MPR

MPR Associates, Inc.
320 King Street
Alexandria, VA 22314

CALCULATION TITLE PAGE

Client	Niagara Mohawk Power Corporation	Page 1 of 6 + ATTACHMENTS
Project	NMP-1 RWCU Weld 33-FW-22 Overlay Design	Task No. 085-9708-295-0
Title	Stresses for Input To Program SSFLAW	Calculation No. 085-295-01

Preparer/Date	Checker/Date	Reviewer/Date	Rev. No.
Randolph C Trench 5/16/97 Randolph C Trench	Paul S Kuntz 5-16-97	J S Nestell 5-16-97	0
Randolph C Trench 5/16/97 Randolph C Trench	Paul S Kuntz 5-16-97	J S Nestell 5-16-97	1

QUALITY ASSURANCE DOCUMENT

This document has been prepared, checked, and reviewed in accordance with the Quality Assurance requirements of 10CFR50 Appendix B, as specified in the MPR Quality Assurance Manual.

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RECORD OF REVISIONS

Calculation No.	Prepared By	Checked By	Page
085-295-01	M C Trend	P. Knuttle	Page 2

Revision	Description
0	Initial Issue
1	Replaced pages in Attachment 1 with final SUPERPIPE output provided by NMPC on 5/16/97. Changed Reference 3, Attachment 2, and Section 3 accordingly.

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1.0 PURPOSE

The purpose of this calculation is to document the values of stresses to be used for input to Program SSFLAW (Reference 1) for the design of a structural overlay for Weld 33-FW-22 in the NMP-1 Reactor Water Cleanup (RWCU) system.

2.0 SUMMARY OF RESULTS

Stresses to be used as input to Program SSFLAW are presented in Attachment 2 to this calculation.

3.0 APPROACH

The spreadsheet in Attachment 2 shows the calculation of the applied tensile and bending stress used for structural overlay design at Weld 33-FW-22.

The method used is as follows:

- NMPC provided piping model results for the portion of the RWCU piping system at this weld. These results are from SUPERPIPE runs dated 4/10/89 and 5/15/97 (References 2 and 3), and are presented in Attachment 1. NMPC indicated that the location corresponding to the weld, which joins piping to the RWCU regenerative heat exchanger (ND-03) inlet nozzle, is represented by four supports. The supports are identified as 432, 432A, 432B, and 432C.

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- Forces and moments at these supports were determined from the SUPERPIPE computer run for the following load cases:

  -- "GRAV", equal to gravity loading plus bellows cold spring
  -- "THR2", equal to thermal loads with all piping at 370°F (this thermal case bounds all other thermal cases)
  -- "SEIS", seismic inertia loading

- Forces and moments from these load cases were used to calculate the stresses for input to SSFLAW. Overlay design is performed by SSFLAW by including the combined action of deadweight, seismic and thermal loads. Two types of stresses are considered:

  -- Tensile stress. Tensile stress results from the combined action of applied axial forces and pressure on the structure. Tensile stress due to axial force is determined by dividing the applied axial force at the weld by the pipe cross sectional area. Program SSFLAW separately calculates the tensile stress due to pressure at the weld location; therefore the tensile stress to be input into Program SSFLAW is equal to the stress due to applied axial force and not pressure stress.

  -- Bending stress. Bending stress is determined by dividing the applied overturning moment at the weld by the pipe section modulus.

- For each type of stress (tensile and bending), the total stress to be input to Program SSFLAW is calculated by summing the stress due to deadweight, thermal expansion and earthquake. Note that thermal expansion causes secondary stress (meaning that the stress will be relieved as the section deflects); including thermal expansion stresses in the overlay design as primary stresses is required by NUREG-0313, Revision 2 (Reference 4) for overlays fabricated from SMAW weld metal.

The spreadsheet in Attachment 2 documents the stress calculation as described above.

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4.0 REFERENCES

1. MPR Report MPR-1037, Revision 1, "SSFLAW -- A Computer Program to Evaluate Cracks in Stainless Steel Piping (Version 1.1)," April 1988.

2. NMPC Calculation S14-33.1-P01, Rev. 1, Disp. #2, per NMPC Fax to MPR dated 5/14/97. [Included in Attachment 1.]

3. Excerpts from NMPC Calculation S14-33.3P01 Revision 02, SUPERPIPE Results for Run dated 5/15/97, per NMPC Fax to MPR dated 5/16/97. [Included in Attachment 1.]

4. NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping -- Final Report," published January 1988.

5. Southwestern Engineering Company Drawing 77528, Rev. 17, "Regenerative Clean-up Heat Exchanger" (for RWCU Hx ND-03).

6. Crane Technical Paper #410, 1988 Ed.

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ATTACHMENT 1

SUPERPIPE Program Output Used To Determine Stresses for Program SSFLAW

Niagara Mohawk Power Corporation/Nine Mile Point/P.O. Box 63, Lycoming, NY 13093

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FAX COVER SHEET

DOC. NO. 085-295-01
ATTACHMENT 1
SHEET 2 OF 15

NINE MILE POINT NUCLEAR ENGINEERING SERVICES BUILDING

TO: FAX TELEPHONE NUMBER: 703-519-0225

NAME: Randy French

LOCATION: MPR

TELEPHONE NUMBER: 703-519-0200

FROM: FAX TELEPHONE NUMBER: (315) 349-1581

NAME: Clyde Strop

DEPARTMENT: C/S

TELEPHONE NUMBER: 315-349-1220

****

TOTAL NUMBER OF PAGES FAXED (including cover sheet): 14

DATE: 5-14-97 OPERATOR:

MESSAGE:

NIAGARA MOHAWK POWER CORPORATION NINE MILE POINT UNIT 1

REACTOR WATER CLEAN-UP SYSTEM 33 INPUT FILE-033.X by JSR

SI4-33.1-P01 REV. 1, DISP. #2
DOC. NO. 0855-275-01 ATTACHMENT 2 SHEET 3 OF 15
CALC 317-33SYSDD Rev 0 page 60 OF 74

ECHO PRINT OF INPUT DATA

```
COLUMN                                                                                                    INPUT
         1         2         3         4         5         6         7         8                          CARD
12345678901234567890123456789012345678901234567890123456789012345678901234567890                        SEQUENCE
 042A 042A  102.0000                                                                                        681
 050A 050A   40.0000                                                                                        682
 029A 029A  240.0000                                                                                        683
 316A 316A  835.0000                                                                                        684
*318A 318A 1100.0000                                                                                        685
c                                                                                                           686
c (I1) SUPPORT LOCATIONS AND PROPERTIES                                                                     687
c                                                                                                           688
c ---------------------------------------                                                                   689
 001A 001  ANCH TGSD   2.8E+07  1.2E+08          SUUSUU                                                     690
 001B 001  ANCH TGSD   9.4E+06  4.1E+08          USUUSU                                                     691
 001C 001  ANCH TGSD   2.2E+06  1.0E+09          UUSUUS                                                     692
 005A 005N ANCH        3.8E+05                   SUUUUU INCL 555R                                           693
 005B 005N ANCH                                  USUUUU INCL 555R                                           694
 005C 005N ANCH                                  UUSUUU INCL 555R                                           695
 005D 005N ANCH                                  UUUSUU INCL 555R                                           696
 005E 005N ANCH                 1.2E+08          UUUUSU INCL 555R                                           697
 005F 005N ANCH                 1.2E+08          UUUUUS INCL 555R                                           698
 555A 555N ANCH        3.8E+05                   SUUUUU INCL 555R                                           699
 555B 555N ANCH                                  USUUUU INCL 555R                                           700
 555C 555N ANCH                                  UUSUUU INCL 555R                                           701
 555D 555N ANCH                                  UUUSUU INCL 555R                                           702
 555E 555N ANCH                 1.2E+08          UUUUSU INCL 555R                                           703
 555F 555N ANCH                 1.2E+08          UUUUUS INCL 555R                                           704
 023  023  ANCH TGSD                             SSSSSS INCL 101J                                           705
 047  047  ANCH TGSD                             SSSSSS INCL 704J                                           706
 063  063  ANCH TGSD                             SSSSSS INCL 003J                                           707
 432  432  ANCH TGSD                             SUSUSU                                                     708
 432A 432  ANCH TGSD  3.58E+07                   USUUUU                                                     709
 432B 432  ANCH TGSD            1.78E+09         UUUSUU                                                     710
 432C 432  ANCH TGSD            2.78E+09         UUUUUS                                                     711
 330A 330  ANCH TGSD                             SUSSSS                                                     712
 330R 330  SNGL TGSD  2.59E+05                        Y                                                     713
 328A 328  ANCH TGSD                             SSSSSU                                                     714
 328R 328  SNGL TGSD            1.09E+08              Y                                                     715
 005  005  CONF  GS                                   INCL 107J                                            716
 012  012  CONF  GS                                   Y                                                    717
 021  021  CONF  GS                                   INCL 102J                                            718
 027  027  CONF  GS                                   Y                                                    719
 208  208  CONF  GS                                   Y                                                    720
```

NOZZLE ND-03

(1)

(2)

NIAGARA MOHAWK POWER CORPORATION NINE MILE POINT UNIT 1

REACTOR WATER CLEAN-UP SYSTEM 33 INPUT FILE-033.X by JSR

S14-33.1-P01 REV. 1, DISP. #2

CALC S14-33 M008 Rev 0 page 11 of 24

DOC. NO. 085-295-01
ATTACHMENT 1
SHEET 4 OF 15

ECHO PRINT OF INPUT DATA

```
COLUMN                                                                                 INPUT
         1         2         3         4         5         6         7         8       CARD
12345678901234567890123456789012345678901234567890123456789012345678901234567890    SEQUENCE

 413  33-H21                                                                          1041
 416  33-HS-13                                                                        1042
 424  33-HS-14                                                                        1043
 425T 33-HS-15                                                                        1044
 425B 33-HS-16                                                                        1045
 426  33-H22                                                                          1046
 432  REGEN. HEAT EXCH. ND-03 ANCHOR                                                  1047
 432A REGEN. HEAT EXCH. ND-03 ANCHOR                                                  1048
 432B REGEN. HEAT EXCH. ND-03 ANCHOR                                                  1049
 432C REGEN. HEAT EXCH. ND-03 ANCHOR                                                  1050
 027  37-H1                                                                           1051
 037  37-HS-1                                                                         1052
 047  37-A1 ANCHOR                                                                    1053
 063  REACTOR DRAIN ANCHOR                                                            1054
 323  33-H26                                                                          1055
 313  33-H25                                                                          1056
 309  33-H24                                                                          1057
 308T 33-HS-18                                                                        1058
 308B 33-HS-19                                                                        1059
 305  33-H23                                                                          1060
 311Z NEW SUPPORT AT DCP 311A                                                         1061
 323X NEW SUPPORT AT DCP 323A                                                         1062
 328A PUMP SUPPORT (FRONT PEDESTAL)                                                   1063
 328R PUMP SUPPORT (FRONT PEDESTAL)                                                   1064
 330A PUMP SUPPORT (REAR BRACKET)                                                     1065
*330R PUMP SUPPORT (REAR BRACKET)                                                     1066
 SYSTEM 33 SUPPORT LOAD SUMMARY                                                       1067
                                                                                      1068
 GRAV      GRAVITY LOADING (DEADWEIGHT + BELLOWS COLD SPRUNG)                         1069
                                                                                      1070
 THR1      THERMAL LOADING MODE 1(REACTOR PRESSURE>150 PSI) ALL PIPING AT 575 F       1071
           EXCEPT BY-PASS LINE TO AUX CLEAN-UP PUMP AT 75 F                           1072
                                                                                      1073
 THR2      THERMAL LOADING MODE 2(REACTOR PRESSURE<150 PSI) ALL PIPING AT 370 F       1074
                                                                                      1075
 THR3      THERMAL LOADING MODE 3(REACTOR PRESSURE-150 PSI) ALL PIPING AT 370 F       1076
           EXCEPT BY-PASS LINE TO AUX CLEAN-UP PUMP AT 75 F                           1077
                                                                                      1078
 THR4      THERMAL LOADING MODE 4(CLEAN-UP SYSTEM ISOLATED) ALL PIPING INSIDE         1079
           DRYWELL AT 150 F ALL PIPING OUTSIDE DRYWELL AT 75 F                        1080
```

LOAD COMB DEFINITION

S14-33.1-P01 REV. 1, DISP. #2

ECHO PRINT OF INPUT DATA

```
COLUMN                                                                                  INPUT
         1         2         3         4         5         6         7         8        CARD
12345678901234567890123456789012345678901234567890123456789012345678901234567890   SEQUENCE

                                                                                         1081
 SEIS      SEISMIC INERTIA LOADING                                                     1082
                                                                                       1083
 NPS       DESIGN LOADING (GRAVITY + MAXIMUM THERMAL)                                  1084
                                                                                       1085
 PLTP      FAULTED PRIMARY LOADING (GRAVITY + MAXIMUM THERMAL + SEIS INERTIA).         1086
                                                                                       1087
*                                                                                      1088
 GRAV      GRAV                                                                        1089
 THR1                THR1                                                            1090
 THR2                THR2                                                            1091
 THR3                THR3                                                            1092
 THR4                THR4                                                            1093
 SEIS           SEIS                                                                 1094
 NPS       GRAV      THR1 THR2 THR3 THR4                                             1095
*FLTP      GRAV SEIS THR1 THR2 THR3 THR4                                             1096
                                                                                       1097
```

DOC. NO. 085-295-01
ATTACHMENT 1
SHEET 6 OF 15

CALC. S14-33Mod Rev. 0
Page 12 of 24

DOC NO. 118-079-N1

ATTACHMENT 1

NIAGARA MOHAWK

~~PIPING ANALYSIS~~ DATA SHEET
R. NOZZLE SUMMARY SHEET

NUCLEAR DESIGN ENGINEERING

PROJECT: NINE MILE POINT NUC. STA.-UNIT 1 CALC. NO. S14-333-P01 REV. 1

SUBJECT: Reactor Cleanup System ORIG. A. Natoli DATE: 2/16/89

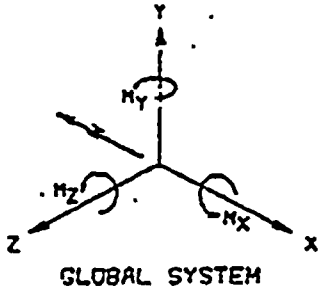
INDEX: 3-N2.1- S14 SYS. NO. 333 CHK'D. [signature] DATE: 12/17/89

PIPE CODE: ANSI B31.1 CLASS: 2 EQUIPMENT ID. N7-033 Recirc Htr Exch.

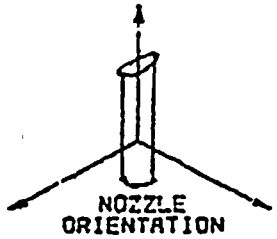
PIPE SIZE: 6 SCHEDULE: 80 NOZZLE ID. Inlet

WALL THICKNESS (NOMINAL): .432" DATA PT. NO. 432

UNITS	COMPONENT	OPERATING: MAXIMUM THERMAL	OPERATING: WEIGHT (PIPE, FLUID & INSULATION)	OPERATING BASIS EARTHQUAKE O.B.E.	DESIGN BASIS EARTHQUAKE D.B.E.	SEISMIC ANCHOR MOVEMENT O.B.E.	TOTAL PIPE LOAD	ALLOWABLE LOAD (3)
FORCE (LBS)	F_X	+ 0 - 3493	- 22	—	—	—	0 -3515	—
	F_Y	+ 0 - 1642	+430	—	—	—	430 -1133	—
	F_Z	+ 0 - 2065	- 38	—	—	—	0 -2103	—
MOMENTS (INCH-LBS)	M_X	+19608 - 0	9348	—	—	—	28956 0	—
	M_Y	+ 0 -16376	988	—	—	—	0 -16466	—
	M_Z	+106032 - 0	18252	—	—	—	118284 0	—



GLOBAL SYSTEM


NOZZLE ORIENTATION

NOTES:
(1) SIGN OF SEISMIC AND SEISMIC ANCHOR MOVEMENT LOADS MAY EITHER (+) OR (-)
(2) ALL FORCES AND MOVEMENTS ARE IN THE GLOBAL COORDINATE SYSTEM. (UNLESS OTHERWISE NOTED)
(3) ALLOWABLE LOAD FROM REFERENCE See Assumption #9 on P. 2 of Sec. F

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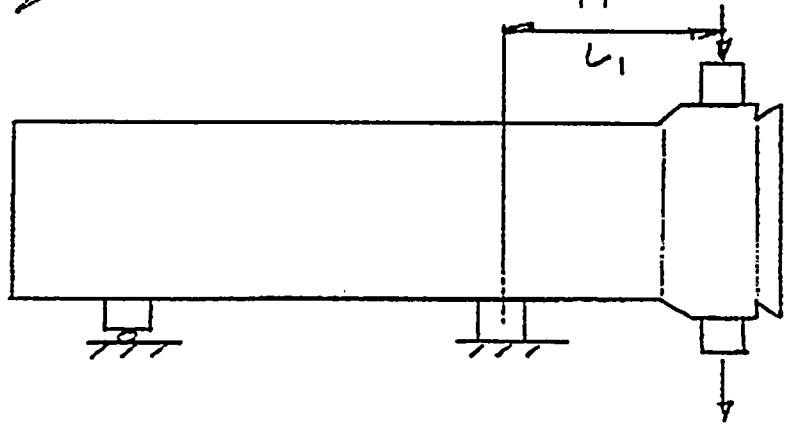
NIAGARA MOHAWK
NUCLEAR DESIGN ENGINEERING

PROJECT: NINE MILE POINT NUC. STA.—UNIT 1 CALC. NO. S14-33M-P01 REV. 1
SUBJECT: Reactor Cleanup System ORIG. A. Patel DATE: 12/4/68
INDEX: 3-N2.1-G4 SYS. NO. 33.3 CHK'D. J.R. DATE: 12/7/68

Calculation of Nozzle Stiffness for Heat Exchanger ND-C23 (DCP 423)

Ref 1) GWECO dwg. 76528 " Rev 7 "Regen Clean-up Heat Exch"
2) GWECO "dwg M-77653 Rev 1 "Shell Detail"
3) GWECO dwg M-77651 Rev 1 "Pill box cover & channel"
4) GWECO dwg M-77704 Rev 1 "Pill box Channel & Cover forging"
5) Commanche Peak Steam Electric Station (TU Electric) Procedure CPPP-1 Attachment 3-13 "Procedure for Calculating Nozzle Stiffnesses"

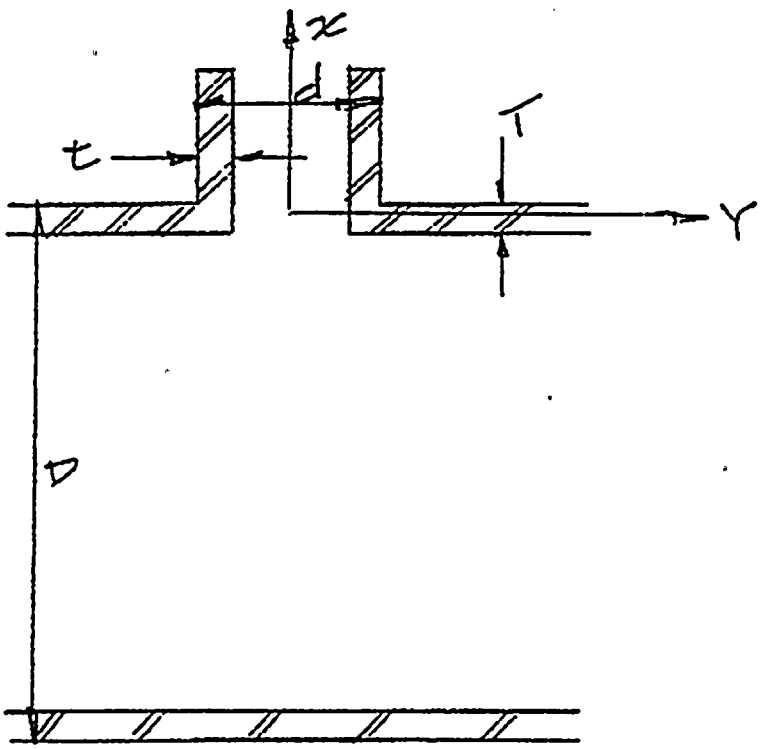
The regen heat exch appears as shown:



Elevation

PROJECT: NINE MILE POINT NUC. STA.—UNIT 1 CALC. NO. S14-333-001 REV. 1
SUBJECT: Reactor Cleanup System ORIG. A. Mott. DATE: 12/4/85
INDEX: 3-N2.1-1014 SYS. NO. 333.3 CHK'D. JSA DATE: 12/9/85

The nozzle coordinates are as shown below



The parameters as taken from the ref dwg's are:

$L_1 = 21\frac{1}{2} + 18\frac{1}{2} = 40''$

$D = 31\frac{3}{8}''$

$T = \frac{31\frac{3}{8} - 23\frac{1}{4}}{2} = 4.0625''$

$d = 5.829'' + 2(.380'') = 6.589''$

$t = .380''$

PROJECT: NINE MILE POINT NUC. STA.—UNIT 1 CALC. NO. S14-333-P01 REV. 1
SUBJECT: Reactor Cleanup System ORIG. A Patel DATE: 12/4/88
INDEX# 3-N2.1-614 SYS. NO. 333 CHK'D. JSK DATE: 12/9/88

Given the thicknesses of the nozzle and cylindrical shell, stiffnesses K_y, K_z and $K_{\theta x}$ can be assumed rigid.

Stiffnesses K_x, $K_{\theta y}$ and $K_{\theta z}$ can be calculated using the procedure from ref 5.

L (effective length) $= 2.5 \times L_1$
$= 2.5 \times 40 = 100$ in

$$\lambda = \frac{L}{(DT)^{1/2}} = \frac{100 \text{ in}}{\left(31\frac{3}{5}\right)(4.0625)^{1/2}} = 8.888 \text{ or } 10$$

$$\eta = \left(\frac{d}{D}\right)\left(\frac{D}{T}\right)^{1/2} = \frac{16.689}{31\frac{3}{5}}\left(\frac{31\frac{3}{5}}{4.0625}\right)^{1/2} = .584$$

$$\frac{T}{t} = \frac{4.0625}{.360} = 10.7$$

$\alpha = 1.5$ (Figure 1 of ref 5)

$\beta_z = 2.6 \times 10^{-2}$ (Figure 2 of ref 5)

$\beta_y = 1.4 \times 10^{-2}$ (Figure 3 of ref 5)

NIAGARA MOHAWK

NUCLEAR DESIGN ENGINEERING

PIPING ANALYSIS

PROJECT: NINE MILE POINT NUC. STA.—UNIT 1 CALC. NO. S14-33M-008 REV. 1

SUBJECT: Reactor Cleanup System ORIG. A. Patel DATE: 12/4/96

INDEX: 3-N2.1-S14 SYS. NO. 33.3 CHK'D. [illegible] DATE: 12/5/96

$$K_x = 4.95 \alpha E T^2 / (D \Lambda^{1/2})$$

$$= \frac{(4.95)(1.5)(29 \times 10^6 \text{ lb/in}^2)(4.0625 \text{ in})^2}{(31.375 \text{ in})(10)^{1/2}}$$

$$= 35.8 \times 10^6 \text{ lb/in} \text{ or } 35.8 \times 10^3 \text{ K/in}$$

$$K_{\theta_1} = 180 \beta_Y E T^3 / \pi$$

$$= \frac{(180)(1.4 \times 10^{-2})(29 \times 10^6 \text{ lb/in}^2)(4.0625 \text{ in})^3}{\pi}$$

$$= 1.78 \times 10^9 \text{ lb-in/rad} \text{ or } 1.78 \times 10^6 \text{ K-in/rad}$$

$$K_{\theta_2} = 180 \beta_Z E T^3 / \pi$$

$$= \frac{(180)(2.6 \times 10^{-2})(29 \times 10^6 \text{ lb/in}^2)(4.0625 \text{ in})^3}{\pi}$$

$$= 2.78 \times 10^9 \text{ lb-in/rad} \text{ or } 2.78 \times 10^6 \text{ K-in/rad}$$

NIAGARA MOHAWK POWER CORPORATION — NINE MILE POINT UNIT 1
REACTOR WATER CLEAN-UP SYSTEM 33 - USE [illegible] COMMAND FOR SPRING CANS INPUT
CALC S14-33.3P01 REV. 02 ATTACHMENT A — INPUT FILE 033.X

P.01

SUPPORT DESIGN LOAD SUMMARY — PAGE ___ OF ___

SUPPORT MARK = REGEN. HEAT EXCH. ND-03 — SUPPORT NAME = 432 — ORIG. BY -
SUPPORT TYPE = ANCH — SUPPORT LOCATION = 432 — CHEK. BY -
DESIGN CALC. NO. = — *** MULTIPLE SUPPORTS AT THIS DCP ***

SUPPORT STIFFNESSES (LOCAL AXES)

TRANSLATION (LB/IN) X	Y	Z	ROTATION (LB.IN/RAD) XX	YY	ZZ
1.0000E+13	0.0000E+00	1.0000E+13	0.0000E+00	1.0000E+15	0.0000E+00

DIR. COS. WRT GLOBAL AXES

LOCL AXIS	GLOBL X	GLOBL Y	GLOBL Z
X	1.000	0.000	0.000
Y	0.000	1.000	0.000
Z	0.000	0.000	1.000

RESULT TYPE	RESULT UNIT	AXIS TYPE	X-AXIS	LOAD SET	Y-AXIS	LOAD SET	Z-AXIS	LOAD SET
FORC	(LB)	GLOB	-25.46	GRAV			-38.00	GRAV
			-25.46	GRAV			-38.00	GRAV
			-538.01	THR1			-742.48	THR1
			-3492.61	THR2			-2064.89	THR2
			-468.76	THR3			-527.32	THR3
			-47.45	THR4			-30.33	THR4
			-237.46	SEIS			-495.81	SEIS
			237.46	SEIS(M+)			495.81	SEIS(M+)
			-3518.07	NPS			-2102.89	NPS
			-25.46	NPS			-38.00	NPS
			-3755.53	FLTP(M-)			-2598.71	FLTP(M-)
			212.00	FLTP			457.81	FLTP
MOMT	(LB.FT)	GLOB			-58.95	GRAV		
					-58.95	GRAV		
					-6394.38	THR1		
					-13642.97	THR2		
					-4346.02	THR3		
					-191.22	THR4		
					-230.09	SEIS		
					230.09	SEIS(M+)		
					-13701.92	NPS		
					-58.95	NPS		
					-13932.02	FLTP(M-)		
					171.15	FLTP		
DISP	(IN)	GLOB			-0.263	THR1(M-)		

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DOC. NO. 085-295-01
ATTACHMENT 1
SHEET 11 OF 15

MAY-16-97 FRI 06:40 PM

NIAGARA MOHAWK POWER CORPORATION — NINE MILE POINT UNIT 1
REACTOR WATER CLEAN-UP SYSTEM 33 - USE [illegible] COMMAND FOR SPRING CANS INPUT
CALC S14-33.3P01 REV. 02 ATTACHMENT A — INPUT FILE 033.X

P.02

SUPPORT DESIGN LOAD SUMMARY — PAGE ___ OF ___

SUPPORT MARK = REGEN. HEAT EXCH. ND-03 (CONTD.) — SUPPORT NAME = 432 — ORIG. BY -

SUPPORT TYPE = ANCH — SUPPORT LOCATION = 432 — CHEK. BY -

DESIGN CALC. NO. = — *** MULTIPLE SUPPORTS AT THIS DCP ***

RESULT TYPE	RESULT UNIT	AXIS TYPE	X-AXIS	LOAD SET	Y-AXIS	LOAD SET	Z-AXIS	LOAD SET
					-0.222	THR2		
					-0.222	THR3		
					-0.263	NPS		
					-0.263	FLTP		
ROTN	(RAD)	GLOB						NEGLIGIBLE

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DOC. NO. 085-295-01
ATTACHMENT 1
SHEET 12 OF 15

MAY-16-97 FRI 06:41 PM

NIAGARA MOHAWK POWER CORPORATION — NINE MILE POINT UNIT 1
REACTOR WATER CLEAN-UP SYSTEM 33 - USE [illegible] COMMAND FOR SPRING CANS INPUT
CALC S14-33.3P01 REV. 02 ATTACHMENT A — INPUT FILE 033.X

SUPPORT DESIGN LOAD SUMMARY

PAGE ___ OF ___

SUPPORT MARK = REGEN. HEAT EXCH. ND-03
SUPPORT NAME = 432A
ORIG. BY -
SUPPORT TYPE = ANCH
SUPPORT LOCATION = 432
CHEK. BY -
DESIGN CALC. NO. =
*** MULTIPLE SUPPORTS AT THIS DCP ***

SUPPORT STIFFNESSES (LOCAL AXES)

TRANSLATION (LB/IN) X	Y	Z	ROTATION (LB.IN/RAD) XX	YY	ZZ
0.0000E+00	3.5800E+07	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

DIR. COS. WRT GLOBAL AXES

LOCL AXIS	GLOBL X	GLOBL Y	GLOBL Z
X	1.000	0.000	0.000
Y	0.000	1.000	0.000
Z	0.000	0.000	1.000

RESULT TYPE	RESULT UNIT	AXIS TYPE	X-AXIS	LOAD SET	Y-AXIS	LOAD SET	Z-AXIS	LOAD SET	
FORC	(LB)	GLOB			398.06	GRAV			
					398.06	GRAV			
					-519.08	THR1			
					-1562.27	THR2(M-)			
					-357.34	THR3			
					-21.70	THR4			
					-357.28	SEIS			
					357.28	SEIS			
					-1164.21	NPS			
					398.06	NPS			
					-1521.49	FLTP			
					755.34	FLTP(M+)			
MOMT	(LB.FT)	GLOB							NEGLIGIBLE
DISP	(IN)	GLOB	0.120	THR1(M+)					
			0.102	THR2					
			0.102	THR3					
			0.120	NPS					
			0.120	FLTP					
ROTN	(RAD)	GLOB							NEGLIGIBLE

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DOC. NO. 085-295-01
ATTACHMENT 1
SHEET 13 OF 15

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SUPPORT DESIGN LOAD SUMMARY PAGE ___ OF ___

SUPPORT MARK = REGEN. HEAT EXCH. ND-03 SUPPORT NAME = 432B ORIG. BY -

SUPPORT TYPE = ANCH SUPPORT LOCATION = 432 CHEK. BY -

DESIGN CALC. NO. = *** MULTIPLE SUPPORTS AT THIS DCP ***

SUPPORT STIFFNESSES (LOCAL AXES)

TRANSLATION (LB/IN)			ROTATION (LB.IN/RAD)		
X	Y	Z	XX	YY	ZZ
0.0000E+00	0.0000E+00	0.0000E+00	1.7800E+09	0.0000E+00	0.0000E+00

DIR. COS. WRT GLOBAL AXES

LOCL AXIS	GLOBL X	GLOBL Y	GLOBL Z
X	1.000	0.000	0.000
Y	0.000	1.000	0.000
Z	0.000	0.000	1.000

RESULT TYPE	RESULT UNIT	AXIS TYPE	X-AXIS	LOAD SET	Y-AXIS	LOAD SET	Z-AXIS	LOAD SET	
FORC	(LB)	GLOB							NEGLIGIBLE
MOMT	(LB.FT)	GLOB	739.74	GRAV					
			739.74	GRAV					
			438.77	THR1					
			1633.96	THR2					
			292.37	THR3					
			22.08	THR4					
			-1111.55	SEIS(M-)					
			1111.55	SEIS					
			739.74	NPS					
			2373.70	NPS					
			-371.81	FLTP					
			3485.25	FLTP(M+)					
DISP	(IN)	GLOB	0.120	THR1(M+)					
			0.102	THR2					
			0.102	THR3					
			0.120	NPS					
			0.120	FLTP					
ROTN	(RAD)	GLOB							NEGLIGIBLE

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DOC. NO. 085-295-01
ATTACHMENT 1
SHEET 14 OF 15

NIAGARA MOHAWK POWER CORPORATION — NINE MILE POINT UNIT 1
REACTOR WATER CLEAN-UP SYSTEM 33 - USE PNTF COMMAND FOR SPRING CANS INPUT
CALC S14-33.3P01 REV. 02 ATTACHMENT A — INPUT FILE 033.X

P.05

SUPPORT DESIGN LOAD SUMMARY — PAGE ___ OF ___

SUPPORT MARK = REGEN. HEAT EXCH. ND-03 — SUPPORT NAME = 432C — ORIG. BY -

SUPPORT TYPE = ANCH — SUPPORT LOCATION = 432 — CHEK. BY -

DESIGN CALC. NO. = — *** MULTIPLE SUPPORTS AT THIS DCP ***

SUPPORT STIFFNESSES (LOCAL AXES)

TRANSLATION (LB/IN) X	Y	Z	ROTATION (LB.IN/RAD) XX	YY	ZZ
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.7800E+09

DIR. COS. WRT GLOBAL AXES

LOCL AXIS	GLOBL X	GLOBL Y	GLOBL Z
X	1.000	0.000	0.000
Y	0.000	1.000	0.000
Z	0.000	0.000	1.000

RESULT TYPE	RESULT UNIT	AXIS TYPE	X-AXIS	LOAD SET	Y-AXIS	LOAD SET	Z-AXIS	LOAD SET	
FORC	(LB)	GLOB							NEGLIGIBLE
MOMT	(LB.FT)	GLOB					1260.56	GRAV	
							1260.56	GRAV	
							774.08	THR1	
							8334.66	THR2	
							809.75	THR3	
							112.55	THR4	
							-413.42	SEIS(M-)	
							413.42	SEIS	
							1260.56	NPS	
							9595.21	NPS	
							847.14	FLTP	
							10008.64	FLTP(M+)	
DISP	(IN)	GLOB	0.120	THR1(M+)					
			0.102	THR2					
			0.102	THR3					
			0.120	NPS					
			0.120	FLTP					
ROTN	(RAD)	GLOB							NEGLIGIBLE

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DOC. NO. 085-295-01
ATTACHMENT 1
SHEET 15 OF 15

MPR Associates, Inc.
320 King Street
Alexandria, VA 22314

Calculation No.	Prepared By	Checked By	Page 1 of 2
085-295-01			

ATTACHMENT 2

Calculation of Stresses for Input to Program SSFLAW

Calculation of Stresses for Input to Program SSFLAW

Forces and Moments From Reference 3 SUPERPIPE Run at Node 432, 432A, 432B, 432C

CASE	FX (pounds)	FY (pounds)	FZ (pounds)	MX (foot-pounds)	MY (foot-pounds)	MZ (foot-pounds)
GRAV	-25.46	398.06	-38.00	739.74	-58.95	1,260.56
TH-1 TH-2 TH-3 TH-4	-3,492.61	-1,562.26	-2,064.89	1,633.96	-13,642.97	8,334.66
TH-Max	3,492.61	1,562.26	2,064.89	1,633.96	13,642.97	8,334.66
SEISMIC	237.46	357.28	495.81	1,111.55	230.09	413.42
GRAV +TH-Max +SEISMIC	3,755.53	2,317.60	2,598.70	3,485.25	13,932.01	10,008.64

Geometry Data

Outside Diameter (Do):	6.625 in	(References 5 and 6)
Nominal Thickness (tn):	0.380 in	(Reference 5)
Pipe Metal Area:	7.46 in^2	
Section Modulus (Z):	11.01 in^3	

Calculation of Stresses for SSFLAW

Calculation of Tensile Stress

Axial Force (FY Direction)		2,317.6	pounds
Pipe Area = pi * (Ro^2 - Ri^2):		7.46	in^2
Axial Stress (= F / Area):		310.9	psi
	USE:	0.4	ksi

Calculation of Bending Stress

Bending Moment (SRSS of MX and MZ)		10,598.1	foot-pounds
Section Modulus (Z):		11.01	in^3
Bending Stress (= 12 * M / Z):		11548.3	psi
	USE:	12.0	ksi