Progress Energy

OCT 04 2010

Serial: HNP-10-098
10 CFR 50.55a

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING RELIEF REQUEST I3R-06

References:
1. Letter from D. H. Corlett to the Nuclear Regulatory Commission (SERIAL: HNP-10-004), "Relief Request From ASME Boiler and Pressure Vessel Code, Section XI Requirements for the Service Water System," dated April 15, 2010

2. Letter from M. Vaaler, Nuclear Regulatory Commission, to C. L. Burton, "Shearon Harris Nuclear Power Plant, Unit No. 1 - Request for Additional Information Regarding a Relief Request to Defer an American Society of Mechanical Engineers Code-Required Repair of a Service Water System Weld until the Next Refueling Outage (TAC NO. ME3765)," dated September 22, 2010

Ladies and Gentlemen:

On September 22, 2010, Harris Nuclear Plant (HNP) received a request from the NRC (Reference 2) for additional information needed to facilitate the review of proposed Relief Request I3R-06. HNP submitted this original request as Serial: HNP-10-004 (Reference 1).

Enclosure 1 to this letter provides the requested additional information.

Enclosure 2 to this letter provides a revised section, 6.5 GL 90-05 Through-Wall Flaw Evaluation, of relief request I3R-06. Inputs to the flaw evaluation were changed after review by HNP's Mechanical/Structural Engineering. The deadweight contribution to total stress was eliminated because the line is in a vertical orientation and attached to a massive pipe. Additionally, the mean pipe radius calculation was revised to conservatively assume a pipe thickness equal to $t_{min}$. The previous calculation assumed a pipe thickness equal to $t_{nom}$.

This document contains no new or revised Regulatory Commitments.

Please refer any questions regarding this submittal to me at (919) 362-3137.

**Progress Energy Carolinas, Inc.**
Harris Nuclear Plant
P. O. Box 165
New Hill, NC 27562

A047
NRR

Sincerely,

John R. Caves

J. R. Caves
Supervisor – Licensing/Regulatory Programs
Harris Nuclear Plant

JRC/kms

Enclosures:
1. Response to Request for Additional Information Regarding Relief Request I3R-06
2. 10 CFR 50.55a Request I3R-06, Revision 1 to Section 6.5

cc:
Mr. J. D. Austin, NRC Sr. Resident Inspector, HNP
Mr. L. A. Reyes, NRC Regional Administrator, Region II
Ms. M. G. Vaaler, NRC Project Manager, HNP

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING RELIEF REQUEST I3R-06

Summary

By letter dated April 15, 2010, Progress Energy Carolinas, Inc. (the licensee) submitted relief request (RR) I3R-06 for the U.S. Nuclear Regulatory Commission (NRC) review and approval. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(5)(iii), the licensee requested relief from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, requirements for the service water system. RR I3R-06 pertains to a temporary non-Code repair of ASME Code Class 3 piping (i.e. interface between a sockolet and sockolet-to-pipe carbon steel weld on line 3SW3/4-1630SA-l to a three-quarter inch supply piping to root valve lSW-1344) in the service water system.

The NRC staff has reviewed the information provided by the licensee in RR I3R-06 and finds additional information is needed to complete its review.

**Request 1:**
Please state the current operating temperature and pressure of service water in the subject pipe for which relief is requested.

**Response:**
The current operating pressure and temperature of 3SW3/4-1630SA-1 is 64 psig and 89°F while operating on the NSW pump. On July 28, 2010, while 3SW3/4-1630SA-1 was supplied by the "A" ESW pump, the operating pressure and temperature was 59 psig and 88°F. Per the design basis, the maximum operating temperature and pressure are 95°F and 130 psig respectively.

**Request 2:**
On page 7, Section 6.4, it is stated that "the maximum pipe stress ratio from Calculation 8050-79 at this location is 0.466." Please explain how 0.466 was obtained. In addition, state the technical purpose behind it and how this value affects the American Society of Mechanical Engineers Code required flaw evaluation.

**Response:**
The reference to the stress ratio of 0.466 was an error inadvertently transcribed from a previous evaluation. It is not needed for the GL 90-05 evaluation as reflected in the Supplement to the Relief Request I3R-06 (Enclosure 2).

**Request 3:**
In addition to the information requested above, please provide a detailed description of the input parameters, assumptions, and methodology used in Calculation 8050-79, such that the NRC staff can perform a comprehensive evaluation of this calculation.

**Response:**
Stress calculation 8050-79 is provided in the Attachment to this Enclosure.

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING RELIEF REQUEST I3R-06

# Attachment - Stress calculation 8050-79

MN/ML NO: 10451 ☐ PRELIMINARY ☐ INTERIM ☑ FINAL ☑ AS-BUILT

CALC. NO. 8050-79

550

ASME SECT. III CLASS 2 & 3 – ANALYST CHECKLIST

| | | MAX. STRESS RATIO (<1) |
|---|---|---|
| ✓ | THERMAL (1 CASES) | .191 |
| NR | LOCA/MSLB (1 CASES) | — |
| ✓ | WEIGHT OPERATING ☐ REF. ONLY | .200 |
| ✓ | WEIGHT TEST ☐ REF. ONLY | .095 |
| ✓ | RELIEF VALVE THRUST | .691 |
| NR | WIND/TORNADO EFFECTS | — |
| NR | FLUID (WATER/STEAM) HAMMER | — |
| NR | VIBRATION | — |
| ✓ | SEISMIC INERTIA (ØBE) | .440 |
| ✓ | SEISMIC INERTIA (DBE) | .500 |
| NR | SEISMIC BUILDING DISPLACEMENT (ØBE) | — |
| NR | SEISMIC BUILDING DISPLACEMENT (DBE) | — |
| ✓ | SEISMIC SECONDARY DISPLACEMENT (ØBE) 1/3G | .117 |
| NR | SEISMIC SECONDARY DISPLACEMENT (DBE) | — |
| NR | SETTLEMENT | — |
| NR | JET IMPINGEMENT | — |
| ✓ | OTHER EQ. 9 (FAULTED) | .383 |
| ✓ | EQUATION NO. 8 | .211 |
| ✓ | EQUATION NO. 9 (UPSET / EMERG.) | .741 / .511 |
| ✓ | EQUATION NO. 10 | .191 |
| ✓ | EQUATION NO. 11 | .161 |
| NR | RUPTURE EQUATION | — |

NR PIPE OD — (IN.) MAX. FORCE — (LB) — LOAD CASE

NR MAX. STRESS INTENSIFICATION FACTOR —

DATA REQUIRED TO COMPLETE ANALYSIS

| ITEM | DESIGNATION | DATA REQUIRED |
|---|---|---|
| 1 | HANGER | DESIGN, LOCATION & VERIFICATION |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Prf'd [signature] Date 11-27-85

Chk'd [signature] Date 12-20-85

PAGE 56

* See memo MN/ML #

ALL ITEMS MUST BE VERIFIED [V], OR INDICATED AS NOT REQUIRED [NR], OR NOT AVAILABLE [NA], OR PENDING/LATER [P]

EBASCO SERVICES INCORPORATED
NEW YORK, NY

STRESS ANALYSIS DEPARTMENT
SUMMARY SHEET

PROJECT: SHEARON HARRIS UNIT 1 TO 4

SYSTEM: SW - PIPING

ANALYST: E. VALCARCEL DATE 8/27/84

CHECKER: [signature] DATE 8/27/84

ISOMETRIC NO. 1A-261-SW-1 REV 4

622-3 (SH) 4-78

MN/ML . . . 1041

SHEARON HARRIS
CHECKER'S REVIEW

CALC. NO. 8050-79

**INPUT AND OUTPUT**

- [V] WAS CORRECT BUILDING RESPONSE SPECTRA ENVELOPED WITH 15% SHIFT
- [V] WERE CORRECT OPTIONS SELECTED IN 2010 PROGRAM
- [V] WERE ALL AND LATEST REF. DOCUMENTS LISTED ON ISOMETRIC
- [V] WERE ALL PIPING PHYSICAL DATA INPUT CORRECTLY ESPECIALLY SPECIFIC GRAVITY
- [V] WERE ALL TEMP AND PRESS. DATA INPUT CORRECTLY
- [NA] WAS EQUIPMENT, IF FLEXIBLE, MODELED CORRECTLY AND WAS MODEL INDICATED ON ISOMETRIC
- [V] WERE SIF'S INDICATED ALL TRUNNIONS, LUGS, ANCHORS, ETC
- [V] WERE ALL ASSUMPTIONS OR ENGINEERING JUDGEMENTS INDICATED ON ISOMETRIC
- [V] WERE ALL LOADING AND COMBINATION CASES CONSIDERED PER PIPING DESIGN SPEC
- [NA] IF PIPING WAS DECOUPLED WAS CORRECT DATA FROM MAIN RUN INPUT CORRECTLY
- [V] WERE EXCESSIVE FORCES AND MOMENTS VERIFIED
- [V] WERE STRESS RATIOS VERIFIED
- [NA] WERE SNUBBER RESTRICTIONS CONSIDERED
- [V] WERE CORRECT DEVICE SPRING CONSTANTS INPUT
- [NA] WERE WALL AND FLOOR PENETRATIONS CHECKED FOR RESTRICTIONS (DOES THE PENETRATION ACT AS AN ANCHOR)
- [NA] HAVE DIFFERENTIAL SEISMIC DISPLACEMENTS BETWEEN BUILDING BEEN INPUT CORRECTLY
- [V] HAS 1/3 G LOADING CASE BEEN SELECTED FOR SECONDARY SEISMIC EFFECTS
- [V] DID SNUBBERS ACT IN DIFFERENTIAL SEISMIC DISP'L CASE(S) AND OTHER DYNAMIC L.C.'S
- [V] WERE ALL FORCE, MOMENT, AND STRESS ALLOWABLES VERIFIED (EQUIP., PENET, VALVES)
- [NA] WERE RC LOOP LOCA DISPLACEMENTS CONSIDERED, IF APPLICABLE
- [NA] WERE HYDRODYNAMIC EFFECTS CONSIDERED
- [NA] WAS S.G. OPR DECK SPECTRA INCLUDED IN SC1 AND 2 ANALYSIS
- [NA] WAS WESTINGHOUSE LOOP SEISMIC DISPLACEMENTS CONSIDERED

**ISOMETRIC**

- [V] WERE ALL NEW DEVICES SHOWN ON ISO PER SYMBOL TABLE
- [V] HAS "ANALYSIS DATA" TABLE BEEN REVISED TO INDICATE NEW DATES, ANALYST, CHECKER, ETC
- [V] HAS VENT AND DRAIN "FIX" BEEN INDICATED, IF REQUIRED
- [V] HAS REVISION BOX BEEN REVISED TO REFLECT CHANGES
- [V] WERE SEISMIC DEVICES LOCATED PER WEIGHT SPANS FOR REV 0 PRELIMINARY ANALYSIS
- [V] WERE FLOORS, WALLS AND COLUMNS SHOWN AND USED TO LOCATE DEVICES
- [V] HAS "REF. DWG" TABLE BEEN REVISED TO INDICATE ALL NEW AND REVISED DATA
- [V] WAS EQUIPMENT, IF RIGID, SO INDICATED ON ISOMETRIC
- [V] HAS "INFO REQ'D TO COMPLETE ANALYSIS" TABLE BEEN CHECKED OFF
- [V] HAS MISSING DATA RESOLVED ITEMS BEEN LINED OUT
- [V] HAVE CROSS-REFERENCED DATA (ITEMS THAT APPEAR ON OTHER ISOS) BEEN INDICATED

**CHECK SHEETS**

- [V] HAVE ALL CHECK-OFF BOXES AND BLANKS BEEN FILLED IN
- [V] HAVE ALL SIGNATURE BOXES BEEN FILLED IN
- [V] HAS DATA REQUIRED TO COMPLETE ANALYSIS BEEN INDICATED

**HANGER AND RESTRAINT**

- [NA] WERE FRICTION FORCES, IF REQUIRED, INCLUDED AND IN CORRECT DIRECTION
- [V] WERE SPRING HANGERS/SUPPORTS INPUT CORRECTLY AND SHOWN ON ISO
- [NA] IF B.P. DEVICE WAS RELOCATED BY ANALYST WAS IT JUSTIFIED
- [NA] WERE B.P. DESIGNS VERIFIED, STAMPED REVIEWED, AND DEVIATIONS INDICATED ON PRINT

550

Prd [illegible] Date 11-27-85

Chkd [illegible] Date 12-26-85

ALL ITEMS MUST BE VERIFIED [V], OR
INDICATED AS NOT REQUIRED [NR], OR
NOT AVAILABLE [NA], OR PENDING/LATER [P]

CHECKER [illegible] DATE 8/27/84

APPROVED [illegible] DATE 8/28/84

Not available information has no impact on stress calculation per Shearon Harris Procedure No. 3

| ISOMETRIC NO. | REV |
|---|---|
| 1A-261-SW-1 | 4 |

PAGE 5

622-5 (SH) 5-78

EBASCO SERVICES INCORPORATED
STRESS ANALYSIS DEPARTMENT

SHEET 60 OF *

CAROLINA POWER AND LIGHT COMPANY
CLIENT

SHEARON HARRIS UNIT #1
PROJECT

550

OFS NO. 4667.390
DEPT NO. 600

# FLANGE EVALUATION SHEET

Flange Size 12" WN Rating 150# Calc No. 8050.79 Run Date 8-24-84 Iso No. 1K-161-GW-1 Rev. No. 1

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT LB MY | MOMENT IN FT LB MZ | BENDING MOMENTS MB FT LB | TORSIONAL MOMENTS MX FT LB | ALLOWABLE MOMENT |
|---|---|---|---|---|---|---|---|
| 3805 | | THERMAL | -35 | -338 | | 85 | |
| | | Sustained Loads | -41 | -883 | | -62 | |
| | | OBE – Occasional Loads | 392 | 6670 | | 752 | |
| | | DBE – Occasional Loads | 784 | 13339 | | 1505 | |
| tatic | A&B | Thermal+ Sustained Loads | -76 | -1221 | 1223 | -62 | 20281 |
| ynamic | A&B | Thermal+ Sustained Loads+ OBE | 468 | 7891 | 7905 | 812 | 40562 |
| | C&D | Thermal+ Sustained Loads+ DBE | 860 | 14560 | 14585 | 1567 | 64457 |
| 3801 | | THERMAL | 116 | 1074 | | -85 | |
| | | Sustained Loads | 33 | 1158 | | 62 | |
| | | OBE – Occasional Loads | 221 | 9122 | | 752 | |
| | | DBE – Occasional Loads | 443 | 18244 | | 1505 | |
| tatic | A&B | Thermal + Sustained Loads | 149 | 2232 | 2237 | 62 | 20281 |
| yne c | A&B | Thermal+ Sustained Loads+ OBE | 310 | 11354 | 11360 | 814 | 40562 |
| | C&D | Thermal+ Sustained Loads+ DBE | 592 | 20476 | 20485 | 1567 | 64457 |
| | | | | | | | |

NOTES:

1. MY and MZ are bending moments
2. If torsional moment is larger than bending moment, compare torisonal moment with allowable moment. Torsional moment is $M_x$
3. Flange Material A-161 Design Temp. 140°F $S_y$ 32.8 ksi $S_y/36$ .911, multiply table values by $S_y/36$ (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local co-ordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. $M_B$ is computed by combining My and Mz by the SRSS method.
8. Refer to SHNPP Procedure 055.
9. Design Pressure = 150 psi
10. Class 2/3Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

E.J. VALCARCEL DATE 8-27-84 CHECKED BY [illegible] DATE 8/27/84

EBASCO SERVICES INCORPORATED
STRESS ANALYSIS DEPARTMENT

SHEET 61 OF X

CAROLINA POWER AND LIGHT COMPANY
CLIENT

EFS NO. 2467.390

SHEARON HARRIS UNIT #1
PROJECT

550

DEPT NO. 600

# FLANGE EVALUATION SHEET

Flange Size 12" WN Rating 150# Calc No. 1050-79 Run Date 8-24-84 Iso No. 14-261-SW-1 Rev. No. 4

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT LB MY | MOMENT IN FT LB MZ | BENDING MOMENTS MB FT LB | TORSIONAL MOMENTS MX FT LB | ALLOWABLE MOMENT |
|---|---|---|---|---|---|---|---|
| 3822 | | THERMAL | 3153 | 3307 | | 410 | |
| | | Sustained Loads | 628 | 715 | | -195 | |
| | | OBE -- Occasional Loads | 1284 | 2122 | | 632 | |
| | | DBE -- Occasional Loads | 2568 | 4244 | | 1263 | |
| Static | A&B | Thermal+ Sustained Loads | 3781 | 4022 | 5520 | 215 | 20281 |
| Dynamic | A&B | Thermal+ Sustained Loads+ OBE | 5065 | 6144 | 7963 | 847 | 40562 |
| | C&D | Thermal+ Sustained Loads+ DBE | 6349 | 8266 | 10423 | 1478 | 64457 |
| 3818 | | THERMAL | -517 | 1132 | | -1140 | |
| | | Sustained Loads | -703 | -528 | | -3 | |
| | | OBE -- Occasional Loads | 1466 | 2941 | | 1094 | |
| | | DBE -- Occasional Loads | 2932 | 5883 | | 2187 | |
| Static | A&B | Thermal + Sustained Loads | -1220 | 604 | 1361 | -1143 | 20281 |
| Dynamic | A&B | Thermal+ Sustained Loads+ OBE | 2686 | 3545 | 4448 | 2237 | 40562 |
| | C&D | Thermal+ Sustained Loads+ DBE | 4152 | 6487 | 7702 | 3330 | 64457 |

NOTES:

DELETED
By REV. 55D

1. MY and MZ are bending moments
2. If torsional moment is larger than bending moment, compare torsional moment with allowable moment. Torsional moment is $M_X$
3. Flange Material A-181 Design Temp. 140 F $S_y$ 32.8 ksi
   $S_y/36$ .911, multiply table values by $S_y/36$ (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local co-ordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. $M_B$ is computed by combining My and Mz by the SRSS method.
8. Refer to SHNPP Procedure 055.
9. Design Pressure = 150 psi
10. Class 2/3Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

BY E. J. VALCARCEL DATE 8-27-84 CHECKED BY [illegible] DATE 8/27/84

Ofs No. 2667.390 Dept. No. 600

550

CLIENT: CAROLINA POWER AND LIGHT COMPANY

OJECT: SHEARON HARRIS NUCLEAR POWER PLANT - UNIT #1

SUBJECT: FLANGE EVALUATION SHEET

Flange Size 12" Rating 150# Calc No. 8050-79 Run Date 8-24-84 Iso No. 1A-261-SW-1 Rev # 4

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT-LB MY | MOMENT IN FT-LB MZ | BENDING MOMENTS MB FT-LB | TORSIONAL MOMENTS MX FT-LB | ALLOW. MOMENT |
|---|---|---|---|---|---|---|---|
| 3880 | | THERMAL | -368 | -213 | | 537 | |
| | | Sustained Loads | -145 | 127 | | 581 | |
| | | OBE - Occassional Loads | 591 | 771 | | 718 | |
| | | DBE - Occassional Loads | 1182 | 1541 | | 1437 | |
| Static | A&B | Thermal+Sustained Loads | -513 | 127 | 528 | 1118 | 20281 |
| Dynamic | A&B | Thermal+Sustained Loads+OBE | 1104 | 898 | 1423 | 1836 | 40562 |
| Dynamic | C&D | Thermal+Sustained Loads+DBE | 1695 | 1668 | 2378 | 2553 | 64457 |
| | | THERMAL | | | | | |
| | | Sustained Loads | | | | | |
| | | OBE - Occassional Loads | | | | | |
| | | DBE - Occassional Loads | | | | | |
| ...tic | A&B | Thermal+Sustained Loads | | | | | |
| Dynamic | A&B | Thermal+Sustained Loads+OBE | | | | | |
| Dynamic | C&D | Thermal+Sustained Loads+DBE | | | | | |
| | | | | | | | |

NOTES:
1. MY and MZ are bending moments.
2. If torsional moment is larger than bending moment, compare torsional moment with allowable moment. Torsional moment is $M_x$.
3. Flange Material A-181 Design Temp. 140 °F $S_y$ 32.6 ksi $S_y/36$ 1911, multiply table values by $S_y/36$ (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local co-ordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. $M_B$ is computed by combining My and Mz by the SRSS method.
8. Refer to SHNPP Procedure 055.
9. Design Pressure = 150 psi
10. Class 2/3 Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

BY E.J. Vallarelli DATE 8.27.84 CHECKED BY [signature] DATE 8/27/84

EBASCO SERVICES INCORPORATED
STRESS ANALYSIS DEPARTMENT

SHEET 63 OF 4

CAROLINA POWER AND LIGHT COMPANY
CLIENT

OFS NO. 2067-390

SHEARON HARRIS UNIT #1
PROJECT

550

DEPT NO. 600

## FLANGE EVALUATION SHEET

Flange Size 4 Rating 150 Calc No. 8050-79 Run Date 8-24-84 Iso No. 11-261-SW-1 Rev. No. 4

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT LB MY | MOMENT IN FT LB MZ | BENDING MOMENTS MB FT LB | TORSIONAL MOMENTS MX FT LB | ALLOWABLE MOMENT |
|---|---|---|---|---|---|---|---|
| | | THERMAL | -48 | 58 | | -47 | |
| 3851 | | Sustained Loads | -44 | 73 | | -67 | |
| | | OBE – Occasional Loads | 89 | 28 | | 24 | |
| | | DBE – Occasional Loads | 177 | 56 | | 48 | |
| tatic | A&B | Thermal+ Sustained Loads | -92 | 131 | 160 | -114 | 2876 |
| ynamic | A&B | Thermal+ Sustained Loads+ OBE | 181 | 159 | 241 | 138 | 5751 |
| | C&D | Thermal+ Sustained Loads+ DBE | 269 | 187 | 328 | 162 | 9924 |
| | | THERMAL | | | | | |
| | | Sustained Loads | | | | | |
| | | OBE – Occasional Loads | | | | | |
| | | DBE – Occasional Loads | | | | | |
| tatic | A&B | Thermal+ Sustained Loads | | | | | |
| ynamic | A&B | Thermal+ Sustained Loads+ OBE | | | | | |
| | C&D | Thermal+ Sustained Loads+ DBE | | | | | |
| | | | | | | | |

NOTES:

1. MY and MZ are bending moments
2. If torsional moment is larger than bending moment, compare torsional moment with allowable moment. Torsional moment is $M_x$
3. Flange Material A-181 Design Temp. 140 °F $S_y$ 32.6 ksf $S_y/36$ .911 multiply table values by $S_y/36$ (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local co-ordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. $M_B$ is computed by combining My and Mz by the SRSS method.
8. Refer to SHNPP Procedure 055.
9. Design Pressure = 150 psi
10. Class 2/3Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

E. J. Vaccarezza DATE 8-27-84 CHECKED BY [signature] DATE 8/27/84

EBASCO SERVICES INCORPORATED
STRESS ANALYSIS DEPARTMENT

CAROLINA POWER AND LIGHT COMPANY
CLIENT

SHEARON HARRIS UNIT #1
PROJECT

SHEET 64 OF 4

OFS NO. 2667.390

DEPT NO. 600

## FLANGE EVALUATION SHEET

Flange Size 3/4" SW Rating 150# Calc No. 106079 Run Date 8-24-84 Iso No. 11-261-SW-1 Rev. No. 1

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT LB MY | MOMENT IN FT LB MZ | BENDING MOMENTS MB FT LB | TORSIONAL MOMENTS MX FT LB | ALLOWABLE MOMENT |
|---|---|---|---|---|---|---|---|
| 9510 | | THERMAL | 1 | -2 | | 0 | |
| | | Sustained Loads | 2 | 2 | | 0 | |
| | | OBE – Occasional Loads | 1 | 13 | | 3 | |
| | | DBE – Occasional Loads | 3 | 27 | | 6 | |
| atic | A&B | Thermal+ Sustained Loads | 2 | 2 | 3 | 0 | 328 |
| namic | A&B | Thermal+ Sustained Loads+ OBE | 3 | 15 | 15 | 3 | 656 |
| | C&D | Thermal+ Sustained Loads+ DBE | 5 | 29 | 29 | 6 | 1164 |
| 9512 | | THERMAL | 1 | 2 | | 0 | |
| | | Sustained Loads | -3 | -2 | | 0 | |
| | | OBE – Occasional Loads | 1 | 12 | | 3 | |
| | | DBE – Occasional Loads | 1 | 23 | | 6 | |
| atic | A&B | Thermal + Sustained Loads | -3 | 2 | 4 | 0 | 328 |
| nam | A&B | Thermal+ Sustained Loads+ OBE | 4 | 14 | 15 | 3 | 656 |
| | C&D | Thermal+ Sustained Loads+ DBE | 4 | 25 | 25 | 6 | 1164 |
| | | | | | | | |

NOTES:

1. MY and MZ are bending moments
2. If torsional moment is larger than bending moment, compare torisonal moment with allowable moment. Torsional moment is $M_x$
3. Flange Material [illegible] Design Temp. 140 °F $S_y$ 32.8 Ksi $S_y/36$ [illegible], multiply table values by $S_y/36$ (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local co-ordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. $M_B$ is computed by combining My and Mz by the SRSS method.
8. Refer to SHNPP Procedure 055.
9. Design Pressure = 150 psi
10. Class 2/3Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

BY E. J. VALCARCEL DATE 8-27-84 CHECKED BY [illegible] DATE 8/27/84

EBASCO SERVICES INCORPORATED
STRESS ANALYSIS DEPARTMENT

SHEET 65 OF *

CAROLINA POWER AND LIGHT COMPANY
CLIENT

OFS NO. 2667.390

SHEARON HARRIS UNIT #1
PROJECT

DEPT NO. 600

## FLANGE EVALUATION SHEET

Flange Size 1" ϕ SW Rating 150# Calc No. 8050-79 Run Date 8-24-84 Iso No. 1-4-261-SW-1 Rev. No. 1

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT LB MY | MOMENT IN FT LB MZ | BENDING MOMENTS MB FT LB | TORSIONAL MOMENTS MX FT LB | ALLOWABLE MOMENT |
|---|---|---|---|---|---|---|---|
| 9055 | | THERMAL | 2 | 5 | | -1 | |
| | | Sustained Loads | 0 | 2 | | -1 | |
| | | OBE – Occasional Loads | 4 | 2 | | 7 | |
| | | DBE – Occasional Loads | 8 | 4 | | 14 | |
| tatic | A&B | Thermal+Sustained Loads | 2 | 7 | 7 | 2 | 373 |
| ynamic | A&B | Thermal+Sustained Loads+OBE | 6 | 9 | 11 | 9 | 746 |
| | C&D | Thermal+Sustained Loads+DBE | 10 | 11 | 15 | 16 | 1323 |
| 9057 | | THERMAL | -2 | -2 | | 1 | |
| | | Sustained Loads | 1 | -5 | | 1 | |
| | | OBE – Occasional Loads | 4 | 2 | | 7 | |
| | | DBE – Occasional Loads | 8 | 5 | | 14 | |
| tatic | A&B | Thermal+Sustained Loads | 1 | -7 | 7 | 2 | 373 |
| ynamic | A&B | Thermal+Sustained Loads+OBE | 5 | 9 | 10 | 9 | 746 |
| | C&D | Thermal+Sustained Loads+DBE | 9 | 12 | 15 | 16 | 1323 |

NOTES:

1. MY and MZ are bending moments.
2. If torsional moment is larger than bending moment, compare torisonal moment with allowable moment. Torsional moment is $M_x$
3. Flange Material [illegible] Design Temp. 140 °F $S_y$ 32.8 ksi $S_y/36$ [illegible], multiply table values by $S_y/36$ (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local co-ordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. $M_B$ is computed by combining My and Mz by the SRSS method.
8. Refer to SHNPP Procedure 055.
9. Design Pressure = 150 psi
10. Class 2/3Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

BY: E.J. VALCARCEL DATE 8-27-84 CHECKED BY [signature] DATE 8/27/84

(44)

Ofs No. 2667.390 Dept. No. 600

550

CLIENT: CAROLINA POWER AND LIGHT COMPANY

PROJECT: SHEARON HARRIS NUCLEAR POWER PLANT - UNIT #1

SUBJECT: FLANGE EVALUATION SHEET

Flange Size 8" Rating 150# Calc No. 8050-79 Run Date 8-24-84 Iso No. 1A-26-SW-1 Rev # 4

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT-LB MY | MOMENT IN FT-LB MZ | BENDING MOMENTS MB FT-LB | TORSIONAL MOMENTS MX FT-LB | ALLOW. MOMENT |
|---|---|---|---|---|---|---|---|
| 4857 | | THERMAL | -49 | -338 | | -213 | |
| | | Sustained Loads | -36 | -470 | | 7 | |
| | | OBE - Occassional Loads | 169 | 59 | | 33 | |
| | | DBE - Occassional Loads | 339 | 119 | | 67 | |
| Static | A&B | Thermal+Sustained Loads | -85 | -808 | 812 | -206 | 6736 |
| Dynamic | A&B | Thermal+Sustained Loads+OBE | 254 | 867 | 903 | 239 | 13472 |
| Dynamic | C&D | Thermal+Sustained Loads+DBE | 424 | 927 | 1019 | 273 | 21282 |
| 4859 | | THERMAL | 71 | 381 | | 213 | |
| | | Sustained Loads | 33 | 404 | | 7 | |
| | | OBE - Occassional Loads | 169 | 89 | | 33 | |
| | | DBE - Occassional Loads | 338 | 177 | | 67 | |
| Static | A&B | Thermal+Sustained Loads | 104 | 785 | 792 | 206 | 6736 |
| Dynamic | A&B | Thermal+Sustained Loads+OBE | 273 | 874 | 916 | 239 | 13472 |
| Dynamic | C&D | Thermal+Sustained Loads+DBE | 442 | 962 | 1059 | 273 | 21282 |
| | | | | | | | |

NOTES:

1. MY and MZ are bending moments.
2. If torsional moment is larger than bending moment, compare torsional moment with allowable moment. Torsional moment is $M_x$.
3. Flange Material A-181 Design Temp. 140°F $S_y$ 32.8 ksi $S_y/36$ .911, multiply table values by $S_y/36$ (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local co-ordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. $M_B$ is computed by combining My and Mz by the SRSS method.
8. Refer to SHNPP Procedure 055.
9. Design Pressure = 150 psi
10. Class 2/3 Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

BY L. WACKOWSKI DATE 8/27/84 CHECKED BY [illegible] DATE 8/27/84

EBASCO SERVICES INCORPORATED
STRESS ANALYSIS DEPARTMENT

CAROLINA POWER AND LIGHT COMPANY
CLIENT

SHEARON HARRIS UNIT #1
PROJECT

SHEET 67 OF 67

OFS NO. 2667.390

DEPT NO. 640

550

WN.

## FLANGE EVALUATION SHEET

Flange Size 8" Rating 150# Calc No. 8050-79 Run Date 8-24-84 Iso No. 1A-261-SW-1 Rev. No. 4

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT LB MY | MOMENT IN FT LB MZ | BENDING MOMENTS ME FT LB | TORSIONAL MOMENTS MX FT LB | ALLOWABLE MOMENT |
|---|---|---|---|---|---|---|---|
| 3864 | | THERMAL | 105 | 447 | | 213 | |
| | | Sustained Loads | 28 | -5 | | -7 | |
| | | OBE – Occasional Loads | 108 | 27 | | 37 | |
| | | DBE – Occasional Loads | 217 | 54 | | 74 | |
| atic | A&B | Thermal+Sustained Loads | 133 | 442 | 462 | 206 | 6736 |
| namic | A&B | Thermal+Sustained Loads+OBE | 241 | 469 | 527 | 243 | 13472 |
| | C&D | Thermal+Sustained Loads+DBE | 350 | 496 | 607 | 280 | 21282 |
| 3860 | | THERMAL | -87 | -412 | | -213 | |
| | | Sustained Loads | -30 | -262 | | 7 | |
| | | OBE – Occasional Loads | 148 | 67 | | 37 | |
| | | DBE – Occasional Loads | 295 | 135 | | 74 | |
| atic | A&B | Thermal+Sustained Loads | -117 | -674 | 684 | -206 | 6736 |
| ner | A&B | Thermal+Sustained Loads+OBE | 265 | 741 | 787 | 243 | 13472 |
| | C&D | Thermal+Sustained Loads+DBE | 412 | 809 | 908 | 280 | 21282 |
| | | | | | | | |

NOTES:

1. MY and MZ are bending moments
2. If torsional moment is larger than bending moment, compare torisonal moment with allowable moment. Torsional moment is $M_x$
3. Flange Material A-181 Design Temp. 640 °F $S_y$ 32.8 ksi $S_y/36$ .911, multiply table values by $S_y/36$ (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local co-ordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. $M_B$ is computed by combining My and Mz by the SRSS method.
8. Refer to SHNPP Procedure 055.
9. Design Pressure = 150 psi
10. Class 2/3Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

BY: E. J. VALLARCEL DATE 8-27-84 CHECKED BY [signature] DATE 8/27/84

(16)

CAROLINA POWER & LIGHT COMPANY

SHEARON HARRIS NUCLEAR POWER PLANT

CALCULATION SHEET

550

CALCULATION # 8050-79 RUN DATE: 8-24-84 (5:42 PM)

ISO # 1A-261-SW-1 REV. 5

ANALYST [illegible] DATE 12-12-85 CHECKER [illegible] DATE 12-20-85

PURPOSE: FLANGE QUALIFICATION ON TEMPORARY STRAINER

REF. 1) S/A CALC # 8050-79 DATED 8-24-84 (5:42 PM)

2) S/A RED LINE ISO 1P-261-SW-1 REV 550

CALCULATION: FOR CONFIGURATION SEE PAGE NO. 6

THERMAL: TOTAL $F_x$ (GLOBAL) LOAD ON NOZZLE = 559 # > 249 # (ANALYZED)

$M_y$ MOMENT @ FLANGES WILL INCREASE

$$\frac{\text{NEW LOAD}}{\text{ANALYZED LOAD}} = \frac{559}{249} = 2.245$$

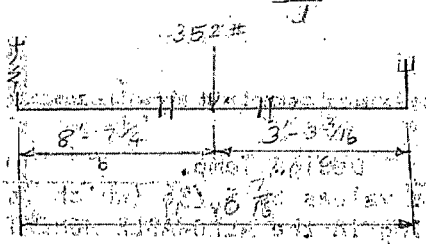
$M_y$ = ANALYZED × 2.245 = 2791 FT LB GLOBAL @ NODE NO 7283

$M_z$ = ANALYZED = 1057 FT LB GLOBAL @ NODE NO 7283

$M_x$ = ANALYZED 755 FT LB GLOBAL @ NODE NO 7283

DWT: DUE TO DEAD WT ONLY $M_x$ MOMENT WILL CHANGE

ADDITIONAL $M_x = \frac{Pab}{l}$




$M_x = \frac{352 \times 3.266 \times 8.604}{11.870}$

= 833 FT LB

TOTAL $M_x$ = ANALYZED @ 7283 + 833 = 1707 + 833 = 2540 FT LB

| SEISMIC | OBE | DBE |
|---|---|---|
| PVRC DAMPING PEAK | $G_x$ = 1.499 g | $G_x$ = 2.143 g |
| ACCELERATIONS @ EL 286' & 261' | $G_y$ = 2.198 g | $G_y$ = 2.935 g |
| | $G_z$ = 1.329 g | $G_z$ = 1.904 |

CAROLINA POWER & LIGHT COMPANY

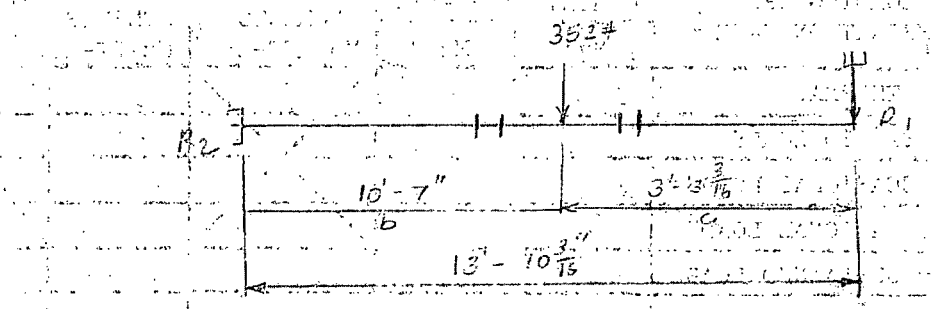
SHEARON HARRIS NUCLEAR POWER PLANT

CALCULATION SHEET

CALCULATION # 8050-79 RUN DATE: 8-24-84 (5:42 PM)

ISO # 1A-261-SW-1 REV. 5

ANALYST [illegible] DATE 12-12-85 CHECKER [illegible] DATE 12-20-85




ASSUME THE REACTION $R_1$ = 352 # CONSERVATIVE

M @ POINT OF LOAD = 352 x 3'-3 3/16" = 1150 FT LB

OBE

M: ADDITIONAL MOMENT + ANALYZED @ 7283

$M_x$ = 1150 x 1.499 + 1211 = 2935 FT LB

$M_y$ = 1150 x 2.198 + 469 = 2997 FT LB

$M_z$ = 1150 x 1.329 + 693 = 2221 FT LB

M: ADDITIONAL MOMENT + ANALYZED @ 7283

$M_x$ = 1150 x 2.193 + 2422 = 4886 FT LB

$M_y$ = 1150 x 2.935 + 938 = 4313 FT LB

$M_z$ = 1150 x 1.904 + 1886 = 3576 FT LB

CAROLINA POWER & LIGHT COMPANY

SHEARON HARRIS NUCLEAR POWER PLANT

FLANGE EVALUATION SHEET

550

FLANGE SIZE: 72" RATING 150 #

CALC. NO. 8080-79 RUN DATE 8-24-84 (5:42 PM)

ISO NO. 1A261-SW-1 REV 5

| MASS PT. | SERV. LIMITS | LOADING OR COMBINATION CASE | MOMENT IN FT-LB. My | Mz | BENDING MOMENTS Mb FT-LB. | TORSION MOMENTS Mx FT-LB | ALLOW. MOMENT |
|---|---|---|---|---|---|---|---|
| TEMP. STRAINER | | THERMAL | 2791 | 755 | | 1057 | |
| | | SUSTAINED LOADS | 233 | 2540 | | 165 | |
| | | OBE-OCCASIONAL LOADS | 2997 | 2935 | | 2221 | |
| | | DBE-OCCASIONAL LOADS | 4313 | 4886 | | 3576 | |
| STATIC | A & B | TH. + SUSTAINED LOADS | 3024 | 3295 | 4472 | 1222 | 20281 |
| DYNAMIC | A & B | TH. + SUST. LOADS ± OBE | 6021 | 6230 | 8664 | 3443 | 40562 |
| DYNAMIC | C & D | TH. + SUST. LOADS ± DBE | 7337 | 8181 | 10989 | 4798 | 64457 |
| TEMP. STRAINER | | THERMAL | 2791 | 755 | | 1057 | |
| | | SUSTAINED LOADS | 233 | 2540 | | 165 | |
| | | OBE-OCCASIONAL LOADS | 2997 | 2935 | | 2221 | |
| | | DBE-OCCASIONAL LOADS | 4313 | 4886 | | 3576 | |
| STATIC | A & B | TH. + SUSTAINED LOADS | 3024 | 3295 | 4472 | 1222 | 20281 |
| DYNAMIC | A & B | TH. + SUST. LOADS ± OBE | 6021 | 6230 | 8664 | 3443 | 40562 |
| DYNAMIC | C & D | TH. + SUST. LOADS ± DBE | 7337 | 8181 | 10989 | 4798 | 64457 |
| | | | | | | | |

NOTES:

1. My and Mz are bending moments.
2. If torsional moment is larger than bending moment, compare torsional moment with allowable moment. Torsional moment is Mx.
3. Flange Material A 181 Design Temp. 140°F Sy 32.8 KSI Sy/36 .911, multiply table values by Sy/36 (which is never taken as greater than unity) before entering in the ALLOWABLE MOMENT column above.
4. B31.1 Flanges: Compare 2010 moments with Static (Normal) and Dynamic (Upset) criteria only.
5. Mx, My and Mz should be recorded from the local coordinate printout.
6. Thermal components are added algebraically to Sustained Loads components. The greater of this sum and the sustained load combined (by components) absolutely with OBE or DBE.
7. Mb is computed by combining My and Mz by the SRSS method.
8. Refer to Design Guidelines for Piping Stress Attachment B.
9. Design Pressure = 150 psi.
10. Class 2/3 Flanges for pipe sizes larger than 24": Criteria for Class 400 and above are outside the scope of this evaluation sheet. Evaluate Class 150 and Class 300 flanges only.

BY [illegible] DATE 12-12-85 CHECKED BY [illegible] DATE 12-20-85

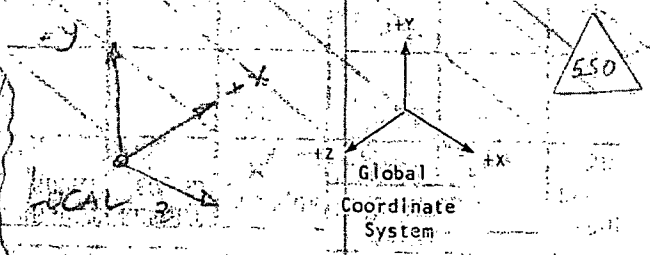
SH/SA-006

| MN/ML ... | 10231 | COMPARISON NOZZLE ACTUALS TO ALLOWABLES LOCAL COORDINATE SYSTEM | CALC NO. 1050-79 |
|---|---|---|---|

| CONDITION PLANT | CONDITION PIPING | LOADING OR COMB. CASE | FORCE (LB) $F_x$ | FORCE (LB) $F_y$ | FORCE (LB) $F_z$ | FORCE (LB) ACTUAL $F_r$ | ALLOW. $F_r$ | MOMENTS (FT-LB) $M_x$ | MOMENTS (FT-LB) $M_y$ | MOMENTS (FT-LB) $M_z$ | MOMENTS (FT-LB) ACTUAL $M_r$ | ALLOW. $M_r$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | -559 | | | | | | | |
| | | THERMAL NORMAL | 110 | 124 | ~~-249~~ | 278 | | 537 | -462 | -260 | 754 | |
| | | WT | -26 | 24 | -53 | 64 | | 581 | -165 | 89 | 610 | |
| | | DBE INERT | 182 | ~~385~~ 509 | 313 | 529 | | 718 | 699 | ~~896~~ 1898 | 1344 | |
| | | DBE INERT | 365 | ~~770~~ 1019 | 626 | 1057 | | 1437 | 1398 | ~~1792~~ 3800 | 2689 | |
| | | | | | | | | | | | | |
| | NORM | TH + WT | -26 / 572 | 148 / 572 | ~~-302~~ -612 / 572 | ~~337~~ 531 | 990 | 1118 / 2194 | -627 / 2194 | -171 / 2194 | 1293 | 3800 |
| | UP LT | TH+WT+DBE | 208 / 1010 | ~~533~~ 657 / 1010 | ~~615~~ 925 / 1010 | ~~840~~ 1154 | 1750 | 1836 / 2800 | 1326 / 2800 | ~~1067~~ 2069 / 2800 | ~~2504~~ 3068 | 4850 |
| | [illegible] | TH+WT+DBE | 391 / 1617 | ~~918~~ 1167 / 1617 | ~~928~~ 1238 / 1617 | ~~1363~~ 1746 | 2800 | 2555 / 4273 | 2025 / 4273 | ~~1963~~ 3971 / 4273 | ~~3806~~ 5138 | 7400 |

EBASCO NOZZLE ALLOWABLES

| LOADING CASE | 0° TO 139°F RESULTANT FORCE | 0° TO 139°F MOMENT | 140°F & ABOVE RESULTANT FORCE | 140°F & ABOVE MOMENT |
|---|---|---|---|---|
| THERMAL | 200 A | 250 Z | 400 A | 500 Z |
| WEIGHT | 100 A | 125 Z | 100 A | 125 Z |
| SEISMIC 0 BE | 100 A | 125 Z | 200 A | 250 Z |
| SEISMIC DBE | 150 A | 190 Z | 300 A | 375 Z |
| FAULTED DBE | 200 A | 250 Z | 400 A | 500 Z |




Allowables used: ☑ Vendor ☐ Ebasco

Nozzle Loads: ☑ DO ☐ DO NOT* meet the allowable criteria.

Ref. Doc. For Nozzle Loads: 99-BE-05-20 NOV-29-82

* See memo MN/ML #

PAGE 71

Prf'd [signature] Date 11-27-85

Chk'd [signature] Date 12-20-85

Equipment is: ☑ Rigid ☐ Flexible

Is Equipment modeled? ☐ Yes ☐ No ☑ N/R

PIPING ARRG'T DWG G-509 407 & 512

EQUIPMENT LOCATION RAB BLDG.

EQUIPMENT DWG 1364-7707

Line No. 3SW12-83 SA-1

NOZZLE SIZE 12" POINT NO. 3834

NOZZLE ID NO. (1A-SA) INLET

EQUIPMENT ID NO. WATER CHILLER (WR-2)

EBASCO SERVICES INCORPORATED
NEW YORK, NY

STRESS ANALYSIS DEPARTMENT
CHECKLISTS

PROJECT SHEARON HARRIS UNIT NO. 1

SYSTEM SW PIPING

ANALYST E. Valcarcel DATE 8-27-84

CHECKER [signature] DATE 8-27-84

APPROVED [signature] DATE 8-28-84

| ISOMETRIC NO. | REV |
|---|---|
| 1A-261-SW-1 | 4 |

622-4 (SH) 3-80

CAROLINA POWER & LIGHT COMPANY

SHEARON HARRIS NUCLEAR POWER PLANT

COMPARISON OF NOZZLE ACTUALS TO ALLOWABLES

CALCULATION # 8050-79 RUN DATE 8-24-84 ISO # 1A-261-SW-1 REV. 5

| LOAD CASE | AXIAL $F_X$ | SHEAR $F_Y$ | SHEAR $F_Z$ | RESULT. SHEAR $F_S$ | RESULT. FORCE $F_R$ | TORQUE $M_X$ | BENDING $M_Y$ | BENDING $M_Z$ | RESULT. BENDING $M_B$ | RESULT. MOMENT $M_R$ | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| THERMAL (CASE #800) | -70 / | 24 / | -153 / | / | / | -47 / | -16 / | 64 / | / | / | |
| WEIGHT (CASE #41) | 232 / | 49 / | 62 / | / | / | -67 / | -214 / | 83 / | / | / | |
| SEISMIC-OBE (I+D+SRV.) (C #200+134) | 89 / | 16 / | 36 / | / | / | 24 / | 95 / | 28 / | / | / | |
| SEISMIC-DBE (I+D+SRV.) (C #300+138) | 179 / | 32 / | 71 / | / | / | 48 / | 190 / | 57 / | / | / | |
| | / | / | / | / | / | / | / | / | / | / | |
| NORMAL (C #800+41) | 232 / NR | 73 / – | 100 / | 124 / NR | – / – | -114 / NR | 253 / – | 147 / – | 293 / NR | / | $F_Z$ LOAD & $M_Y$ INCREASED BY 10% DUE TO RELOCATION OF SUPPORT. |
| UPSET (NORMAL±OBE) | 321 / 424 | 89 / – | 140 / – | 166 / 254 | – / – | -138 / 530 | 358 / – | 175 / – | 398 / 442 | / | |
| EMERGENCY (NORMAL±DBE) | 411* / 406 | 105 / – | 178 / – | 207 / 243 | – / – | 162 / 636 | 462 / – | 204 / – | 505 / 530 | / | |

ALLOWABLES USED: ☒ VENDOR ☐ EBASCO
NOZZLE ALLOWABLES AS PER CAR-SH-M-71

NOZZLE LOADS: ☐ DO ☒ DO NOT MEET ALLOWABLE CRITERIA (REF. TO SH/SA-013)

EQUIPMENT IS: ☒ RIGID ☐ FLEXIBLE

IS EQUIPMENT MODELED? ☐ YES ☒ NO ☐ NOT REQ'D

REF. DOC. FOR NOZZLE LOADS: 9Q-BE-06-205

EQUIPMENT MODEL:

PIPING ARRG'T DWG G-509 S07 & S12

EQUIPMENT LOC. & I.D. RAB BLDG PUMP P-7 (1A-SA)

EQUIPMENT DWG. 1364-5952

NOZZLE SIZE 4" Φ POINT NO. 3850

NOZZLE ID NO. 1A-SA OUTLET

LINE # 3SW6-857 SA-1

ANALYST [illegible] DATE 12-19-85

CHECKER [illegible] DATE 12-20-85

ACTUALS / ALLOW.

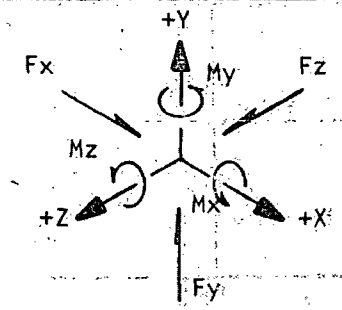
FORCES IN POUNDS, MOMENTS IN FT-LB. & LOCAL COORDINATES

SH/SA-007

Client: Carolina Power and Light Company
Project: Shearon Harris Nuclear Power Plant - Unit #1
Subject: NON-ACTIVE VALVES

Ofs No. 2667.390 Dept. No. 0

Page 73 of 8




Prf'd [signature] Date 11-23-85
Chk'd [signature] Date 12-20-85

STRESS CALC. NO.: 8050-79 Rev. 8 (550)

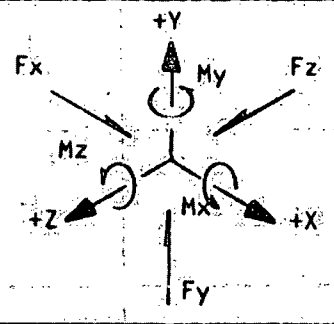
SEISMIC LOADS: X DIR. = 3.0g
Y DIR. = 2.0g
Z DIR. = 3.0g

$G_R$ = 4.69g

REF: PROJECT SPEC. CAR-SH-M-45

NOTE: G FACTORS ARE CALCULATED FROM GLOBAL COORDINATE (DBE)

| C.G. STRESS PT. | VALVE TAG NUMBER | VALVE SIZE AND TYPE | VALVE EMDRAC NO. | VALVE WEIGHT | CALCULATED G - FACTOR | REMARKS |
|---|---|---|---|---|---|---|
| 958 959 960 | 38W-V845 SA-1 | 1" φ GLOBE | 3407 | 16# | X= .60<br>Y= 1.01<br>Z= .52 | |
| 8593 8594 8593 | 38W-V929 SA-1 | 1" φ GLOBE | ~~20535~~ 3407 | 16# | X= .60<br>Y= 1.01<br>Z= .52 | |
| 55 54 53 52 | 38W-R16 SA-1 | 3/4" φ RELIEF | 36182 | ~~18#~~ 36# | X= 1.71<br>Y= 1.01<br>Z= .48 | SEE P. SAC. 5B (8) |
| 12 11 13 | 38W-V851 SA-1 | 3/4" φ GLOBE | 3407 | 11# | X= .58<br>Y= .99<br>Z= 1.04 | |
| 5055 5056 5054 | 38W-V803 SA-1 | 1" φ GLOBE | 3407 | 16# | X= N/R<br>Y=<br>Z= | ~~DETAIL "A"~~ |
| 5106 5104 5105 | 38W-V804 SA-1 | 1" φ GLOBE | 3407 | 16#<br>See P. 5C (9) | X= N/R<br>Y=<br>Z= | ~~DETAIL "A"~~ |




Prd'd [illegible] Date 11-27-85
Chk'd [illegible] Date 12-26-85

STRESS CALC. NO.: 8050-79

SEISMIC LOADS: X DIR. = 3.0g
Y DIR. = 2.0g
Z DIR. = 3.0g

$G_R$ = 4.69g

REF: PROJECT SPEC. CAR-SH-M-45

NOTE: G FACTORS ARE CALCULATED FROM GLOBAL COORDINATE (DBE)

| C.G. STRESS PT. | VALVE TAG NUMBER | VALVE SIZE AND TYPE | VALVE EMDRAC NO. | VALVE WEIGHT | CALCULATED G - FACTOR | REMARKS |
|---|---|---|---|---|---|---|
| 5255 / 5256 / 5254 | 3SW-V805 SA-1 | 1"ϕ GLOBE | 3407 | 16# (See p 5c) | X= Y= N/R Z= | ~~DETAIL "A"~~ |
| 5305 / 5304 / 5306 | 3SW-V846 SA-1 | 1"ϕ GLOBE | 3407 | 16# | X= Y= N/R Z= | ~~DETAIL "A"~~ |
| 3862 / 3861 / 3863 | 3SW-B301 SA-1 | 8"ϕ BUTTERFLY | 15520 | 105# | X= .60 Y= 1.01 Z= .53 | |
| 3858 / 3857 / 3859 | 3SW-V800 SA-1 | 8"ϕ CHK WAFER | A683 | 71# | X= .60 Y= 1.01 Z= .53 | |
| 858 / 857 / 859 | 3SW-V809 SA-1 | 1"ϕ GLOBE | 3407 | 16# | X= 1.45 Y= 1.01 Z= 1.92 | |
| 3036 / 3037 / 3035 | 3SW-V63 SA-1 | 1"ϕ GLOBE | 3407 | 16# | X= .59 Y= 1.28 Z= .57 | |

lent: Carolina Power and Light Company
Project: Shearon Harris Nuclear Power Plant - Unit #1
Subject: NON-ACTIVE VALVES

Ofs No. 2667.390 Dept. 600

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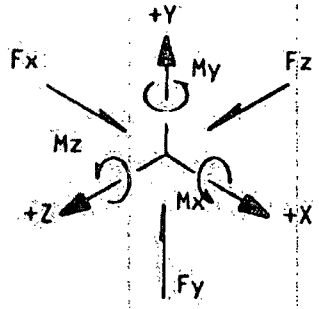



Prfd [signature] Date 11-27-85
Chk'd [signature] Date 12-20-85

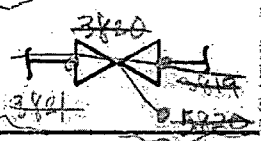
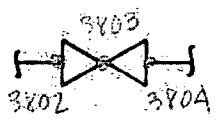
STRESS CALC. NO.: 8050-79

SEISMIC LOADS: X DIR. = 3.0g
Y DIR. = 2.0g
Z DIR. = 3.0g

$G_R$ = 4.69g

REF: PROJECT SPEC. CAR-SH-M-45

NOTE: G FACTORS ARE CALCULATED FROM GLOBAL COORDINATE (DBE)

| C.G. STRESS PT. | VALVE TAG NUMBER | VALVE SIZE AND TYPE | VALVE EMDRAC NO. | VALVE WEIGHT | CALCULATED G - FACTOR | REMARKS |
|---|---|---|---|---|---|---|
|  | ~~3SW-B300 SA-1~~ | ~~10" φ BUTTERFLY~~ | ~~3-5643~~ | ~~300#~~ | ~~X= .62~~ ~~Y= 1.04~~ ~~Z= .51~~ | 551 By: [illegible] 11-16-87 [illegible] 11-23-87 |
| | 3SW-V847 SA-1 | 1" φ GLOBE | 3407 | 16# See P.5C | X= Y= Z= N/R | Detail "A" |
|  | 3SW-B82 SA-1 | 12" φ BUTTERFLY | 15533 | 185# | X= .62 Y= 1.01 Z= .53 | |
| | 3SW-V908 SA-1 | 1" φ GLOBE | 3407 | 16# | X= Y= Z= N/R | |
| | 3SW-V1009 SA-1 | 3/4" φ GLOBE | 3407 | 11# | X= Y= Z= N/R | |
| | | | | | X= Y= Z= | |

Ofs No. 2667.390 Del No. 600

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CLIENT: CAROLINA POWER AND LIGHT COMPANY

PROJECT: SHEARON HARRIS NUCLEAR POWER PLANT - UNIT #1

SUBJECT: B-P SUPPORTS ON ALL VALVES

| ISOMETRIC NO | REV # | CALC # | SUPPORT FUNCTION | NODE PT. | VALVE TAG NO. | VALVE WT. | REMARKS |
|---|---|---|---|---|---|---|---|
| 1A-2G1-8W-1 | 4 | 8050-79 | LAT(X+Y) 2 Z | 3820 | 3SW-B300 CA-1 | 300# | BOP VALVE, Restraint SATISFACTORY PER MEMO-SHNPP-S/R-S/A-473 dtd: Jan. 18, 1985. |

Prf'd Amit Date 11-27-85

Chk'd [illegible] Date 12-2-85

DELETED

By Rev. 551

(22)

550

79.14 PIPING CLEARANCE REVIEW

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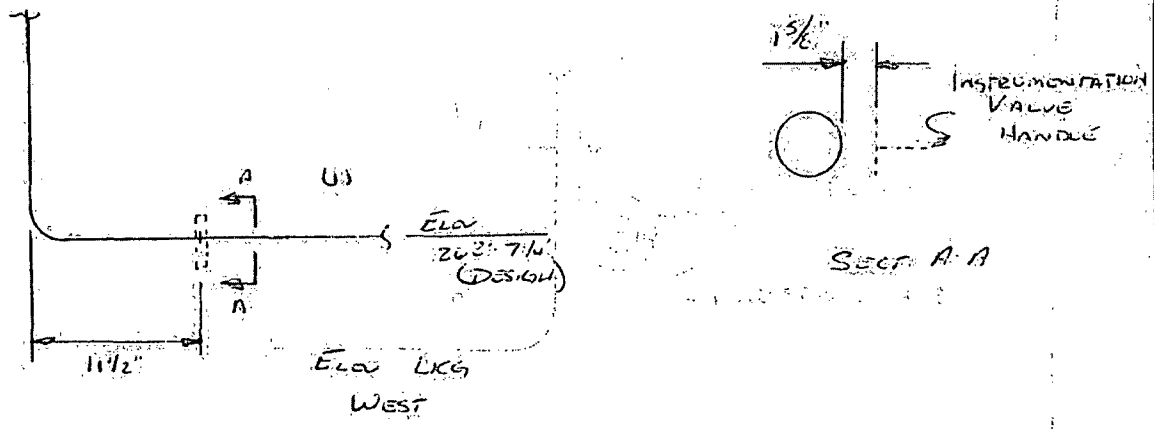
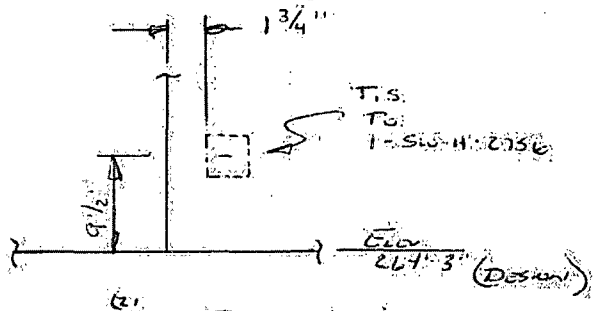
FAB ISO. No. 1-SW-526 PAGE 2 OF 2

CALC. No. 8050-79 WALKDOWN SPECIALIST [signature] DATE 10/26/85

| OITL # | DESCRIPTION/SKETCH |
|---|---|
| 70490 (1) |  |
| 70500 (2) |  |



| OITL# | CODE | REVIEW COMMENTS | OITL# | CODE | REVIEW COMMENTS |
|---|---|---|---|---|---|
| 70490 | 1 | ACCEPTED AS 7-3 | | | |
| 70500 | 1 | ACCEPTED AS 20 | | | |
| | | | | | |
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| | | | | | |

HPES S/A CLEARANCE REVIEWED BY [signature] 11-27-85 DATE: [signature] CHECKED BY:

CODES: (1) No further action required by construction. 12-26-85
(2) Construction shall trim/remove insulation per above comments.
(3) Initiate FCR/PW as required.

550

79.14 PIPING CLEARANCE REVIEW

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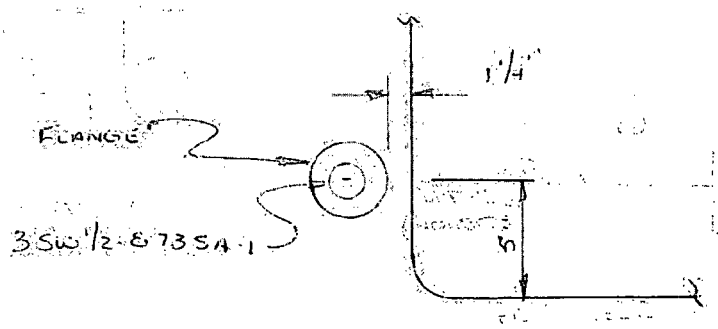
FAB ISO. No. 1-SW-544 PAGE 2 OF 2

CALC. No. 8050-79 WALKDOWN SPECIALIST David W. [illegible] DATE 10/26/85

| OITL # | DESCRIPTION/SKETCH |
|---|---|
| 70510 |  |



Elev. Lkg North

| OITL# | CODE | REVIEW COMMENTS | OITL# | CODE | REVIEW COMMENTS |
|---|---|---|---|---|---|
| 70510 | 1 | ACCEPTED AS IS. | | | |
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HPES S/A CLEARANCE REVIEWED BY Amrit Patel 11-27-85 DATE: [illegible] 12-20-85 CHECKED BY:

CODES: (1) No further action required by construction.
(2) Construction shall trim/remove insulation per above comments.
(3) Initiate FCR/PW as required.

79.14 PIPING CLEARANCE REVIEW

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FAB ISO. No. 1-SW-5260 PAGE 1 OF 1

CALC. No. 80050-79 WALKDOWN SPECIALIST [illegible] DATE 7-29-85

| OITL # | DESCRIPTION/SKETCH |
|---|---|
| 31150 | #1) 11 5/8" NORTH OF ℄ 90° EL., AN INSTRUMENTATION VALVE HANDLE IS 5/8" WEST OF 3SW6-875 SA-1. |

| OITL# | CODE | REVIEW COMMENTS | OITL# | CODE | REVIEW COMMENTS |
|---|---|---|---|---|---|
| 31150 | 1 | ACCEPT AS IS | | | |
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| | | | | | |

HPES S/A CLEARANCE REVIEWED BY [illegible] 11-27-85 DATE: 11/11/85 CHECKED BY:

CODES: (1) No further action required by construction.
(2) Construction shall trim/remove insulation per above comments.
(3) Initiate FCR/PW as required.

11-10-85

79.14 PIPING CLEARANCE REVIEW

80

FAB ISO. No. 1-SW-528 PAGE 1 OF 1

CALC. No. 8050-79 WALKDOWN SPECIALIST [signature] DATE 7-30-85

| OITL # | DESCRIPTION/SKETCH |
|---|---|
| 31110 | #1) 3'-6 3/4" SOUTH OF 90° EL, 1-SW-H-2139 (DUMMY SNUBBER PADDLE), 13 1/2" ABOVE 3SW12-83SA1. |

| OITL# | CODE | REVIEW COMMENTS | OITL# | CODE | REVIEW COMMENTS |
|---|---|---|---|---|---|
| 31110 | 1 | ACCEPT AS IS | | | |
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HPES S/A CLEARANCE REVIEWED BY Amrit Patel 11-27-85 DATE: 6/11/86 CHECKED BY: 12-20-85

CODES: (1) No further action required by construction.
(2) Construction shall trim/remove insulation per above comments.
(3) Initiate FCR/PW as required.

79.14 PIPING CLEARANCE REVIEW



FAB ISO. No. 1-SW-544 PAGE 1 OF 1

CALC. No. 80050-79 WALKDOWN SPECIALIST [illegible] DATE 7-29-85

| OITL # | DESCRIPTION/SKETCH |
|---|---|
| 31160 | #1) BEGINNING AT THE 90° EL. (DOWN) AT 264' 7 1/4", 7CH1-1103-1 IS SOUTH OF 7SW1-904-1 WITH CLEARANCES RANGING FROM 1 1/16" TO 1/2". |

| OITL# | CODE | REVIEW COMMENTS | OITL# | CODE | REVIEW COMMENTS |
|---|---|---|---|---|---|
| 31160 | 1 | ACCEPT AS IS | | | |
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HPES S/A CLEARANCE REVIEWED BY Amrit Patel 11-27-85 DATE: [illegible] CHECKED BY: 12-20-85

CODES: (1) No further action required by construction.
(2) Construction shall trim/remove insulation per above comments.
(3) Initiate FCR/PW as required.

SHEARON HARRIS NUCLEAR PROJECT
AS-BUILT VERIFICATION PIPING CONFIGURATION CHECKLIST

Calculation No. 8050-79 Stress Iso. 1A-251-SW-1 Rev. 5

| Item No. | Item Requiring Verification | Where Verified | Acceptable Yes | Acceptable No |
|---|---|---|---|---|
| 1 | Piping geometry | WP-141 | ✓ | |
| 2 | Pipe Outside Diameter | CQC 19, Form QA 28 | | |
| 3 | Valve Location, Tag Numbers | WP-141 | ✓ | |
| 4 | Valve Operator Orientation | WP-141 | ✓ | |
| 5 | Reducer Location | WP-141 | ✓ | |
| 6 | Type of Elbows, Tees | Sw Fab NPP-1 Code D.R. | | |
| 7 | Floor/Wall Sleeve Clearance | WP-141 | ✓ | |
| 8 | Clearance Between Pipe and Structural Members | WP-141 | ✓ | |
| 9 | Pipe Embedded in Wall | WP-141 | N/R | |
| 10 | S/R Location and Function | WP-110/WP-141 | ✓ | |
| 11 | Insulation | Line List | | |
| 12 | Location of Instrument Taps | WP-141 | ✓ | |
| 13 | Slope of Pipe | WP-141 | ✓ | |
| 14 | Weld Locations on Class 1 | WP-141 | N/R | |

Remarks: N/R - NOT REQUIRED

Performed by [illegible] Date 11-27-85

Checked by [illegible] Date 12-2-85

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
10 CFR 50.55a REQUEST: I3R-06
Revision 1

## 6.5 GL 90-05 THROUGH-WALL FLAW EVALUATION

GL 90-05 "through-wall" flaw evaluation criteria were used to evaluate the pinhole leak in ESW line 3SW3/4-1630SA-1. The GL 90-05 criteria are applicable since this line is ASME Section III, Class 3 piping per the Engineering Design Basis (EDB).

The allowable stress for the pipe material ASTM A106, Grade B per EDB is:

S = 15000 psi  reference ASME Section III, Appendices

The pipe properties for 3SW3/4-1630SA-1 (three-quarter inch, schedule 40 pipe) are: (Reference: EDB, Calculation 8050-79, NAVCO Piping Datalog)

| | |
|---|---|
| $D_o$ = 1.050 in | Outer Diameter |
| $t_{nom}$ = 0.113 in | Nominal Thickness |
| t = 0.103 in | Actual Measured Thickness (which is greater than $t_{min}$) |
| p = 150 psi | Design Pressure |
| T = 95 deg | Maximum Operating Temperature |

The allowable stress intensity factor (K) for determining the acceptability of flawed piping under the applied load is:

$K_{si} = 35\ \text{ksi(in)}^{0.5}$  (reference NRC GL 90-05) where, ksi = 1000 psi

Minimum required wall thickness due to hoop stress, per ASME Section III, Class 3 Equations:

$$t_m = \frac{p\,D_o}{2(S+0.4p)} = 0.005 \text{ in}$$

The following through-wall flaw evaluation is performed in accordance with GL 90-05, Enclosure 1, Section C.3.a. The stress intensity factor for through-wall flaw (including safety factor of 1.4) is:

$K = 1.4\,(s)(F)(3.1416*a)^{0.5}$ , where:

the geometry factor "F" is:

$F = 1 + (A)(c)^{1.5} + (B)(c)^{2.5} + (C)(c)^{3.5}$ , where:

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
10 CFR 50.55a REQUEST: I3R-06
Revision 1

2a = the flaw length, in. (reference GL 90-05)
a = 0.05 in
2a = 0.10 in

(Note: The flaw length (2a) is basically the diameter of the pin hole which is less than 0.0625". However, 0.05 is conservatively used for "a". (2*a=2*0.05=0.100>0.065"))

R = mean pipe radius = $\frac{D_o - t_m}{2}$ = 0.522 in.

$c = \frac{a}{(3.1416)(R)} = 0.030$

s = 3.135 x $10^3$ psi Total Stress (per HNP Engineering)

$r = \frac{R}{t_m} = 99.9$

$A = -3.26543 + 1.52784r - 0.072698r^2 + 0.0016011r^3 = 1.02 \times 10^3$

$B = 11.36322 - 3.91412r + 0.18619\,r^2 - 0.004099r^3 = -2.608 \times 10^3$

$C = -3.18609 + 3.84763\,r - 0.18304r^2 + 0.00403r^3 = 2.572 \times 10^3$

$F = 1 + (A)(c)^{1.5} + (B)(c)^{2.5} + (C)(c)^{3.5} = 6.015$

Therefore,

$K = 1.4\,(s)(F)(3.1416*a)^{0.5} = 10.462$ ksi(in)$^{0.5}$

**$K < K_{si}$ = 35 ksi(in)$^{0.5}$**

Per GL 90-05 criteria, the flaw length "2a" (0.10 inches) shall not exceed either three inches or 15 percent of the length of the pipe circumference.

Pipe circumference $A = \pi \times D_o = 3.299$ in

15 percent of the length of the pipe circumference $A_{15} = 15 \times \frac{A}{100} = 0.495$ in

**Flaw Length 2a < 15 percent of the pipe circumference**

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
10 CFR 50.55a REQUEST: I3R-06
Revision 1

Note: The stresses considered in original Relief Request I3R-06 Rev. 0 were conservatively evaluated to be 7461 psi. The stresses used in the above calculation, 3135 psi, are based on a more realistic approach to account for all loading conditions to which this pipe is subjected. The deadweight contribution to total stress was eliminated because the line is in a vertical orientation and attached to a massive pipe. Additionally, the mean pipe radius calculation was revised to conservatively assume a pipe thickness equal to $t_{min}$. The previous calculation assumed a pipe thickness equal to $t_{nom}$.

The through-wall flaw evaluations for the pinhole flaw demonstrate that the piping, including the weld joining the pipe to the sockolet for line 3SW3/4-1630SA-1 is structurally adequate per GL 90-05.