THROTTLE VALVES, TRAP LINES & REFERENCE DWGS. REVISED LINES. | | | | |

REFERENCE DRAWINGS:

| | |
|---|---|
| FLOW DIAGRAM EXTRACTION STEAM | FM-15A |
| FLOW DIAGRAM AUX.STEAM & AIR REMOVAL | FM-16A |
| FLOW DIAGRAM MISC.DRAINS SECONDARY PLANT | FM-1 & |
| FLOW DIAGRAM SAMPLING SYSTEM | FM-32A |
| FLOW DIAGRAM TURBINE GLAND STEAM | FM-115A |
| FLOW DIAGRAM STEAM GENERATOR BLOWDOWN | 11448-FM-122A |
| VALVE OPERATING NUMBERS MAIN STEAM | FM-66A |

NOTES:
FLOW DIAGRAM SYMBOLS, STD HM-100 TO HM-108 INCL
© SK-10-753, REV 5.61.
ALL PRESSURE CONNS TO BE ½".
ALL TEMPERATURE CONNS TO BE ½" REAMED HOLE EXCEPT AS NOTED.
⊕ INDICATES FURNISHED BY EQUIPMENT MFR.
2 ETC SHOWN AT EQUIP CONNS INDICATES MFR'S CONN NUMBER - COND DWG NO. 2259-R1651-3002.
- TURB DWG 68-0-1332.
- REACTOR CONTAINMENT PENETRATIONS 11548-FV-1A.
⊕ ⊕ INDICATES POWER RELIEF VALVE MODULATING TYPE.
▲ INDICATES COMPUTER POINT.
REFERENCE DRAWINGS (A-B)

FLOW DIAGRAM
MAIN STEAM

1572 EXTENSION-SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

11548-FM-14A

REV. 1

11548FM-18A

STEAM GENERATORS

MKS-100G

MKS-101G

MKS-102G

MKS-118A

MKS-118G2

MKS-118G1

SHIELD WALL

WALL OF REACTOR CONTAINMENT

MISSILE PROTECTION

FEED WATER HEATERS

2-FW-E-1A

2-FW-E-1B

CONDENSER
2-CN-SC-1A

10,000 GAL CONDENSATE STORAGE TANK
2-CN-TK-1

STEAM GENERATOR FEED PUMPS
13,800 GPM @ 1700 FT TDH
HALF SIZE

2-FW-P-1A

2-FW-P-1B

MIN FLOW ORIFICE (TYP)

REFERENCE DRAWINGS:
FLOW DIAGRAM - CONDENSATE
FLOW DIAGRAM - SAMPLING SYSTEM
FLOW DIAGRAM - CHEMICAL FEED SYSTEM
FIRE PROTECTION ARRST
VALVE OPERATOR NUMBERS FEEDWATER
FLOW DIAGRAM CROSS-CONNECTS FOR AUXILIARY FEED

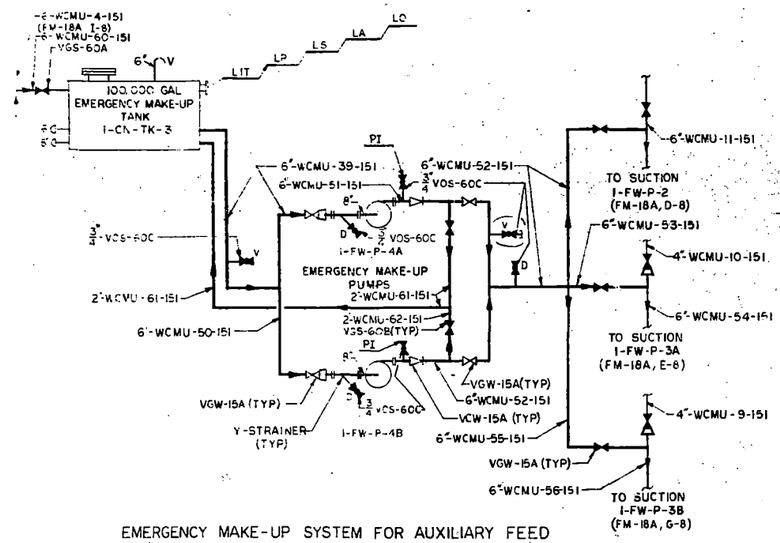
FM-17A
FM-12A
FM-12IA
11448-FE-2A
FM-68A
11448-PM-18B

NOTES:
12 ETC SHOWN AT EQUIP CONN INDICATES MFR CONN NO. - COND DWG M4-225D-AREBT-5800.
-REACTOR CONTAINMENT PENETRATIONS 11548-FV-1A.
ALL PRESSURE CONN TO BE ¾".
ALL TEMPERATURE CONN TO BE 1" REAMED HOLE.
⊕ INDICATES FURNISHED BY EQUIP MFR.
⚠ INDICATES COMPUTER POINT.

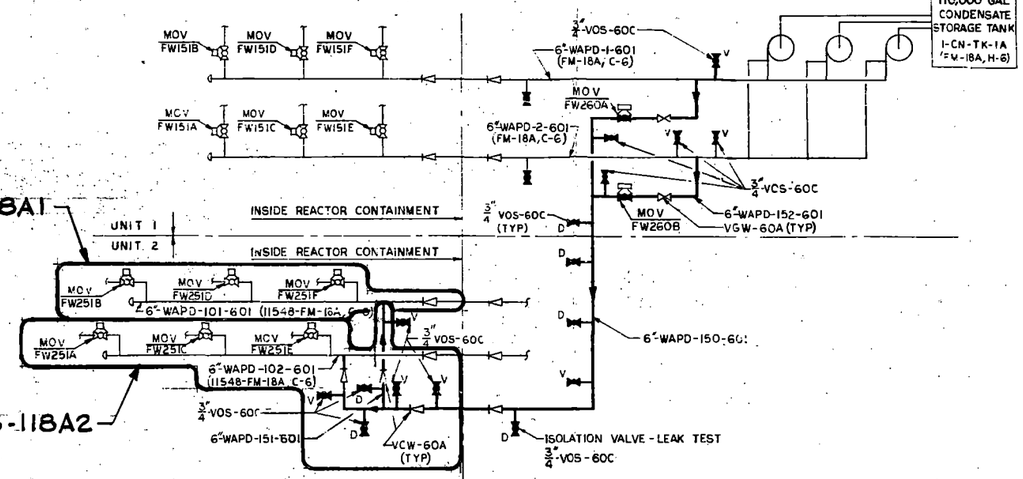
FLOW DIAGRAM
FEEDWATER
HZ EXTENSION-SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY

11548-FM-8A

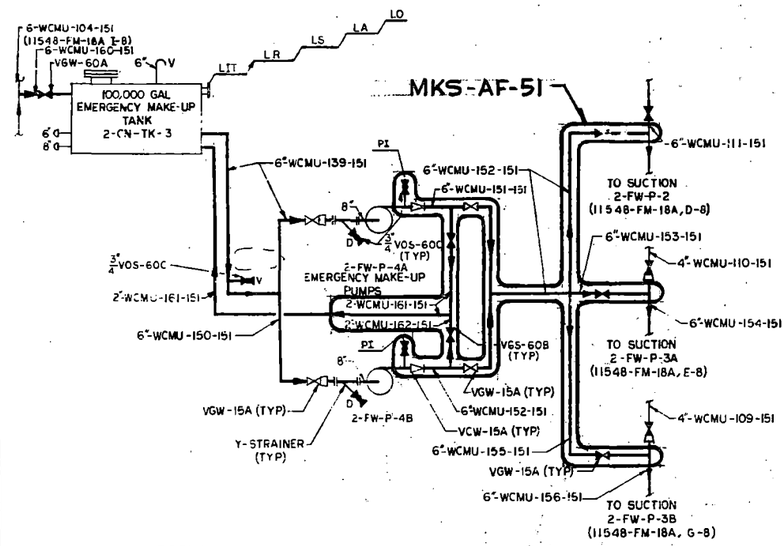
11448-FM-183



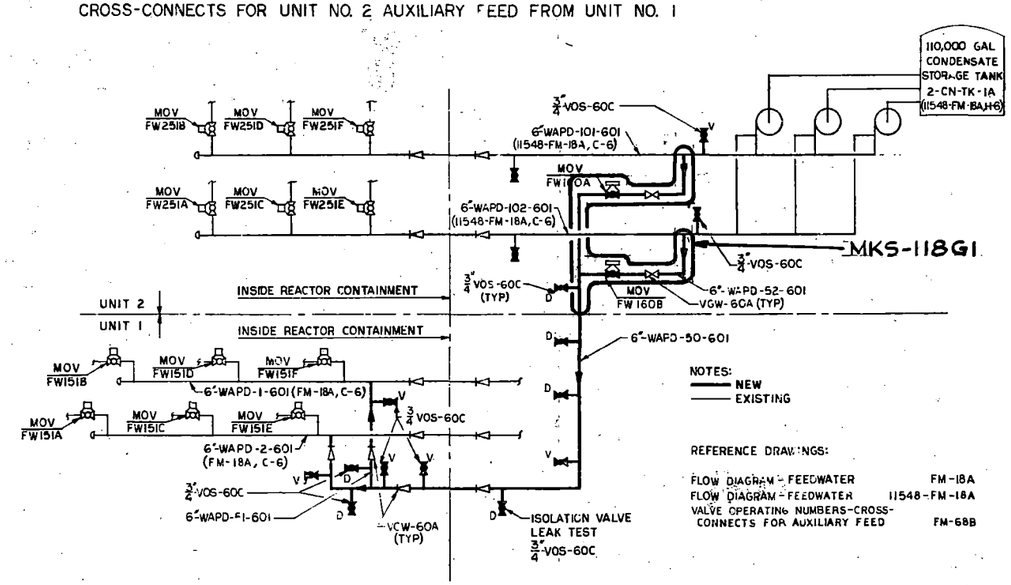

EMERGENCY MAKE-UP SYSTEM FOR AUXILIARY FEED
UNIT NO. 1




CROSS-CONNECTS FOR UNIT NO. 2 AUXILIARY FEED FROM UNIT NO. 1




EMERGENCY MAKE-UP SYSTEM FOR AUXILIARY FEED
UNIT NO. 2




CROSS-CONNECTS FOR UNIT NO. 1 AUXILIARY FEED FROM UNIT NO. 2

NOTES:
NEW
EXISTING

REFERENCE DRAWINGS:

| | |
|---|---|
| FLOW DIAGRAM - FEEDWATER | FM-18A |
| FLOW DIAGRAM - FEEDWATER | 11548-FM-18A |
| VALVE OPERATING NUMBERS-CROSS-CONNECTS FOR AUXILIARY FEED | FM-68B |

APPROVED _____ CERTIFIED PROFESSIONAL ENGINEER NO. 04892 COMMONWEALTH OF VIRGINIA

| ISSUE | DESCRIPTION | CHKD | CORR | APPR | DATE |
|---|---|---|---|---|---|
| 5 | ADDED VALVE AND DELETED DRAIN VALVE | | | | |
| 4 | ADDED CHECK VALVES | | | | |
| 3 | ADDED: VALVES, TK CONN, INST, 6"WCMU-160-151 DELETED: REF DWG | | | | |
| 2 | ADDED RETURN LINES FROM ITS FM-18A&B, ADDED VENTS & DRAINS | | | | |
| 1 | ORIGINAL ISSUE | | | | |

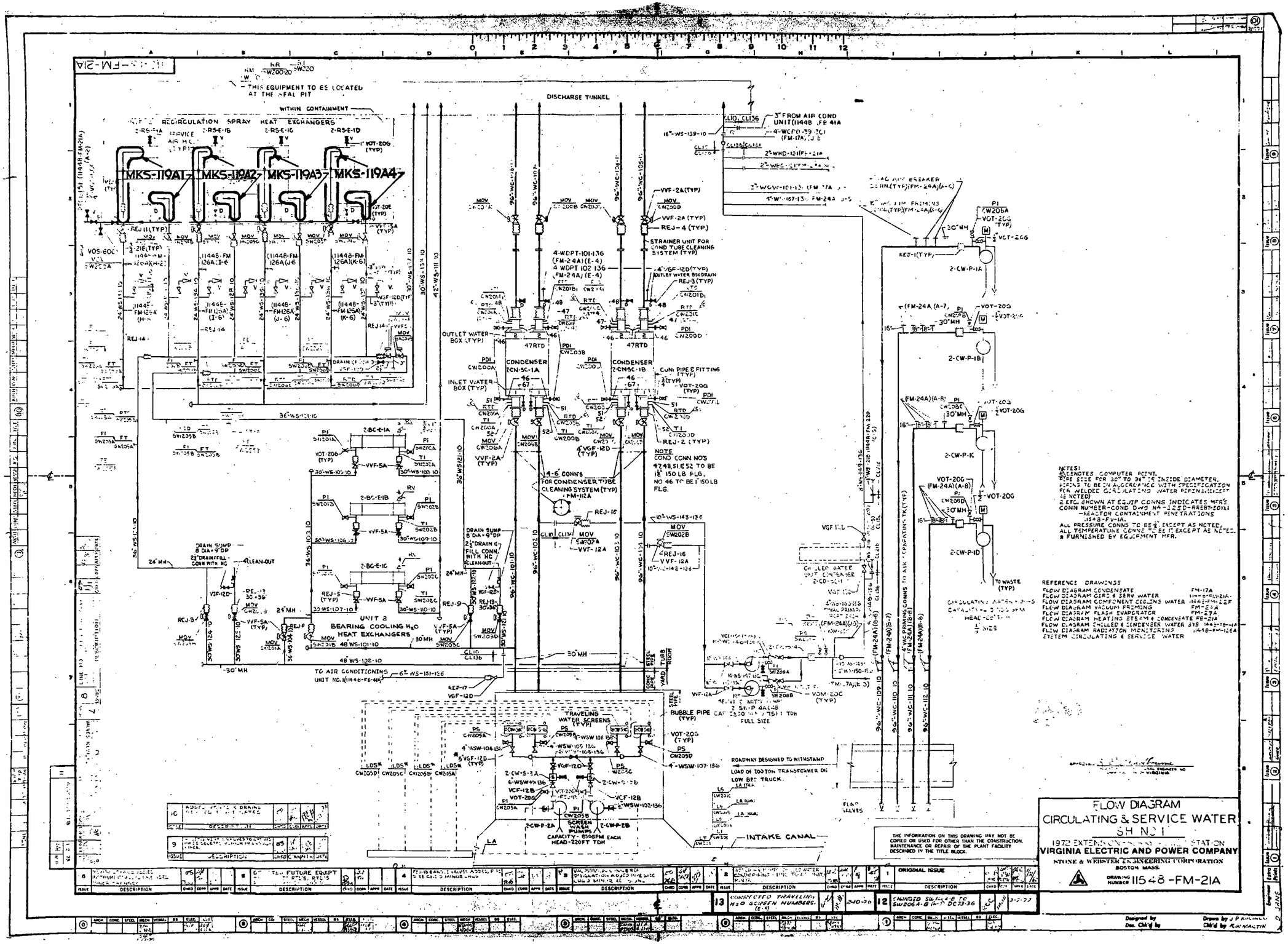


# FLOW DIAGRAM CROSS-CONNECTS FOR AUXILIARY FEED

SURRY POWER STATION
**VIRGINIA ELECTRIC AND POWER COMPANY**
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 11448-FM-18B

Designed by
Des. Ch'd by
Drawn by S.W. GENTAINE
Ch'd by G.L. Auvil


RECIRCULATION SPRAY HEAT EXCHANGERS
2-RS-E-1A
2-RS-E-1B
2-RS-E-1C
2-RS-E-1D
MKS-119A1
MKS-119A2
MKS-119A3
MKS-119A4
SERVICE AIR H/C (TYP)
WITHIN CONTAINMENT
THIS EQUIPMENT TO BE LOCATED AT THE SEAL PIT
DISCHARGE TUNNEL
3" FROM AIR COND UNIT (11448 SH 41A (FM-17A) J-E
CONDENSER 2CN-SC-1A
CONDENSER 2CN-SC-1B
OUTLET WATER BOX (TYP)
INLET WATER BOX (TYP)
4-WDPT-101-136 (FM-24A) (E-4)
4 WDPT 102 136 FM-24A) (E-4)
STRAINER UNIT FOR COND TUBE CLEANING SYSTEM (TYP)
4-6 CONNS FOR CONDENSER TUBE CLEANING SYSTEM (TYP) FM-112A
NOTE COND CONN NO'S 47,48,51,52 TO BE 18" 150 LB FLG. NO 46 TO BE 150 LB FLG.
UNIT 2 BEARING COOLING H2O HEAT EXCHANGERS
2-BC-E-1A
2-BC-E-1B
2-BC-E-1C
DRAIN SUMP 8 DIA-9 DP
TG AIR CONDITIONING UNIT NO.1 (11448-FB-4H)
TRAVELING WATER SCREENS (TYP)
2-CW-S-1A
2-CW-S-1B
2-CW-P-2A
2-CW-P-2B
SCREEN WASH PUMPS
CAPACITY - 8500GPM EACH HEAD-220FT TDH
INTAKE CANAL
ROADWAY DESIGNED TO WITHSTAND LOAD OF 100 TON TRANSFORMER ON LOW BED TRUCK.
FLAP VALVES
BUBBLE PIPE CAP 2500 GPM / 75FT TDH FULL SIZE
CHILLED WATER UNIT CONDENSER 2-CD-SC-1
2-CW-P-1A
2-CW-P-1B
2-CW-P-1C
2-CW-P-1D
TO WASTE (TYP)
CIRCULATING WATER PUMPS CAPACITY - 31,000 GPM HEAD - 60 FT TDH
1/2 SIZE
NOTES:
1. DENOTES COMPUTER POINT.
2. PIPE SIZE FOR 30" TO 36" CS INSIDE DIAMETER, PIPING TO BE IN ACCORDANCE WITH SPECIFICATION FOR WELDED CARBON STEEL CIRCULATING WATER PIPING (EXCEPT AS NOTED)
3. ETC. SHOWN AT EQUIP CONNS INDICATES MFR'S CONN NUMBER-COND DWG NA-2250D-RREBT-S0101 -REACTOR CONTAINMENT PENETRATIONS 11548-FV-1A.
ALL PRESSURE CONNS TO BE 150# EXCEPT AS NOTED. ALL TEMPERATURE CONNS TO BE 1# EXCEPT AS NOTED.
# FURNISHED BY EQUIPMENT MFR.
REFERENCE DRAWINGS
FLOW DIAGRAM CONDENSATE FM-17A
FLOW DIAGRAM GRS & SERV WATER 11448-FM-21A-
FLOW DIAGRAM COMPONENT COOLING WATER 11448-FM-22F
FLOW DIAGRAM VACUUM PRIMING FM-23A
FLOW DIAGRAM FLASH EVAPORATOR FM-27A
FLOW DIAGRAM HEATING STEAM & CONDENSATE FB-21A
FLOW DIAGRAM CHILLED & CONDENSER WATER SYS 1448-FB-4A
FLOW DIAGRAM RADIATION MONITORING 11448-FM-12EA
SYSTEM CIRCULATING & SERVICE WATER
THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.
FLOW DIAGRAM
CIRCULATING & SERVICE WATER
SH NO 1
1972 EXTENSION
STATION
VIRGINIA ELECTRIC AND POWER COMPANY
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON MASS.
DRAWING NUMBER 11548-FM-21A
13 CONNECTED TRAVELING H2O SCREEN NUMBERS. (E-6) 2-10-78
12 CHANGED SIZE OF & TO SW2026A-B (M-1 DC 13-36) 3-2-77
1 ORIGINAL ISSUE
Designed by
Drawn by J P KUCINSKI
Chk'd by R.W. MARTIN

11548-FM-22A

MKS-112AB1

MKS-112S1

MKS-112S2

MKS-112AA1

OUTSIDE REACTOR CONTAINMENT | INSIDE REACTOR CONTAINMENT

TO UPPER BRG. LUBE OIL COOLER (TYP)

TO STATOR COOLER (TYP)

TO LOWER BRG. LUBE OIL COOLER (TYP)

TO THERMAL BARRIER (TYP)

REACTOR COOLANT PUMPS

REACTOR SHROUD COOLING COILS

EXCESS LETDOWN HEAT EXCHANGER

PRIMARY DRAIN COOLER

SEAL COOLER 2-RH-E-2A

SEAL COOLER 2-RH-E-2B

RESIDUAL HEAT REMOVAL PUMPS

RESIDUAL HEAT REMOVAL EXCHANGERS

2-CC-E-2 PIPE PENETRATION COOLING COILS (INNER)

TO REACTOR CONTAINMENT SUMP (TYP)

TO REACTOR CONTAINMENT SUMP

PENETRATION NO FV-1A (TYP)

DETAIL A
TYPICAL ORIFICE FLANGE

Δ LOCAL SAMPLE DETAIL

NOTES:
ALL TEMPERATURE CONNECTIONS TO BE 1" EXCEPT AS NOTED.
NUMBER SHOWN AT REACTOR CONTAINMENT LINE INDICATES PIPING PENETRATION NUMBER
ALL PRESSURE, SAMPLE, DRAIN & VENT CONNECTIONS TO BE 3/4" WITH V05-60C EXCEPT AS NOTED.
* FURNISHED BY EQUIPMENT MANUFACTURER
MCB - MAIN CONTROL BOARD
Δ - COMPUTER
LMC-LEAKAGE MONITORING TEST CONNECTIONS
# PROVIDE ROOT VALVES AT ALL FLOW ORIFICES DETAIL A

REFERENCE DWGS:

| | |
|---|---|
| FLOW DIAG. COMPONENT COOLING WATER SH. 2 | -FM-22B |
| FLOW DIAG. COMPONENT COOLING WATER SH. 6 | 11448-FM-22F |
| FLOW DIAG. SAMPLING SYSTEM | FM-32A |
| FLOW DIAG. VENT & DRAIN SYSTEM | FM-100A |
| REACTOR CONTAINMENT PENETRATIONS | FV-1A |

H. B. SUMNER, JR. No. 04323 COMMONWEALTH OF VIRGINIA REGISTERED PROFESSIONAL ENGINEER

APPROVED M. B. Sumner Jr. CERTIFIED PROFESSIONAL ENGINEER NO. 04323 COMMONWEALTH OF VIRGINIA

# FLOW DIAGRAM COMPONENT COOLING WATER SH 1

1972 EXTENSION—SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 11548-FM-22A

THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESIGNED IN THE TITLE BLOCK.

| ISSUE | DESCRIPTION | CHKD | COORD | APPR | DATE |
|---|---|---|---|---|---|
| 11 | ADDED CHECK VALVES, RELIEF VALVE & CONTROL ORIFICES | | | | |
| 10 | ADDED VENTS, DRAINS, REMOVED LINES ON 2-SW-P-1A,1B. ADDED NOTE FOR ROOT VALVES, & DETAIL A | | | | |
| 9 | ADDED BY-PASS FOR INSTR. LINE NO. CHANGED 'N' RHR PUMP | | | | |
| 8 | RELIEF VALVE SIZES CHANGED MINOR CHGS. | | | | |
| 7 | REMOVED NEUTRON SHIELD TANK COOLERS. MINOR CHANGES. | | | | |
| 6 | GENERAL REVISION | | | | |
| 5 | PIPING, VALVES, INST. ADDED. PIPING REVISED | | | | |
| 4 | ORIGINAL ISSUE | | | | |

OUTSIDE REACTOR CONTAINMENT UNIT 2 | INSIDE REACTOR CONTAINMENT UNIT 2

Designed by — Dwn. Ck'd by —

Drawn by W.C. Hutchinson — Ck'd by G.L. Arce

1154S-FM-101A

MKS-123C2 INSIDE REACTOR CONTAINMENT

OUTSIDE REACTOR CONTAINMENT MKS-123J1

MKS-123A1

360° SPRAY HEADER 368 NOZZLES EQ SPACED

MKS-123K1

MKS-123C1

DRAIN TO CONTAINMENT SUMP

RECIRC SPRAY SUMP

MKS-123D4 MKS-123P1

MKS-123D2 MKS-123D1

MKS-123D3

MKS-123H1 MKS-123E2 MKS-123H2

MKS-123E1 MKS-123M1

MKS-123G1

MKS-123N2

MKS-123N1

MKS-123G2

MKS-123Q1 MKS-123Q2

MKS-123L1

MKS-117C1

2-CS-TK-1 REFUELING WATER STORAGE TANK VDW-15Y

REFUELING WATER CHEM ADDITION TANK PUMP 2-CS-P3

REFUELING WATER STORAGE TANK HEATERS

REFUELING WATER RECIRCULATING PUMPS

REFUELING WATER REFRIGERATION UNITS

CONTAINMENT SPRAY PUMPS

CONTAINMENT SPRAY PUMP SUCTION FILTERS

INSIDE RECIRCULATION SPRAY PUMPS

OUTSIDE CONTAINMENT RECIRCULATION SRAY PUMPS

RECIRC SPRAY SUMP

VALVE PIT

MAIN STEAM SYSTEM (FM-14A)(B-8)

MAIN STM SYS (FM-14A)(A-7)

LOCAL SAMPLE

THERMO. COUPLE

NOTES.
* INDICATES FURNISHED BY EQUIPMENT MANUFACTURER
** HEAT TRACING TO 3 FEET BELOW GROUND GRADE
*** REFRIGERANT INSTRUMENT SYSTEM
ALL FLOW AND PRESSURE INSTRUMENT CONNECTIONS T SEE 7A4.
ALL VALVE STEM LEAKOFF PIPES TO HAVE 3,000 LB SS UNION AT VALVES.
ALL TEMPERATURE CONNECTIONS TO BE 1"
LMC - LEAKAGE MONITORING CONNECTIONS.

REFERENCE DRAWINGS:

| | |
|---|---|
| FLOW DIAGRAM - MAIN STEAM SYSTEM | FM-14A |
| FLOW DIAGRAM - CIRC. & SERVICE WATER | FM-21A |
| FLOW DIAGRAM - COMPONENT COOLING WATER SYS. | 1448-FM-22F |
| FLOW DIAGRAM - RESIDUAL HEAT REMOVAL SYS | FM-10A |
| FLOW DIAGRAM - CHEMICAL & VOL CONTROL SYS | FM-12B |
| FLOW DIAGRAM - SAFETY INJECTION SYS | FM-10B |
| FLOOR DRAINAGE REACTOR CONTAINMENT | FB-40B |
| FLOW DIAGRAM - FUEL PT SYSTEMS | 1448-FM-13 |
| FLOW DIAGRAM - VENT & DRAIN SYSTEM | FM-100A(B |
| VALVE OPER NUMBERS CONT. & RECIRC. SPRAY SYS. | FM-101A |

APPROVED — COMMONWEALTH OF VIRGINIA

# FLOW DIAGRAM CONTAINMENT & RECIRCULATION SPRAY SYSTEM

1972 EXTENSION-SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY
STONE & WEBSTER ENGINEERING CORPORATION BOSTON, MASS.

DRAWING NUMBER 1154S-FM-101A



| NO. | DESCRIPTION | DATE |
|---|---|---|
| 15 | ADDED OFFSITE CHANGES 73C16EB 0672-01 (7&IN) | 11-13-78 3-29-79 |
| 14 | ADDED MOTR-2001(3-R) & OTHER CHANGES AS BUILT | 7-7-78 |
| 13 | DELETED 3"-CS-GATE VLV WITH PLUG #VSVDF.015-F-0 FOR S.C. 75-44 | 6-4-76 |
| 12 | ADDED 8"-CS-1179-153(Q-1) FOR J.O. 12498.01 | 11-3-75 |
| 11 | REVISED LINE NUMBERS & VALVES SPRAY SYS | |
| 10 | MINOR CHANGES | |
| 9 | | |
| 8 | | |
| 7 | | |
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | GENERAL REVISION | |
| 2 | CHGS ON SPRAY HEADER CHGS ON REFUELING WTR TK MINOR CHGS | |
| 1 | ORIGINAL ISSUE | |

Designed by Des. Ck'd by

Drawn by N.D.P. Ck'd by J.M.PARKER

11548-FM-102A

OUTSIDE REACTOR CONTAINMENT | INSIDE REACTOR CONTAINMENT

PDI LM202
SERVO MANOMETER
FROM CONTAINMENT ISOLATION SYSTEM
TO CONTAINMENT ISOLATION AND SAFEGUARDS INITIATION SYSTEMS
TO CONTAINMENT VACUUM SYSTEM STARTING CONTROLS
TEST AIR
SOV LM200E, LM200D, LM200C, LM200B, LM200A, LM200H, LM200G, LM200F
PT CV201A, PT CV201B, PT LM200C, PT LM200A, PT LM200D, PT LM200B
OPEN PRESSURE TAPS
3/8"-LM-(ALL OPEN TAPS)-N7
3/8"-LM-111-N7
3/8"-LM-112-N7
3/8"-LM-113-N7
3/8"-LM-116-N7
1/4"-LM-114-N7
1/4"-LM-115-N7
3/8"-LM-101-N6
3/8"-LM-102-N6
3/8"-LM-103-N6
3/8"-LM-117-N6
3/8"-LM-104-N6
3/8"-LM-105-N6
3/8"-LM-106-N6
3/8"-LM-107-N6
3/8"-LM-109-N6
3/8"-LM-110-N6
VOS-40X
VOS-40X (TYP)
TV LM200G, LM200A, LM200C, LM200E, LM200H, LM200B, LM200D
LMC
PT LM202
BAROMETER
PDI LM200
MANOMETER (ATMOSPHERIC)
PT LM203
LEAKAGE MONITORING SEALED SYSTEM VACUUM PUMP 2-CV-P-2
SV LM200
PCV LM200
PDI LM201
MANOMETER (DIFFERENTIAL)
DRY AIR CYLINDER (LESS THAN -70°DEWPOINT AIR)
FROM CONTAINMENT ISOLATION SYSTEM
SOV LM201B, SOV LM201A
TV LM201A, TV LM201B
TO ATMOSPHERE
8"CV-109-151
CONTAINMENT VACUUM EJECTOR 2-CV-EJ-1
A.C.
VGW 15A
8"CV-108-151
4"SA-30-301 (11448-FM-16B)(E-6)
SOV CV200, HCV CV200
VCW-15A
VOS-60C
MKS-137A
SEALED PRESSURE SYSTEM
2"(TYP)
3/4"-VOM-20D
PI LM204
FI LM201
PCV LM201
2-SA-FL-1 LEAKAGE TEST METER FILTER
TI LM201
2-LM-120-21B
2"-LM-121-21B (FM-25E)(C-6)
(FM-25E)(B-6)
2"-LM-119-21B
FI CV250
FIT CV250
FX CV250
VCS-60A
VDS-15Z
2"CV-103-154 (11448-FM-107B)(B-8)
2"CV-104-154
2"CV-103-154
VBS-15Z
2"GW-224-154 (11448-FM-107B) (J-8)
TV CV250B, SOV CV250B
SOV CV250A, TV CV250A
4"CV-120-152
PLATF EL 47'-4"
2"CV-101-154
VDS-15Y
2"SWING CHECK 93
2"CV-121-152
2"SWING CHECK
CL152
CL154
2-CV-P-1A
2-CV-P-1B
CONTAINMENT VACUUM PUMPS
VDS-15Z
2"GW-220-154 (11448-FM-107A) (D-2)
FROM CONTAINMENT ISOLATION SYSTEM
SOV CV2500, SOV CV250C
TV CV2500, TV CV250C
VCS-15X
FLOOR DRAINS
92
UNIT NO.2 REACTOR CONTAINMENT
2"CV-102-154
2"GW-221-154 (11448-FM-107A) (C-2)
2"GW-222-154 (11448-FM-107B)(J-8)

NOTES:
RTD-LM200-1 THRU 20 TO MEASURE REACTOR CONTAINMENT AIR TEMPERATURE AT DIFFERENT POINTS
MT-LM200-1&2 TO MEASURE REACTOR CONTAINMENT AIR MOISTURE CONTENT.
RTD-LM200-19&20 SEND SIGNAL TO TI-LM200-1&2 ON MAIN CONTROL BOARD.
RTD-LM200-1 THRU 18 SEND SIGNAL TO DATA LOGGER
MT-LM200-1 SENDS SIGNAL TO MI-LM200-1 ON MAIN CONTROL BOARD.
MT-LM200-2 SENDS SIGNAL TO DATA LOGGER.
# INDICATES FURNISHED BY EQUIPMENT MFR
LMC - LEAKAGE MONITORING CONNECTIONS

REFERENCE DWGS.
FLOW DIAGRAM GASEOUS WASTE DISPOSAL SYSTEM 11448-FM-107A,B
FLOW DIAGRAM COMPRESSED AIR LINES FM-25E
FLOW DIAGRAM AUXILIARY STEAM-PRIMARY PLANT 11448-FM-66B
VALVE OPER. NO'S. CONTAINMENT VAC & LEAKAGE MONITOR SYSTEM FM-85A

R. M. SIMONETTI No. 04123 COMMONWEALTH OF VIRGINIA

| ISSUE | DESCRIPTION | CHKD | CORR | APPR | DATE |
|---|---|---|---|---|---|
| 10 | ADDED VALVES, REVISED DWG. COORDINATES & REFERENCE DWGS. | | | | |
| 9 | ADDED VALVE NOS & LINE SIZES REMOVED CHARCOAL FILTERS | | | | |
| 8 | LMC'S ADDED, VDS SOR'S VOM-20D AND FIT-LM-101 REMOVED | | | | |
| 7 | OPEN PRESSURE TAPS DELETED SEALED PRESSURE TAPS ADDED | | | | |
| 6 | MINOR CHANGES | | | | |
| 5 | CONTROL VALVE & INSTRUMENT CHANGES, MINOR CHANGES | | | | |
| 4 | GENERAL REVISION | | | | |
| 3 | ADDED VALVES, REVISED DWG. COORDINATES & REFERENCE DWGS. | | | | |
| 2 | ADDED VALVE NOS & LINE SIZES REMOVED CHARCOAL FILTERS | | | | |
| 1 | ORIGINAL ISSUE | | | | |

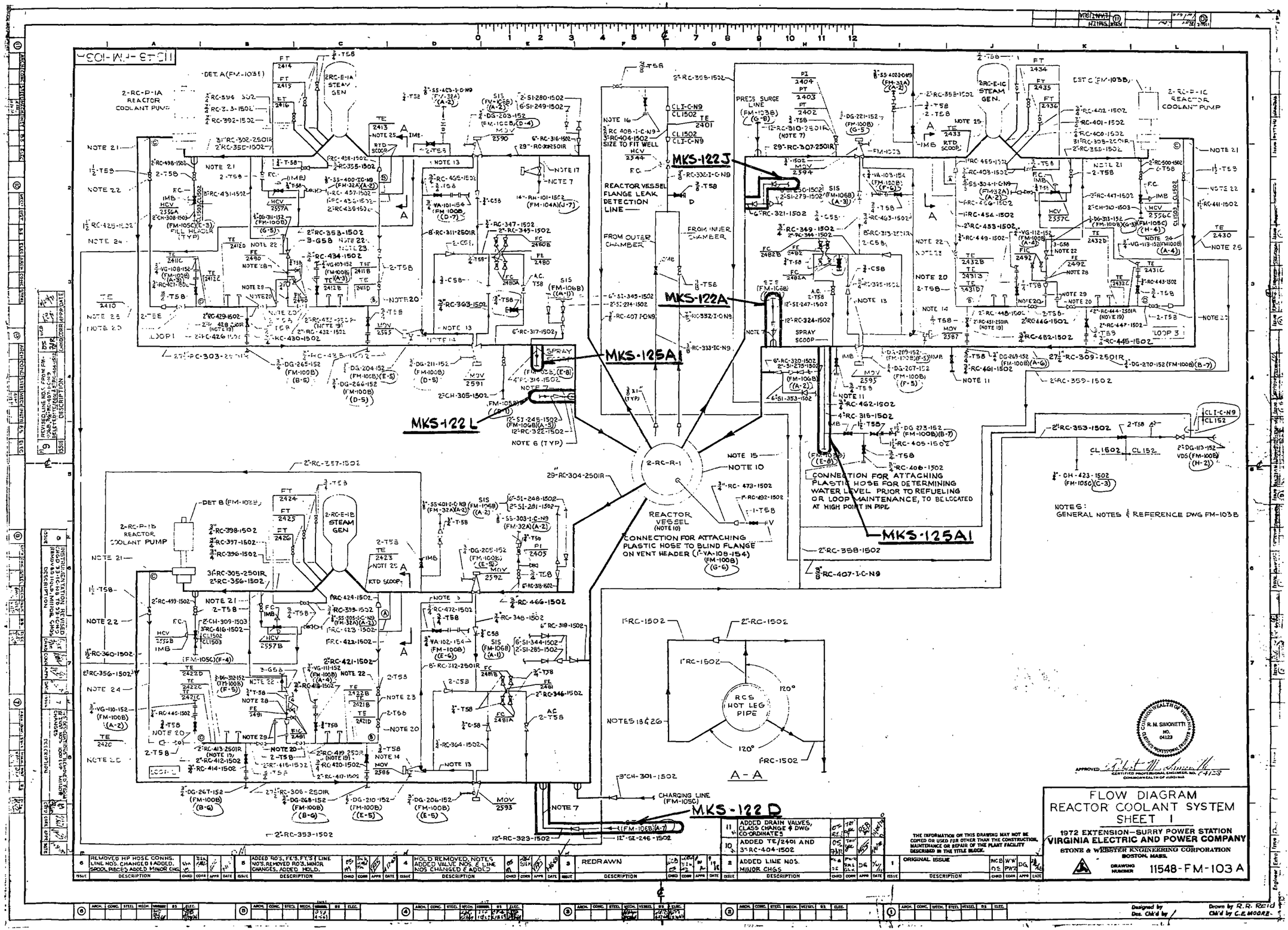
THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.

# FLOW DIAGRAM CONTAINMENT VAC. & LEAKAGE MONITOR SYSTEM

1972 EXTENSION-SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 11548-FM-102A

Designed by
Dsn. Ck'd by
Drawn by J.J. CORBETT
Ck'd by W.C. HUTCHINSON




| ISSUE | DESCRIPTION | CHKD | CORR | APPR | DATE |
|---|---|---|---|---|---|
| 11 | ADDED DRAIN VALVES, CLASS CHANGE & DWG CO-ORDINATES | GS | TAB | RSB | 5/1/72 |
| 10 | ADDED TE/2401 AND 3"-RC-404-1502 | DS | TAB | RSB | 5/1/72 |
| 9 | REVISED LINE NOS. FROM FM-103B, 3"-RC-407-1-C-N9 DELETED, 6"-RC-316-1502 ADDED | DS | TAB | RSB | 5/1/72 |
| 8 | INSTRUMENTATION REVISED (CAGD SPECIFICATIONS REMOVED) MINOR CHGS | DS | TAB | RSB | 5/1/72 |
| 7 | REVISED INSTRUMENTATION (CAGD SPECIFICATIONS) MINOR CHGS | DS | TAB | RSB | 5/1/72 |
| 6 | REMOVED HP HOSE CONNS. LINE NOS. CHANGED & ADDED, SPOOL PIECES ADDED MINOR CHG | GS | TAB | RSB | 5/1/72 |
| 5 | ADDED RO'S, FE'S, FT'S & LINE NO'S. REMOVED RO'S. MINOR CHANGES. ADDED HOLD. | DS | TAB | RSB | 5/1/72 |
| 4 | HOLD REMOVED, NOTES ADDED VALVE NOS. & LINE NOS CHANGED & ADDED | DS | TAB | RSB | 5/1/72 |
| 3 | REDRAWN | DS | TAB | RSB | 5/1/72 |
| 2 | ADDED LINE NOS. MINOR CHGS | WC B DS | WW PWD | DG | 5/1/72 |
| 1 | ORIGINAL ISSUE | WC B DS | WW PWD | DG | 5/1/72 |

THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.

R. M. SIMONETTI NO. 04123 CERTIFIED PROFESSIONAL ENGINEER COMMONWEALTH OF VIRGINIA

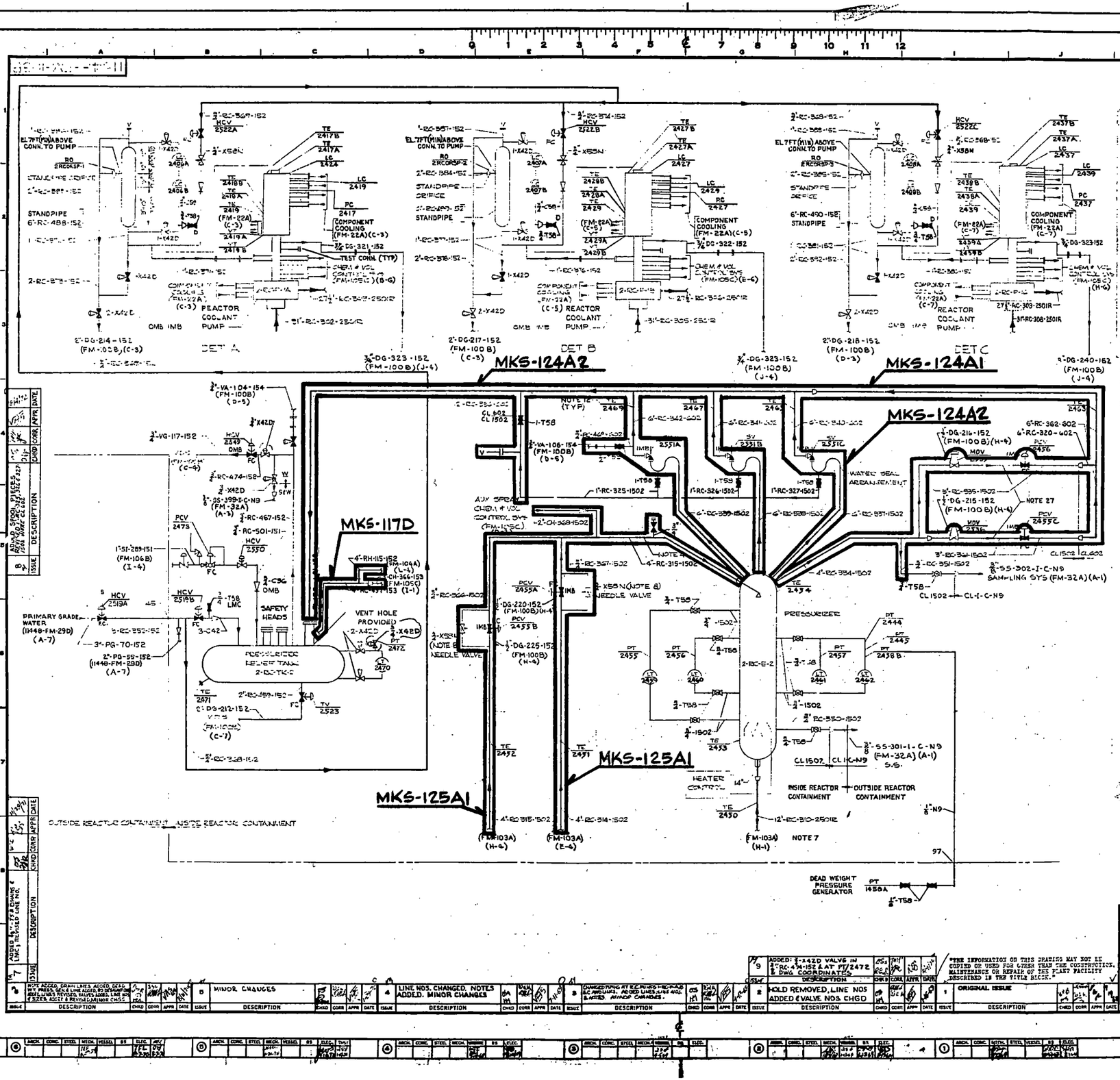
APPROVED R. M. Simonetti CERTIFIED PROFESSIONAL ENGINEER, NO. 04123 COMMONWEALTH OF VIRGINIA

# FLOW DIAGRAM REACTOR COOLANT SYSTEM SHEET 1

1972 EXTENSION—SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 11548-FM-103A

Designed by
Des. Ch'd by
Drawn by R.R. REID
Ch'd by C.E. MOORE




NOTES:

1. 27 1/2°, 29° and 31° BENDS TO REDUCE RISERTEN.
2. ALL GLASS 25CLS PIPING SUPPLIED BY WESTINGHOUSE FOR DETAILS SEE W SPEC. 676340, 676342 AND 676343. ALL OTHER CLASSES - PIPING SPEC. NGS-20.
3. ALL STEM TEMPERATURES TESTS TO BE FLANGED OFF WITH 1,500 LB RF 316SS BLIND FLANGE DURING NORMAL OPERATION.
4. PROVIDE WATER SEAL AT SPRAY VALVE.
5. GLOBE VALVES NORMALLY INSTALLED WITH FLOW UNDER SEAT EXCEPTIONS ARE VALVES 2-758 DOWNSTREAM OF VALVES 8V/RC
6. INDICATES CONNECTION WITH THERMAL SLEEVE. -2356A, B, ETC.
7. SCHEDULE 160 PIPE.
8. PROVIDE EXTENSION STEM FOR ADJUSTMENT DURING NORMAL OPERATION.
9. STELLITE - PIPING SPECIFICATION.
10. ACCESS FOR INSPECTION OF REACTOR COOLANT PIPE TO REACTOR VESSEL NOZZLE WELDS TO BE PROVIDED.
11. TEST CONNECTIONS FOR LOOP STOP VALVE ANALYSIS
12. PLACE INSULATION AT BOTTOM OF PIPE.
13. SCHEDULE 140 PIPE.
14. 0.25" BORE VENTURI VALVE FLOW.
15. LOCATE BELOW ELEVATION OF REACTOR VESSEL FLANGE.
16. LOCAL COLLECTOR RINGS FOR DETECTING LEAKAGE PATH.
17. LOCATE CONNECTION 45° BELOW HORIZONTAL CENTER LINE.
18. HOT LEG BYPASS LINE 8020B - ALL LOCATED IN SAME QUAD-SECTIONAL PLANE (SEE SECTION A-A)
19. RTD MANIFOLD AND RTD'S SUPPLIED AS PACKAGE BY WESTINGHOUSE (MANIFOLD APPROXIMATELY 30° LONG).
20. LOCATE VALVES APPROXIMATELY 9" FROM MANIFOLD
21. LOCATE CONNECTIONS ON UPPER LOOP OF PIPE CIRCUMFERENCE
22. LOCATE VALVE ABOVE CENTER LINE ELEVATION OF REACTOR VESSEL NOZZLES.
23. TOTAL LENGTH OF HOT LEG 29° SECTION UPSTREAM OF RTD MANIFOLD A TO D TO BE A MAXIMUM OF 4'-6 1/2". ALL BYPASS LOOP PIPING AND RTD MANIFOLDS SHALL HAVE REMOVABLE INSULATION UP TO LOOP ROOT VALVES
24. TOTAL LENGTH OF COLD LEG SECTION UPSTREAM OF RTD MANIFOLD C TO D TO BE A MAXIMUM OF 6'-6".
25. RTD INSTALLED IN WELL
26. PARALLEL PIPE PATHS SHOULD BE APPROXIMATELY EQUIVALENT LENGTHS. FLOW PATH LENGTHS OF EACH 1" PIPING SECTION SHOULD NOT EXCEED 10'-0".
27. PROVIDE WATER SEAL FOR RELIEF VALVES
28. LOCATE ORIFICE IN BYPASS RETURN LINE WITH MINIMUM OF 20 PIPE DIAMETERS UP UPSTREAM STRAIGHT RUN.
29. FLANGES INSTALLED FOR INSERTION OF FLOW LIMITING ORIFICES IF REQUIRED. BLANK ORIFICE PLATE WILL BE DRILLED IN FIELD AS REQUIRED.
30. DRAIN LINES TO BE SLOPED DOWN FROM LOOP SEALS TO CONNECT WITH COMMON RELIEF LINE TO PRESSURIZER RELIEF TANK.

LEGEND
A.C. - INDICATED MANUAL VALVE POSITION MAINTAINED BY ADMINISTRATIVE CONTROL WHICH IS CONSIDERED EQUIVALENT TO A LOCKED VALVE
(MB-INSIDE / MB-OUTSIDE) - MISSILE BARRIER AND/OR SECONDARY SHIELD
F.O. - FAIL OPEN
F.C. - FAIL CLOSED
D - LOCAL DRAIN
V - LOCAL VENT
S - TRIPPED BY SAFEGUARDS INITIATION SYSTEM
- NEEDLE VALVE
- HEAT TRACING
- DIAPHRAGM VALVE WITH AIR OPERATOR
LMC - LEAKAGE MONITORING CONNECTION

REFERENCE DWGS:

| | |
|---|---|
| COMPONENT COOLING SYSTEM | FM-22A&B |
| SAMPLING SYSTEM | FM-32A |
| VENT & DRAIN SYSTEM | FM-100B |
| REACTOR COOLANT SYSTEM | FM-103A |
| RESIDUAL HEAT REMOVAL | FM-104A |
| CHEM & VOLUME CONTROL | FM-105B&C |
| SAFETY INJECTION SYSTEM | FM-106B |
| BORON RECOVERY SYSTEM | 11448-FM-29A&D |

R. M. SIMONETTI NO. 04123 CERTIFIED PROFESSIONAL ENGINEER COMMONWEALTH OF VIRGINIA

# FLOW DIAGRAM REACTOR COOLANT SYSTEM SHEET 2

1972 EXTENSION—SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 11548 - FM-103B

*THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.*

| ISSUE | DESCRIPTION | CHKD | CORR | APPR | DATE |
|---|---|---|---|---|---|
| 9 | ADDED: 3-142D VALVE IN 2"RC-474-152 & AT PT/2472 & DWG COORDINATES | | | | |
| 8 | MINOR CHANGES | | | | |
| 7 | NOTE ADDED, DRAIN LINES ADDED, DEAD END LINES DELETED, LINE NOS. CHANGED, NOTES ADDED, LINES REVISED, VALVES, LINES & LINE NOS. ADDED & REVISED, MINOR CHGS. | | | | |
| 6 | LINE NOS. CHANGED, NOTES ADDED. MINOR CHANGES | | | | |
| 5 | CHANGED PIPING AT EC RUNS 1-RC-A-NB & EC AND LINES. ADDED LINES 3-RC-402 & 403 ES. MINOR CHANGES. | | | | |
| 4 | HOLD REMOVED, LINE NOS ADDED & VALVE NOS CHGD | | | | |
| 3 | ORIGINAL ISSUE | | | | |

Designed by
Dsn. Ch'd by
Drawn by H.H. SADLER
Chk'd by G.T. REYNOLDS

11548-FM-104A

RESIDUAL HEAT REMOVAL EXCHANGERS

RESIDUAL HEAT REMOVAL PUMPS

TO LET DOWN HDR

2-RH-E-1A

2-RH-E-1B

2-RH-P-1A

2-RH-P-1B

SEAL COOLER 2-RH-E-2A

SEAL COOLER 2-RH-E-2B

MECHANICAL SEAL FACE & BEARING COOLING FM-22A (TYP)

MECHANICAL SEAL TELL-TALE (TYP)

SAMPLE (FM-32A) (A-1)

INSIDE | OUTSIDE REACTOR CONTAINMENT

SEAL WATER RETURN RELIEF VALVE DISCH. (FM-108C)(C-4)

LOOP DRAIN HDR RELIEF VALVE DISCH. (FM-100B)(C-3)

ACCUMULATORS TEST LINE RELIEF VALVE (FM-108B)(C-3)

PRIMARY DRAIN TRANSFER TK RELIEF VALVE DISCHARGE (FM-100B)

MKS-117A1

MKS-117B1

MKS-117C1

MKS-117D1

MKS-122D1

NOTE 5

NOTE 4

NOTE 6

REFERENCE DWGS:

| | |
|---|---|
| FLOW DIAGRAM COMPONENT COOLING | FM-22A |
| FLOW DIAGRAM SAMPLING | FM-32A |
| FLOW DIAGRAM VENT & DRAIN | FM-100B |
| FLOW DIAGRAM CONTAINMENT & RECIRC. SPRAY SYS. | FM-101A |
| FLOW DIAGRAM REACTOR COOLANT | FM-105A(B |
| FLOW DIAGRAM CHEMICAL & VOLUME CONTROL | FM-108C |
| FLOW DIAGRAM SAFETY INJECTION | FM-106B |
| VALVE OPER. NO. RESIDUAL HEAT REMOVAL SYS. | FM-87A |

LEGEND:

D INDICATES LOCAL DRAIN CONNECTION
V INDICATES LOCAL VENT CONNECTION
OMB OUTSIDE MISSILE BARRIER
IMB INSIDE MISSILE BARRIER
T PLUGGED CONNECTION

NOTES:

1. VALVES ARE NORMALLY INSTALLED WITH FLOW UNDER SEAT.
2. REACTOR COOLANT PRESSURE INTERLOCK PREVENTS ISOLATION VALVE OPENING ABOVE SET PRESSURE.
3. LOCATE ISOLATION VALVE CLOSE TO MAIN HEADER.
4. LOCATE CONNECTION IN BOTTOM HALF OF REACTOR COOLANT PIPING ON 45° ANGLE TO VERTICAL
5. FLANGES ARE 300 LB. STAINLESS STEEL TYPE 316

R. M. SIVONETTI NO. 04123 — COMMONWEALTH OF VIRGINIA — REGISTERED PROFESSIONAL ENGINEER

APPROVED R. M. Sivonetti 4-23-74

THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.

# FLOW DIAGRAM RESIDUAL HEAT REMOVAL SYSTEM

1972 EXTENSION - SURRY POWER STATION

VIRGINIA ELECTRIC AND POWER COMPANY

STONE & WEBSTER ENGINEERING CORPORATION BOSTON, MASS.

DRAWING NUMBER 11548-FM-104A

| ISSUE | DESCRIPTION | CHKD | CORR | APPR | DATE |
|---|---|---|---|---|---|
| 7 | RV-2271 CHGD TO 2721 | | | | |
| 6 | RH-124 ETC REMOVED, LINES NO. CC-253, 264, 261 & 262 CHGD TO 271, 272, 274, & 275, DG LINES REVISED. | | | | |
| 5 | SYSTEM DESIGNATIONS REVISED FROM W. WASTE, NOS IONS & AIR NOTES ADDED, PIPING SPECS AT AIR PUMPS & DG CONN ADDED, MINOR CHANGES. | | | | |
| 4 | GENERAL REVISION | | | | |
| 3 | ADDED LINE NOS, DELETED DG LINES & REFERRED TO FM-100B & MINOR CHGS. | | | | |
| 2 | ADDED LINE NOS. & CLASS. MINOR CHGS. | | | | |
| 1 | ORIGINAL ISSUE | | | | |

11548-FM-105B

TCV-CC 203 (11448-FM-22E)

NONREGENERATIVE HEAT EXCHANGER

2-CH-E-2

SHELL SIDE VENTS

7 ½" TUBE SIDE DRAINS

SHELL SIDE DR

TUBE SIDE DR

TO DEBORATING, CATION FM MIXED BED DEMINERALIZERS (FM-105A)

FROM DEBORATING, CATION & MIXED BED DEMINERALIZERS (FM-105A)

REACTOR COOLANT FILTER 2-CH-FL-2

TO PRIMARY DRAIN TANK (FM-100A)

VOLUME CONTROL TANK 2-CH-TK-2

2-CH-FL-3 SEAL WATER FILTER

2-CH-E-1 SEAL WATER HT EXCHANGER

2-CH-P-1A

2-CH-P-1B

2-CH-P-1C

CHARGING PUMPS

SEAL WATER INJECTION FILTERS

CHEMICAL MIXING TANK 2-CH-TK-3

FROM BORIC ACID FILTER (11448-FM-105A)

FROM LOW HEAD SAFETY INJECTION PUMP DISCH

WATER STORAGE TANK

OUTSIDE REACTOR CONTAINMENT

INSIDE REACTOR CONTAINMENT

HYDRO TEST CONN

LOCAL TEMP SAMPLE CONN

MKS-127G1

NOTE:
DEVELOPED FROM M 684J303
GENERAL NOTES & REF. DWG. SEE FM-105 A
THE VALVES LISTED BELOW ARE SUPPLIED BY S&W
ALL OTHER VALVES ARE SUPPLIED BY WESTINGHOUSE
2. ½"VDS-15Y
2. ½"-VCS-15X
1. 1"-VDS-15Y

| NO. | DESCRIPTION |
|---|---|
| 12 | CHANGED VC VALVE FOR SEAL INJECTION (A-7) |
| 11 | DELETE PIPES & VALVES ON 2201, 4151 & 1503 (F-3, F-6) FOR DC 73-43 |
| 10 | ADDED VENTS, DRAINS, LINE SPECS & LINE NO. |
| 9 | ADDED VENTS, DRAINS, LINE SPECS & SEAL DATES |
| 8 | MOVED 2-CH-FL-5 PIPING, REVISED PCV 2117 A CHECK VALVE TRACER V-4-43). |
| 7 | REVISED INSTRUMENTATION, FILTERS & PIPING ADDED MINOR CHANGES |
| 6 | SYS DESIGNATIONS REMOVED FROM W INSTR. NOS. 1000 & UP. MINOR CHGS & LINES ADDED OR REMOVED |
| 5 | GENERAL REVISION |
| 4 | REDRAWN & LINE NO. CHGS. |
| 3 | ORIGINAL ISSUE |

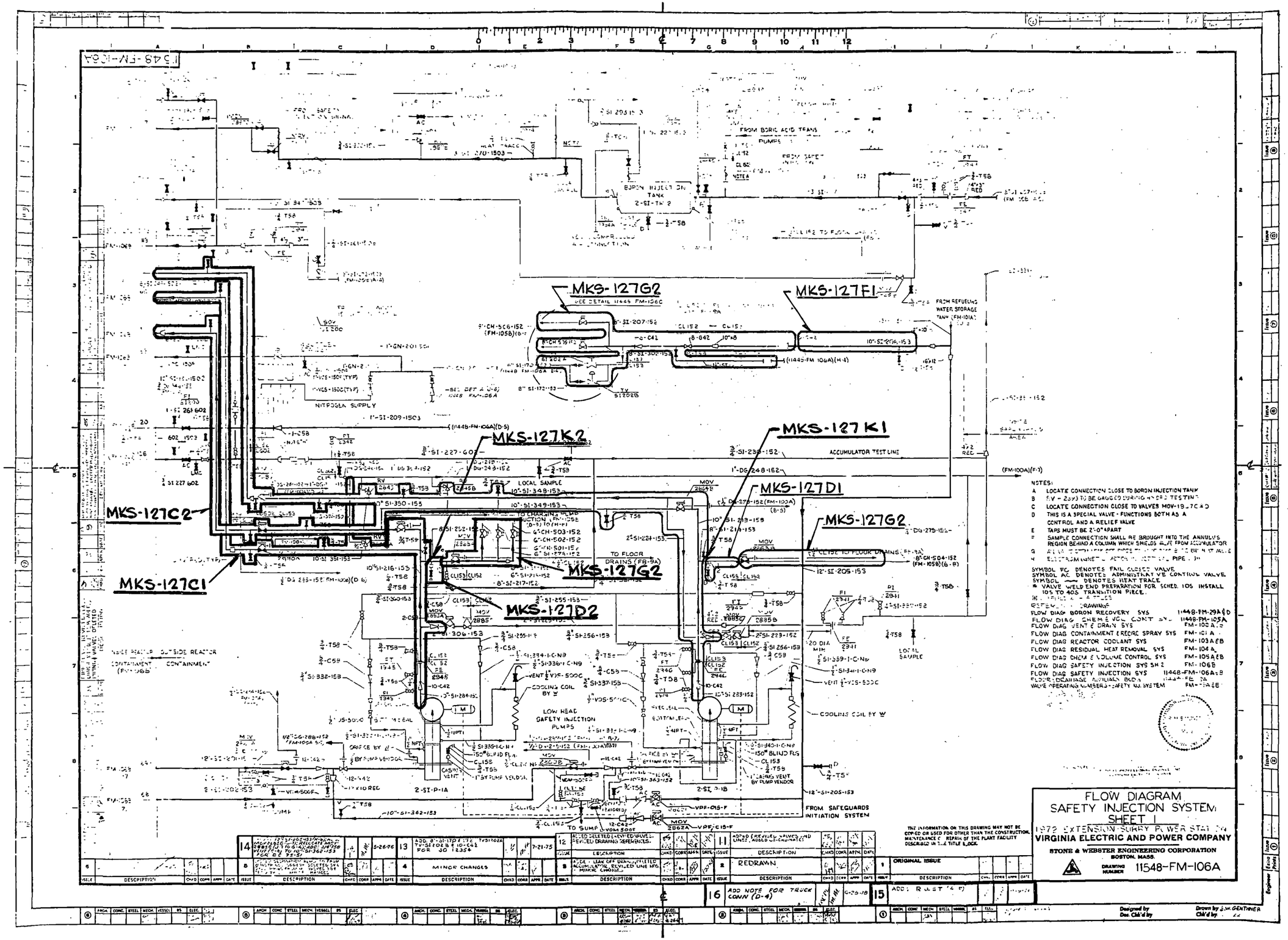
THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.

APPROVED M. R. Hummel, Jr. 04523

FLOW DIAGRAM
CHEM & VOLUME CONTROL SYS
SHEET-2
1972 EXTENSION · SURRY POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 11548-FM-105B

Designed by
Dsn. Ch'd by




NOTES:

A LOCATE CONNECTION CLOSE TO BORON INJECTION TANK
B F.V. = 2293 TO BE GAGGED DURING HYDRO TESTING
C LOCATE CONNECTION CLOSE TO VALVES MOV-1867C AND D
D THIS IS A SPECIAL VALVE - FUNCTIONS BOTH AS A CONTROL AND A RELIEF VALVE
E TAPS MUST BE 2'-0" APART
F SAMPLE CONNECTION SHALL BE BROUGHT INTO THE ANNULUS REGION BEHIND A COLUMN WHICH SHIELDS VALVE FROM ACCUMULATOR
G [illegible]
H ELECTROMAGNET - ASTRO [illegible] PIPE - [illegible]

SYMBOL FC DENOTES FAIL CLOSED VALVE
SYMBOL AC DENOTES ADMINISTRATIVE CONTROL VALVE
SYMBOL ——— DENOTES HEAT TRACE
* VALVE WELD END PREPARATION FOR SCHED. 10S INSTALL 10S TO 40S TRANSITION PIECE.

REFERENCE DRAWINGS

| | |
|---|---|
| FLOW DIAG BORON RECOVERY SYS | 11448-FM-29A&D |
| FLOW DIAG CHEM & VCL CONT SYS | 11448-FM-105A |
| FLOW DIAG VENT & DRAIN SYS | FM-102A,B |
| FLOW DIAG CONTAINMENT & RECIRC SPRAY SYS | FM-101A |
| FLOW DIAG REACTOR COOLANT SYS | FM-103A&B |
| FLOW DIAG RESIDUAL HEAT REMOVAL SYS | FM-104A |
| FLOW DIAG CHEM & VOLUME CONTROL SYS | FM-105A&B |
| FLOW DIAG SAFETY INJECTION SYS SH 2 | FM-106B |
| FLOW DIAG SAFETY INJECTION SYS | 11448-FM-106A&B |
| FLOOR DRAINAGE AUXILIARY BLDG | [illegible] FB-3A |
| VALVE OPERATING NUMBERS - SAFETY INJ SYSTEM | FM-106B |

| ISSUE | DESCRIPTION | CHKD | CORR | APPR | DATE |
|---|---|---|---|---|---|
| 14 | ADD 8"-SI-170 & 172, TV-SI-202A & 202B, MOV-1867C & D, 10"-CS-42 FOR JO 12354 | | | | 7-21-75 |
| 13 | MINOR CHANGES | | | | 5-26-76 |
| 12 | ADDED DELETED & REVISED VALVES, REVISED DRAWING REFERENCES. | | | | |
| 11 | ADDED (NEW) VALVES AND LINES, ADDED CO-ORDINATES | | | | |
| 10 | ADDED LEAK OFF DRAIN, DELETED ACCUMULATOR, REVISED LINE NOS. - MINOR CHANGES | | | | |
| 9 | REDRAWN | | | | |
| 8 | | | | | |
| 7 | ORIGINAL ISSUE | | | | |
| 16 | ADD NOTE FOR TRUCK CONN (D-4) | | | | 4-29-78 |
| 15 | ADD: R.J.S.T. (4 P) | | | | |

THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE & REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.

# FLOW DIAGRAM SAFETY INJECTION SYSTEM SHEET 1

1970 EXTENSION SURRY POWER STATION

**VIRGINIA ELECTRIC AND POWER COMPANY**

STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 11548-FM-106A

Designed by
Des. Ck'd by

Drawn by J.W. GENTHNER
Ck'd by

11548-FM-106B

MKS-122 J-1

MKS-122 L-1

MKS-122 D-1

MKS-122A-1

CL1502 CL1503

INSIDE MISSILE BARRIER | OUTSIDE MISSILE BARRIER

INSIDE REACTOR CONTAINMENT | OUTSIDE REACTOR CONTAINMENT

ACCUMULATOR TANK NO.1 2-SI-TK-1A

ACCUMULATOR TANK NO.2 2-SI-TK-1B

ACCUMULATOR TANK NO.3 2-SI-TK-1C

ACCUMULATOR TANKS

LOOP NO.1

LOOP NO.2

LOOP NO.3

6"RC-317-1502 COLD LEG LOOP 1 (FM-103A) (E-3)

6"RC-319-1502 COLD LEG LOOP 2 (FM-103A) (E-2)

6"RC-320-1502 COLD LEG LOOP 3 (FM-103A) (E-4)

6"RC-318-1502 HOT LEG LOOP 2 (FM-103A) (E-6)

6"RC-316-1502 HOT LEG LOOP 1 (FM-103A) (E-1)

6"RC-321-1502 HOT LEG LOOP 3 (FM-103A) (E-2)

LOOP 1 COLD LEG (RCS) (FM-103A)(E-5) 12"RC-322-1502

LOOP 2 COLD LEG (RCS) (FM-103A)(E-8) 12"RC-323-1502

LOOP 3 COLD LEG (RCS) (FM-103A)(E-7) 12"RC-324-1502

REACTOR CONTAINMENT SUMP (FM-101A)(C-8)

SEE NOTE 'E' (TYP) 2'-0"

LOCAL SAMPLE SEE NOTE F

FROM SAFETY INJECTION SIGNAL

FROM SAFETY INJECTION SYSTEM

FROM SAFETY INJECT SIGNAL

SEE DET. 'B'

LEVEL TRANSMITTERS SEE ACCUMULATOR TANKS 1, 2 & 3

NOTES:
GENERAL NOTES & REF DWGS. - FM-106A
Δ ADDITIONAL CHECK VALVES INSTALLED TO PROVIDE 2 VALVE ISOLATION

# FLOW DIAGRAM SAFETY INJECTION SYSTEM SHEET 2

1973 EXTENSION-SURRY POWER STATION

VIRGINIA ELECTRIC AND POWER COMPANY

STONE & WEBSTER ENGINEERING CORPORATION BOSTON, MASS.

DRAWING NUMBER 11548-FM-106B

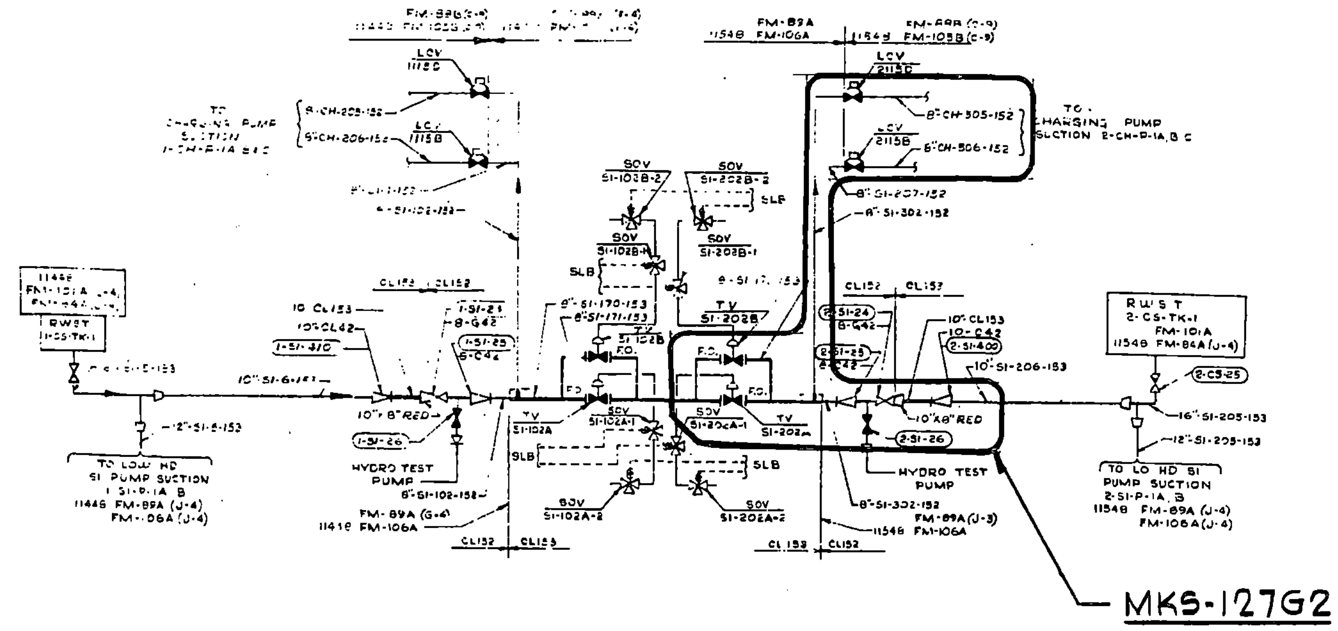
| ISSUE | DESCRIPTION | CHKD | CORR | APPR | DATE |
|---|---|---|---|---|---|
| 11 | ADD VV'S & LINES TO ACCU. TANKS A, B & C & REVISED DET. 'B' DC 76-46 | | | | 3-29-77 |
| 10 | ADD LEVEL TRANSMITTERS TO TANKS 1, 2 & 3; DET 'B' (C-8) FOR DC 73-83 | | | | 4-29-76 |
| 9 | ADDED VALVE, REVISED VALVES, LINE NO. CONG REFS. | | | | |
| 8 | ADDED AND REVISED VALVES, LINES AND LINE NUMBERS. | | | | |
| 7 | SYSTEM DESIGNATIONS REMOVED FROM WATER POS. 1000 & 1100 AREAS CONTROL ROOM HOUSE & CONTROL FOR NOV/DEC 1975 | | | | |
| 6 | ADDED 12-SI-202-153, 12-SI-203-153, 12-SI-201-153 | | | | |
| 5 | MINOR CHANGES | | | | |
| 4 | ADDED LEAKOFF DRAINS REVISED LINE NOS. MINOR CHANGES | | | | |
| 1 | ORIGINAL ISSUE | | | | |



Designed by Dsn. Ch'd by

Drawn by S.W. GUENTHNER Ch'd by G. ARENA

APPROVED R. M. SIMONETTI No. 6413 REGISTERED PROFESSIONAL ENGINEER COMMONWEALTH OF VIRGINIA



1 ORIGINAL ISSUE
RWST CROSSTIE (A-?, 1-4)
11-9-76

FLOW & VALVE NUMBERS
R.W.S.T. CROSSTIE

SURRY POWER STATION
V. E. P. C. O.

11448-FM-106C

SURRY POWER STATION - UNIT 2

APPENDIX C

RESPONSE TO
IE BULLETIN 79-04

SURRY POWER STATION - UNIT 2

APPENDIX C

RESPONSE TO IE BULLETIN 79-04

Velan swing check valves, sized 3 and 6 inches, are installed in the following seismic Category I piping systems:

a) Chemical and volume control system

b) Safety injection systems

A detailed listing by line number is contained in the following table.

Lines with 6 inch check valves were originally seismically analyzed by computer program or hand calculations. The re-evaluation of these systems using the correct valve weight is currently being done under the NUPIPE program. The results have shown that the pipe stress is within the allowable for all lines.

Lines with 3 inch check valves were analyzed originally by hand calculations. An estimated weight, overly conservative, was used instead of actual valve weights. The incorrect valve weight has no effect on these calculations and re-evaluation is not required, however, these valves and the related pipe lines are included in the scope of IE Bulletin 79-14.

SURRY POWER STATION - UNIT 2

LISTING OF VELAN SWING CHECK VALVES

COVERED BY IE BULLETIN NO. 79-04

SAFETY INJECTION SYSTEMS - UNIT 2

| | | |
|---|---|---|
| 6 Inch | 2-SI-79 | 6-RC-317-1502 |
| | 2-SI-82 | 6-RC-319-1502 |
| | 2-SI-85 | 6-RC-320-1502 |
| | 2-SI-88 | 6-RC-318-1502 |
| | 2-SI-91 | 6-RC-316-1502 |
| | 2-SI-94 | 6-RC-321-1502 |
| | 2-SI-228 | 6-SI-249-1502 |
| | 2-SI-229 | 6-SI-249-1502 |
| | 2-SI-238 | 6-SI-248-1502 |
| | 2-SI-239 | 6-SI-249-1502 |
| | 2-SI-240 | 6-SI-250-1502 |
| | 2-SI-241 | 6-SI-345-1502 |
| | 2-SI-242 | 6-SI-344-1502 |
| | 2-SI-243 | 6-SI-353-1502 |
| 3 Inch | 2-SI-224 | 3-SI-346-1503 |
| | 2-SI-225 | 3-SI-270-1503 |
| | 2-SI-226 | 3-SI-347-1503 |
| | 2-SI-227 | 3-SI-272-1503 |

CHEMICAL AND VOLUME CONTROL SYSTEM - UNIT 2

| | | |
|---|---|---|
| 3 Inch | 2-CH-196 | 3-CH-500-1502 |
| | 2-CH-258 | 3-CH-381-1503 |
| | 2-CH-267 | 3-CH-302-1503 |
| | 2-CH-276 | 3-CH-303-1503 |
| | 2-CH-309 | 3-CH-379-1503 |
| | 2-CH-312 | 3-CH-301-1502 |

# APPENDIX D

# CORRESPONDENCE WITH THE NRC

SURRY POWER STATION - UNIT 2

APPENDIX D

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 IE Bulletin No. 79-14, Revision 1 |
| 7 | 8/15/79 | O'Reilly | Proffitt | Letter of Guidance on IE 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 |

SURRY POWER STATION - UNIT 2

APPENDIX D (Cont'd)

CORRESPONDENCE WITH NRC

| Item No. | Date | Signature | Addressee | Letter No./Subject |
|---|---|---|---|---|
| | | | VEPCO TO NRC | |
| 14 | 3/30/79 | Spencer | Denton/ Stello | 198/Initial Response to Show Cause Order |
| 15 | 4/19/79 | Stallings | O'Reilly | 270/LER 79-010/013L-0 |
| 16 | 4/23/79 | Spencer | O'Reilly | 289/Response to IE Bulletin No. 79-07 |
| 17 | 4/24/79 | Spencer | O'Reilly | 288/Response to IE 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 |

1

SURRY POWER STATION - UNIT 2

APPENDIX D (Cont'd)

CORRESPONDENCE WITH NRC

| Item No. | Date | Signature | Addressee | Letter No./Subject |
|---|---|---|---|---|
| 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 |
| 33 | 8/31/79 | Spencer | Denton | Reanalysis of Piping Systems |
| 34 | 8/31/79 | Spencer | O'Reilly | 60-Day Response for IE 79-14 |
| 35 | 9/13/79 | Spencer | Eisenhut | Response to NRC Letter of 5/25/79 |
| 36 | 10/3/79 | Proffitt | Denton | Seismic Analysis of Piping Systems |
| 37 | 10/4/79 | Spencer | O'Reilly | Response to NRC Letter of 7/2/79 |
| 38 | 10/4/79 | Spencer | O'Reilly | Response to IE Letter Dated 9/7/79 |
| 39 | 10/15/79 | Spencer | O'Reilly | Extension of IE Bulletin 79-14 Deadline |
| 40 | 10/23/79 | Spencer | O'Reilly | Extension of IE Bulletin 79-14 Deadline, Unit 2 |
| 41 | 10/30/79 | Spencer | O'Reilly | 120-Day Response to IE 79-14 |
| 42 | 11/28/79 | Spencer | Denton | Seismic Analysis of Piping Systems |

1

SURRY POWER STATION - UNIT 2

APPENDIX D (Cont'd)

CORRESPONDENCE WITH NRC

| Item No. | Date | Signature | Addressee | Letter No./Subject |
|---|---|---|---|---|
| 43 | 12/7/79 | Spencer | O'Reilly | Response to NRC Letter of 11/8/79 |
| 44 | 12/13/79 | Spencer | Denton | Show Cause Order Reanalysis |
| 45 | 12/21/79 | Spencer | O'Reilly | Show Cause 60 Days Analysis Completion |
| 46 | 2/1/80 | Spencer | Denton | Show Cause Modification Schedule Revision |
| 47 | 2/22/80 | Spencer | Denton | Start-up Request for Surry Unit 2 |
| 48 | 3/21/80 | Spencer | Denton | Amended Start-up Request for Surry Unit 2 |
| 49 | 3/28/80 | Spencer | Denton | Show Cause Report Errata for Surry Unit 1 |
| | | | S&W to NRC | |
| 50 | 3/22/79 | Kennedy | Denton | Transmittal of S&W Computer Programs |
| 51 | 3/30/79 | Jacobs | Herring | Submittal of Computer Outputs |
| 52 | 4/3/79 | Jacobs | Bezler | Submittal of Benchmark Problem to Brookhaven National Laboratory |
| 53 | 4/6/79 | Kennedy | Denton | Transmittal of S&W Computer Programs |
| 54 | 4/6/79 | Jacobs | Stello | Plan for Verification of Dynamic Analysis Codes |
| 55 | 4/11/79 | Jacobs | Bezler | Submittal of Computer Outputs |
| 56 | 4/13/79 | Jacobs | Stello | Update and Status of Verification Plan for Dynamic Analysis Codes |

1

SURRY POWER STATION - UNIT 2

APPENDIX D (Cont'd)

CORRESPONDENCE WITH NRC

| Item No. | Date | Signature | Addressee | Letter No./Subject |
|---|---|---|---|---|
| 57 | 4/18/79 | Jacobs | Hartman | Submittal of Computer Outputs |
| 58 | 4/27/79 | Jacobs | Bezler | Submittal of Benchmark Problems |
| 59 | 4/27/79 | Jacobs | Stello | Status of Verification Plan for Dynamic Analysis Codes |
| 60 | 5/8/79 | Rossier | Neighbors | Draft Outline of SSI-ARS Report |
| 61 | 5/9/79 | Kennedy | Stello | Reference SHOCK 0 Program |
| 62 | 5/11/79 | Kennedy | Stello | Reference SHOCK 0 Program 1 |
| 63 | 5/14/79 | Kennedy | Denton | Proprietary Computer Codes |
| 64 | 6/4/79 | Jacobs | Bezler | Submittal of Benchmark Problems |
| 65 | 6/12/79 | Jacobs | Bezler | Submittal of Benchmark Problems |
| 66 | 9/6/79 | Allen | Stello | Response to NRC Letter of 8/10/79 |
| | | Ebasco to NRC | | |
| 67 | 9/7/79 | Nelson | Hartzman | Benchmark Problem VEP/NRC/001 |
| 68 | 1/3/90 | Nelson | Hartzman | Benchmark Problem VEP/NRC/002 |