LICENSEE: Niagara Mohawk Power Corporation January 6, 1997

FACILITY: Nine Mile Point Nuclear Station Unit No. 1

SUBJECT: SUMMARY OF TELEPHONE CONVERSATION OF DECEMBER 18, 1996, ON REACTOR AND TURBINE BUILDING BLOWOUT PANELS (TAC NO. M94858)

On December 18, 1996, the NRC staff discussed, via telephone, the licensee's letter of November 15, 1996, "Response to Trip Report of August 20, 1996, Audit of Reactor and Turbine Building Blowout Panels" (Response). Participants for Niagara Mohawk Power Corporation were Messrs. C. Stroup and D. Baker. Participants for NRC were Messrs. D. Jeng and D. Hood.

The licensee's Response provided the results of revised Reactor and Turbine Building superstructure calculations resulting from steam line breaks outside primary containment. The calculations for building pressure capacities were revised by eliminating the use of the 1.05 dynamic load factor (i.e., strain rate factor for increasing Fy of material) and adjusting the dead load scaling factor. The reduction factor was also changed from 0.95 ϕ to 0.90 ϕ. The resulting lower bound failure internal pressures for the Reactor Building were 117 psf for the secondary member (roof bracing) and 124 psf for the primary member (critical column). The resulting lower bound failure internal pressures for the Turbine Building were 135 psf for the secondary member (roof truss) and 150 psf for the primary member (critical column).

During the telephone call, the NRC staff requested additional information regarding the principal inputs and assumptions used in these calculations. The staff also asked if the revised reduction factor that was applied in the revised structural capacity calculation had also been used in the blowout panel capacity calculation, and if so, what were the effects?

The licensee responded to the staff's request by faxing the enclosed additional pages from the engineering calculations, and two notes of explanation.

/S/

Darl S. Hood, Senior Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosure: As stated

cc w/encl: See next page

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Memo

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001
January 6, 1997

LICENSEE: Niagara Mohawk Power Corporation

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cc w/encl: See next page

Niagara Mohawk Power Corporation

Nine Mile Point Nuclear Station
Unit No. 1

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NIAGARA MOHAWK

NINE MILE POINT NUCLEAR STATION
P.O. BOX 63, LYCOMING, NEW YORK 13093

FAX COVER LETTER

NINE MILE POINT UNIT 2

FROM: FAX TELEPHONE NUMBER: (315) 349-1400

NAME: Dave Baker

DEPARTMENT: LICENSING/ENVIRONMENTAL

TELEPHONE NUMBER:

FAX #

TO: Darl Hood NRC

TOTAL NUMBER OF PAGES FAXED (INCLUDING COVER LETTER): 29

DATE: 12/19/96 TIME: ________

MESSAGE: Calculation extracts as requested in telecon of 12/18/96 with 1 note of explanation on calc S4RX34DBLDG01, page 6; and 1 discussion point on usage of reduction or overcapacity factors in calculation S7RX340W01

D-C-13

ORIGINAL

NIAGARA MOHAWK
NUCLEAR ENGINEERING

DISPOSITION COVER SHEET

Page 1 (Next) 2
Total 393
Last D-379

Project: NINE MILE POINT NUCLEAR STATION Unit (1,2 or 0=Both): 1 Discipline: STRUCTURAL

Title: EVALUATION OF TURBINE BUILDING ABOVE EL. 300 FOR 125 PSF INTERNAL PRESSURE		Calculation No. SATB300BLDG01	Rev 00 / Disp 00B
		Originator: CE Strop	Date 8-30-96
(Sub)System(s): N/A	Index No. S4	Checker: C.R. ACOSTA	Date 9/6/96
Design Change No. N/A		Approver: Mohammed Alvi	Date 9-10-96

NMPC Acceptance/Date: N/A

Superseded Document(s): NONE

Description of Change

INCORPORATE NRC NRR COMMENTS OF REVISION 0.

Resolution

SEE ATTACHED PAGES 2-14

Cross Reference Change(s):

NONE

Confirmation Required (Yes/No): NO See Page(s):	Final Issue Status (APP/FIO/VOI): APP	File Location (Calculation/Hold): C	Operations Accepted on Issue (Yes/No): YES

Safety Evaluation Number(s)/Revision:
Copy of Applicability Review Attached? Yes ___ N/R ✓

Component ID(s)/EPN(s)/Line Numbers: N/A

Key Words: PRESSURE RELIEF PANELS, TURBINE BUILDING, INTERNAL PRESSURE, STRUCTURAL, NMP1, COSMOSM

NEP-DES-08-F03-001

NEP-DES-08
Rev 01

NIAGARA MOHAWK NUCLEAR ENGINEERING | CALCULATION CONTINUATION SHEET | Page 2

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
C E Strop 8-27-96	S4TB300BLDG01.	0

Checked	Date	Disposition
[illegible]	9/4/96	ΦΦB

Ref.

OBJECTIVE:

1) Revision 0 extrapolated the internal pressure which would cause structure failure using linear extrapolation of results [member forces and moments], which included both deadweight and pressure loadings.

This Calc removes the effect of dead weight when extrapolating the 125psF upwards (or down) to obtain the pressure loading causing failure.

2) Revision 0 included a 1.05 increase factor of the internal pressure based on a strain rate effect.

This calc eliminates this factor for the governing structural members.

Project: *NINE MILE POINT NUCLEAR STATION* Unit: 1

Originator/Date	Calc. No.	Rev
CES 8-27-96	S4TB300BLDG01	0

Checked	Date	Disposition
[illegible]	9/5/96	ΦΦB

Ref.

Member 3491 [page 62] Top Chord Member

From page 70, use $F_y = 37.59$ ksi (Mill Certs Minimum)

For Tensile Loading & Moment Combined:

$$\frac{P_u}{\phi_t P_n} + \frac{8}{9}\left(\frac{M_y}{\phi_b M_{ny}} + \frac{M_z}{\phi_b M_{nz}}\right) \leq 1.0 \qquad \text{LRFD H1-1a}$$

Since $\frac{P}{\phi_t P_n} \geq 0.2$

$$\phi_t P_n = \underbrace{(0.75)}_{\text{LRFD D1-2}}\underbrace{(19.4 - 2(0.75))}_{A_e,\ \text{Net area}}\underbrace{(37.59\,\text{ksi})}_{F_y} = 518.74^k$$

For double-angles, M_n is given by LRFD EQ F1-15:

$$\left(\text{Note: } \frac{b}{t} = \frac{8}{3/4} = 10.667 \leq \lambda_r = \frac{76}{\sqrt{37.59}} = 12.4\right)$$

$$M_n = \frac{C_b \pi \sqrt{E I_y G J}}{L_b} \cdot \left[B + \sqrt{1+B^2}\right] \leq Z F_y$$

$G = 11{,}200$ ksi; $E = 29{,}000$ ksi $B = \pm 2.3 \frac{d}{L_b}\sqrt{\frac{I_y}{J}}$

NIAGARA MOHAWK
NUCLEAR ENGINEERING

CALCULATION CONTINUATION SHEET

Page 4

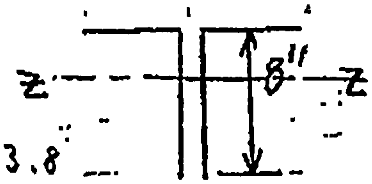
Project: *NINE MILE POINT NUCLEAR STATION* Unit: 1

Originator/Date	Calc. No.	Rev
CES 8-27-96	S4TB300BLDG01	0

Checked	Date	Disposition
CA	9/5/96	ΦΦB

Ref.

$I_y = 127.4$



TOP CHORD

$J = 2 * 1.90 = 3.8$

$C_w = 2 * 7.28 = 14.56$

LRFD Torsion properties 1-142. For double angle, sum individual J & Cw per (2) page 1-83

NOTE: SKETCH ON PAGE 62 IS INCORRECT. ANGLES ARE LLV AS CORRECTLY MODELED IN COSMOSM

$L_b = 8'-7\frac{1}{2}$ About Z-Z axis

$L_b = 8'-7\frac{1}{2}$ About Y-Y axis — Top Chord only Braced by Purlins (Drawing C-15349-C)

Use $L_b = 8'-7\frac{1}{2} = 103.5''$

$$B = 2.3\,\frac{(8'')}{103.5}\sqrt{\frac{127.4}{3.8}} = 1.029$$

Stem in Compression (– Sign on Moments M_t)

$$= \frac{C_b\,\pi\sqrt{(29{,}000)(127.4)(11{,}200)(3.8)}}{103.5} = 12{,}036\,C_b$$

$$M_n = 12{,}036\,C_b\left[-1.029 + \sqrt{1 + 1.029^2}\right] = 4{,}885\,C_b \text{ k-in}$$

Use $C_b = 1.0$ Conservative However, note that $M_y = S F_y = (23.3\text{ in}^3)(36\text{ ksi}) = 838.8\text{ k-in}$

[illegible]

NIAGARA MOHAWK NUCLEAR ENGINEERING — CALCULATION CONTINUATION SHEET — Page 5

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
CES 8-27-96	54TB300BLDG01	0

Checked	Date	Disposition
[illegible]	9/5/96	ΦΦ6

Ref.

Therefore use $M_n = 0.9 * 838.8 = 754.92$ k-in

Likewise for Y-Y axis

$$M_y = (15.44\ in^3)(36\ ksi) = 555.84\ k\text{-}in$$

$$M_n = 0.9\ (555.84) = 500\ k\text{-}in$$

NOTE: We have used SF_y instead of ZF_y for both directions. Since $S < Z$, this approach is conservative as recommended by LRFD for double-angle beams.

Interaction:

$$\frac{319.6}{518.74} + \frac{8}{9}\left(\frac{73.3}{500} + \frac{122.6}{754.92}\right) = 0.891 \le 1.0$$

For Failure Pressure of 125psf + dead weight

Extrapolate to failure pressure considering deadweight.
(SEE PAGE D-326 FOR DW FORCES & MOMENTS)

	125psf + DW		DW		125psF ONLY
Axial	319.6^k T	=	114.1^k C	+	433.7^k (T)
M_y	+73.3 k-in (end)	=	-21.26 k-in (end)	+	94.56 k-in
M_z	-122.6 k-in (end)	=	-3.173 k-in (end)	+	-119.43 k-in

Keeping close track of signs.

	125psf+DW/0.891		DW	X psf
AXIAL	358.7^k T	=	114.1^k C	472.8

$$X, psf\ \text{FAILURE Pressure} = \frac{472.8}{433.7} \times 125 = 136.3\ psf$$

DRC-11

NIAGARA MOHAWK NUCLEAR ENGINEERING

CALCULATION CONTINUATION SHEET

Page 6

Project: *NINE MILE POINT NUCLEAR STATION* Unit: 1

Originator/Date	Calc. No.	Rev
CLS 8-27-96	S4TB300BLDG-01	0

Checked	Date	Disposition
A	9/5/96	ΦΦB

Check 136 psf: [All Moments are at same Location]

136 PSF ONLY		DW		136psf+DW
$\frac{136}{125} \times 433.7 =$	471.9^k (T)	+	119.1^k C	$= 357.8^k$ (T)
$\frac{136}{125} \times 94.56 =$	102.88 k-in	+	−21.26 k-in	= 81.62 k-in
$\frac{136}{125} \times -119.43 =$	−130 k-in	+	−3.173 k-in	= −133.173 k-in

AUD

$$\frac{357.8}{518.74} + \frac{8}{9}\left(\frac{81.62}{500} + \frac{133.123}{754.96}\right) = 0.992$$

OK

The Failure Internal Pressure is 136 PSF (Based on Member 3491)

Member 3745: [p.60] L6X4X$\frac{7}{16}$ LLV

$$\phi_t P_n = \underbrace{(0.75)}_{\text{LRFD D1-2}}\underbrace{(4.18-0.44)}_{\text{Net Area}}\underbrace{(36)}_{F_y} = 100.98^k.$$

Mn is defined for single angles as not to exceed $\phi F_y Q_s$ ksi. LRFD Appendix B

$$\frac{b}{t} = \frac{6}{7/16} = 13.714 \qquad \frac{76}{\sqrt{F_y}} = \frac{76}{6} = 12.67$$

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
C25 8-27-96	S4TB300BLD601	0

Checked	Date	Disposition
[signature]	9/5/96	ΦΦB

Ref.

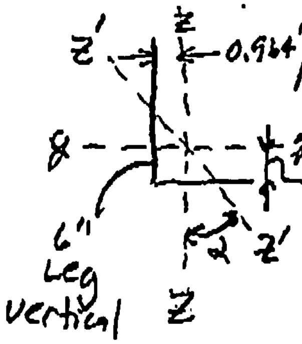
$\frac{155}{\sqrt{F_y}} = 25.833$ since $\frac{76}{\sqrt{F_y}} < \frac{b}{t} < \frac{155}{\sqrt{F_y}}$

$Q_s = 1.340 - 0.00447 \frac{b}{t} \sqrt{F_y}$. LRFD A-B5-1

$Q_s = 1.340 - 0.00447(13.714)\sqrt{36} = 0.972$

$M_n = \phi Q_s F_y S = (0.9)(0.972)(36) S = 31.5 S$

where S should be determined about appropriate axis.



$A = 4.18 in^2$ $I_y = 15.5 in^4$ $S_y = 3.83 in^3$ $r_y = 1.92$

$I_z = 5.6 in^4$ $S_z = 1.85 in^3$ $r_z = 1.16 in$

$r_{z'} = 0.873$ $\tan\alpha = 0.443$

$I_{z'} = A r_{z'}^2 = 4.18 in^2 (0.873)^2 = 3.186 in^4$

NOTE: Page 60 M_z and M_y are interchanged. $M_y = 34.99$ k-in $M_z = 0.38$. Local axis Y is major axis.

$M_{ny} = (31.5)(3.83 in^3) = 120.6$ k-in [COSMOS/M LOCAL Member Y-axis]

$M_{nz} = (31.5)(1.85) = 58.3$ k-in [COSMOS/M LOCAL Member Z-axis]

$\frac{61.02}{100.98} + \frac{34.99}{120.66} + \frac{0.38}{58.3} = 0.901$

Failure Pressure
125 PSF + DW

NIAGARA MOHAWK NUCLEAR ENGINEERING

CALCULATION CONTINUATION SHEET

Project: *NINE MILE POINT NUCLEAR STATION* Unit: 1

Originator/Date	Calc. No.	Rev
CSS/10-p 8-27-96	S4TB300BLDG01	0

Checked	Date	Disposition
[signature]	9/5/96	ΦΦB

Ref.

Extrapolate to Failure pressure Considering deadweight.
[SEE PAGE D-351 FOR DW FORCES & MOMENTS]

	125 psf + DW		DW		125 psf ONLY
AXIAL	61.02^k (T)	=	0.255^k (C)	+	61.28
M_z	0.38 k-in	=	−0.0289		0.409
M_y	34.99 k-in	=	34.96		0.03 k-in

Moment terms are all due to deadweight only.

125 PSF+DW / 0.901		DW		X, PSF ONLY
67.72^k (T)	=	0.257^k (C)	+	67.98^k (T)

$$X, \text{psf Failure pressure} = \frac{67.98}{61.28} \times 125 = 138.67 \text{ psf}$$

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
CES 8-28-96	S4TB3008LDG-Φ1	Φ

Checked	Date	Disposition
A	9/6/96	ΦΦB

Ref.

Member 136 [Page 38] Col. 24WF94

$M_{max} = 6,800$ k-in $P = 5^k (c)$

Flexure

As explained in page 32, the column is fully braced along its length by the siding on the outside which prevents twist of the cross-section.

Therefore $M_u = \phi M_n = \phi M_p = \phi Z F_y$ [LRFD Chapter F]

$M_u = (0.9)(253 in^3)(36 ksi) = 8,197.2$ k-in

where F_y has been conservatively used as 36ksi. [Page 71 shows that F_y from mill certs is a minimum of (0.955) 42,680 = 40,760 ksi.]

Compression $K = 1.2$ [Table C-C2.1, pg. 6-151 LRFD]

$$\lambda_c = \frac{(1.2)(204.56'')}{(1.98)\pi}\sqrt{\frac{36}{29,000}}$$ Eq. E2-4 LRFD

{ where $L = 204.56''$
$r = 1.98''$ per page 31.

$\lambda_c = 1.390 \leq 1.5$ Eq. E2-2 LRFD

$$P_n = A_g F_{cr} = A_g (0.658^{\lambda_c^2}) F_y = (27.7 in^2)(0.658)^{(1.390)^2} 36$$

$P_n = 1,268.4^k$

$\phi P_n = 0.85(1268.4) = 1,078.2^k$ E2-1 LRFD

NIAGARA MOHAWK NUCLEAR ENGINEERING | **CALCULATION CONTINUATION SHEET** | Page 10

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
CSS 8-26-96	S4TB300BLDG-D1	0

Checked	Date	Disposition
A	9/6/96	ΦΦB

Ref.

Since $\frac{P}{\phi P_n} = \frac{5}{1,078.2} = 0.0046 < 0.2$

Then interaction equation is:

$$\frac{P}{2\phi P_n} + \frac{M_y}{\phi_b M_y} + \frac{M_z}{\phi_b M_z} \leq 1.0 \quad \text{LRFD H1-1b}$$

M_y may be neglected. Then,

$$\frac{5}{2(1,078)} + \frac{6,800}{8,197.2} = 0.830 \quad \text{For } 125\,psf + DW$$

[SEE PAGE D-155 FOR DEADWEIGHT FORCES & MOMENTS]

Extrapolate to Failure Pressure considering deadweight;

NOTE: MAX. Moment is NOT at either end.

	125 psf + DW		DW		125 psf ONLY
AXIAL	5^k (C)	=	24.85^k (C)	+	19.85^k (T)
M_z	−6,668 k-in (Start)	=	12.74 k-in	+	−6,680.7 k-in
M_z	+4,362 k-in (end)	=	−23.67 k-in	+	4,385.67 k-in
V_y	29.39^k (End)	=	0.0534	+	$+29.34^k$
V_z	6.840^k (Start)	=	−0.0534	+	$+6.893^k$
	(125 psf + DW) / 0.830		DW		X psf
M_z	−8,034 k-in	=	12.74		−8,046 k-in

$$X, \text{PSF FAILURE} = \frac{8,046}{6,680.7} \times 125 = 150 \text{ psf}$$

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
CES 8-28-96	S4TB300BLDGΦ1	Φ
Checked A	Date 9/6/96	Disposition ΦΦB

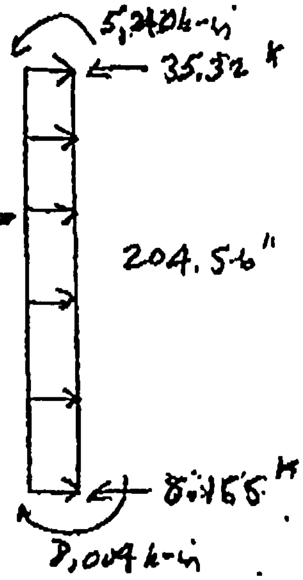
Ref.

This result is identical to the previous result on page 38. This is because deadweight moments are very small and the member design is governed by moment.

Check for 150 psf (Previous governing pressure).

	150 PSF (ONLY)		DW		150psf + DW
AXIAL	150/125 × 19.85^k = 23.82^k(T)	+	24.85^k(c)	=	− 1.03^k
Mz: START	150/125 × −6,680.7 = −8,016.8 k-in	+	12.74 k-in	=	−8,004.1 k-in
Mz: end	150/125 × 4,386 = 5,263.2 k-in	+	−23.67 k-in	=	5,240 k-in
Vy: Start	150/125 × 6.840 = 8.208^k	+	−.0534^k	=	8.155^k
Vy: end	150/125 × 29.39 = 35.27^k	+	+.0534^k	=	35.32^k

Determine Max. Moment:



$\frac{150}{125} \times 0.1771\ k/in = 0.2125\ k/in$

$M = 8{,}004 + 8{,}155X - .2125\frac{X^2}{2}$

$\frac{dM}{dX} = 0 = 8.155 - .2125X$

$X = 38.38''$

$M_{max} = 8{,}160.5\ k\text{-in}$ @ $X = 38.38''$

NIAGARA MOHAWK
NUCLEAR ENGINEERING

CALCULATION CONTINUATION SHEET

Page 12

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date		Calc. No.	Rev
CGS 8-28-96		S4TB300BLDG01	0
Checked	Date 9/6/96	Disposition 0AB	

Ref.

Then using page 10 of this Disposition:

$$\frac{5^{K}}{2(1078)} + \frac{8,140.5}{8,197.2} = 0.998 \leq 1.0 \quad \underline{OK}$$

2AWF95 Columns Failure load 150 PSF

NIAGARA MOHAWK NUCLEAR ENGINEERING	CALCULATION CONTINUATION SHEET	Page 13

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
C. Strong 8-28-96	SATB300BLDG01	0

Checked	Date	Disposition
[signature]	9/6/96	.008

Ref.

Member 4229 [Page 58]

From page 58 $P_{cr} = 123^k(c)$, $P = -88.1^k$ 125 psf + DW
[SEE page D-378 FOR DEADWEIGHT FORCE]

AXIAL $\underset{88.1^K(c)}{\underline{125\,psf + DW}} = \underset{33.73^k(T)}{\underline{DW}} + \underset{121.83^k(c)}{\underline{125\,psf\ ONLY}}$

NOTE that DW is tension, Pressure Compression

So @ Failure Pressure $= 123^k(c) + \underset{DW}{33.73^k} = 156.73^k(c)$

↑ pressure which yields this force will fail 4229

$$\frac{156.73^k}{121.83^k} \times 125\,psf = 160\ psf$$

125 psf ONLY

Check this result:

$\underline{160\ psf\ ONLY}$ — $\underline{DW}$ = $\underline{160\ psf + DW}$

$$\frac{160}{125} \times 121.83^k(c) = 155.94^k(c) + 33.73^k(T) = 122.21^k(c)$$

$$\frac{122.21}{123^k} = 0.994 \le 1.0 \quad \underline{OK}$$

∴ Failure Pressure For 4229 is 160 psf

NIAGARA MOHAWK
NUCLEAR ENGINEERING

CALCULATION CONTINUATION SHEET

Project: *NINE MILE POINT NUCLEAR STATION* Unit: 1

Originator/Date	Calc. No.	Rev
CSStroup 8-28-96	S4TB300BLDGΦ1	Φ

Checked	Date	Disposition
A	9/6/96	ΦΦB

Ref.

Conclusion

The Turbine Building Main Hall (Above EL. 300) Internal Pressure = 135PSF @ Failure

This 135 psf is in compliance with the Functional Failure Criteria of the FSAR: 0.9 F_y or 0.9 $P_{critical}$.

```
  Vs=-.6057E+02 0.6057E+02  Ms=-.2503E+03 -.1094E+03  (Ms/Ss)=0.1041E+02 -.4548E+01
  Vt=0.1758E+01 -.1758E+01  Mt=0.1436E+05 -.2675E+05  (Mt/St)=-.6463E+02 -.1204E+03
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.8473E+03 -.7396E+03
                                                       Smin  =-.9973E+03 -.9895E+03
129     [   52  ,    53 ]
  Fr=0.1811E+05 -.1643E+05  Tr=-.6627E+00 0.6627E+00  (P/A)  =-.6539E+03 -.5931E+03
  Vs=-.6148E+02 0.6148E+02  Ms=0.1094E+03 -.4508E+03  (Ms/Ss)=-.4548E+01 -.1874E+02
  Vt=0.1585E+01 -.1585E+01  Mt=0.2674E+05 -.3999E+05  (Mt/St)=-.1204E+03 -.1800E+03
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.5289E+03 -.3943E+03
                                                       Smin  =-.7788E+03 -.7919E+03
130     [   38  ,    54 ]
  Fr=0.2538E+05 -.2379E+05  Tr=-.6361E+01 0.6361E+01  (P/A)  =-.9164E+03 -.8587E+03
  Vs=-.3796E+02 0.3796E+02  Ms=-.1087E+04 -.4127E+04  (Ms/Ss)=0.4519E+02 -.1716E+03
  Vt=0.2549E+02 -.2549E+02  Mt=0.9140E+04 -.1690E+05  (Mt/St)=-.4115E+02 -.7610E+02
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.8301E+03 -.6110E+03
                                                       Smin  =-.1003E+04 -.1106E+04
131     [   54  ,    55 ]
  Fr=0.1754E+05 -.1585E+05  Tr=0.2484E+01 -.2484E+01  (P/A)  =-.6331E+03 -.5723E+03
  Vs=-.1113E+02 0.1113E+02  Ms=-.3876E+04 -.2241E+04  (Ms/Ss)=0.1612E+03 -.9318E+02
  Vt=0.2839E+02 -.2839E+02  Mt=0.1690E+05 -.1930E+05  (Mt/St)=-.7610E+02 -.8690E+02
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.3958E+03 -.3923E+03
                                                       Smin  =-.8704E+03 -.7524E+03
132     [   40  ,    56 ]
  Fr=0.2448E+05 -.2289E+05  Tr=-.1192E+02 0.1192E+02  (P/A)  =-.8839E+03 -.8262E+03
  Vs=-.2323E+02 0.2323E+02  Ms=-.1163E+04 -.4210E+04  (Ms/Ss)=0.4835E+02 -.1751E+03
  Vt=0.2626E+02 -.2626E+02  Mt=0.5583E+04 -.1034E+05  (Mt/St)=-.2513E+02 -.4653E+02
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.8104E+03 -.6046E+03
                                                       Smin  =-.9574E+03 -.1048E+04
133     [   56  ,    57 ]
  Fr=0.1673E+05 -.1505E+05  Tr=0.4180E+01 -.4180E+01  (P/A)  =-.6040E+03 -.5432E+03
  Vs=0.1033E+02 -.1033E+02  Ms=-.3918E+04 -.2361E+04  (Ms/Ss)=0.1629E+03 -.9817E+02
  Vt=0.2915E+02 -.2915E+02  Mt=0.1033E+05 -.8108E+04  (Mt/St)=-.4652E+02 -.3650E+02
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.3945E+03 -.4085E+03
                                                       Smin  =-.8134E+03 -.6779E+03
134     [   41  ,    58 ]
  Fr=0.2412E+05 -.2252E+05  Tr=0.8306E+00 -.8306E+00  (P/A)  =-.8707E+03 -.8130E+03
  Vs=-.3502E+02 0.3502E+02  Ms=-.2748E+03 -.1211E+03  (Ms/Ss)=0.1143E+02 -.5035E+01
  Vt=0.1935E+01 -.1935E+01  Mt=0.8310E+04 -.1547E+05  (Mt/St)=-.3741E+02 -.6966E+02
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.8219E+03 -.7383E+03
                                                       Smin  =-.9196E+03 -.8877E+03
135     [   58  ,    59 ]
  Fr=0.1666E+05 -.1497E+05  Tr=0.2017E+00 -.2017E+00  (P/A)  =-.6013E+03 -.5405E+03
  Vs=-.3559E+02 0.3559E+02  Ms=0.1211E+03 -.4837E+03  (Ms/Ss)=-.5035E+01 -.2011E+02
  Vt=0.1683E+01 -.1683E+01  Mt=0.1547E+05 -.2314E+05  (Mt/St)=-.6966E+02 -.1042E+03
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.5266E+03 -.4163E+03
                                                       Smin  =-.6760E+03 -.6648E+03
136     [   42  ,    60 ]
  Fr=0.2485E+05 -.2325E+05  Tr=0.4295E+00 -.4295E+00  (P/A)  =-.8969E+03 -.8392E+03
  Vs=-.5341E+02 0.5341E+02  Ms=-.1559E+03 -.3011E+03  (Ms/Ss)=0.6482E+01 -.1252E+02
  Vt=0.2234E+01 -.2234E+01  Mt=0.1274E+05 -.2367E+05  (Mt/St)=-.5735E+02 -.1065E+03
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.8331E+03 -.7202E+03
                                                       Smin  =-.9608E+03 -.9583E+03
137     [   60  ,    61 ]
  Fr=0.1705E+05 -.1537E+05  Tr=0.4295E+00 -.4295E+00  (P/A)  =-.6157E+03 -.5549E+03
  Vs=-.5341E+02 0.5341E+02  Ms=0.3011E+03 0.5422E+03  (Ms/Ss)=-.1252E+02 0.2255E+02
  Vt=-.3915E+01 0.3915E+01  Mt=0.2367E+05 -.3517E+05  (Mt/St)=-.1065E+03 -.1583E+03
               (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00      Smax  =-.4966E+03 -.3740E+03
                                                       Smin  =-.7347E+03 -.7358E+03
138     [   43  ,    62 ]
  Fr=0.2503E+05 -.2343E+05  Tr=-.1977E+00 0.1977E+00  (P/A)  =-.9037E+03 -.8460E+03
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                                                    Smin  =0.1321E+04 0.1510E+04
3483     [ 1107  ,   1106 ]
   Fr=0.6759E+05 -.6755E+05  Tr=-.2234E+02 0.2234E+02  (P/A) =-.3396E+04 -.3394E+04
   Vs=-.2356E+02 0.2346E+02  Ms=-.1248E+04 -.1007E+04  (Ms/Ss)=0.5945E+02 -.4795E+02
   Vt=0.3006E+03 0.2551E+03  Mt=-.8736E+03 -.1459E+04  (Mt/St)=0.4294E+02 -.7169E+02
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =-.3294E+04 -.3275E+04
                                                        Smin  =-.3498E+04 -.3514E+04
3484     [ 1108  ,   1050 ]
   Fr=-.6204E+05 0.6204E+05  Tr=0.2896E+02 -.2896E+02  (P/A) =0.3117E+04 0.3117E+04
   Vs=0.4034E+00 -.4034E+00  Ms=0.2363E+04 -.1998E+04  (Ms/Ss)=-.1125E+03 -.9515E+02
   Vt=0.2697E+03 0.2772E+03  Mt=0.7812E+02 -.3881E+02  (Mt/St)=-.3840E+01 -.1908E+01
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =0.3234E+04 0.3214E+04
                                                        Smin  =0.3001E+04 0.3020E+04
3485     [ 1106  ,   1100 ]
   Fr=0.8874E+05 -.8870E+05  Tr=-.2451E+02 0.2451E+02  (P/A) =-.4459E+04 -.4457E+04
   Vs=0.3179E+02 -.3177E+02  Ms=0.9771E+03 -.4403E+04  (Ms/Ss)=-.4653E+02 -.2097E+03
   Vt=0.3086E+03 0.2384E+03  Mt=0.1458E+04 0.1645E+04  (Mt/St)=-.7164E+02 0.8086E+02
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =-.4341E+04 -.4167E+04
                                                        Smin  =-.4577E+04 -.4748E+04
3486     [ 1050  ,   1101 ]
   Fr=-.8316E+05 0.8316E+05  Tr=0.2896E+02 -.2896E+02  (P/A) =0.4179E+04 0.4179E+04
   Vs=0.4034E+00 -.4034E+00  Ms=0.1998E+04 -.1430E+05  (Ms/Ss)=-.9515E+02 -.6810E+03
   Vt=0.3999E+03 0.1477E+03  Mt=0.3881E+02 0.5497E+00  (Mt/St)=-.1908E+01 0.2702E-01
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =0.4276E+04 0.4860E+04
                                                        Smin  =0.4082E+04 0.3498E+04
3487     [ 1100  ,   1099 ]
   Fr=0.1031E+06 -.1031E+06  Tr=-.2639E+02 0.2639E+02  (P/A) =-.5183E+04 -.5181E+04
   Vs=-.3778E+02 0.3772E+02  Ms=0.4376E+04 -.1270E+05  (Ms/Ss)=-.2084E+03 -.6047E+03
   Vt=0.3589E+03 0.1887E+03  Mt=-.1644E+04 -.2045E+04  (Mt/St)=0.8083E+02 -.1005E+03
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =-.4894E+04 -.4476E+04
                                                        Smin  =-.5472E+04 -.5886E+04
3488     [ 1101  ,   1049 ]
   Fr=-.9445E+05 0.9445E+05  Tr=0.2173E+02 -.2173E+02  (P/A) =0.4746E+04 0.4746E+04
   Vs=-.3136E+01 0.3136E+01  Ms=0.1210E+05 -.8453E+04  (Ms/Ss)=-.5762E+03 -.4026E+03
   Vt=0.2456E+03 0.3182E+03  Mt=-.5497E+00 -.3144E+03  (Mt/St)=0.2702E-01 -.1546E+02
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =0.5322E+04 0.5164E+04
                                                        Smin  =0.4170E+04 0.4328E+04
3489     [ 1099  ,   1093 ]
   Fr=0.1113E+06 -.1113E+06  Tr=-.2772E+02 0.2772E+02  (P/A) =-.5592E+04 -.5591E+04
   Vs=0.4447E+02 -.4450E+02  Ms=0.1268E+05 -.8694E+04  (Ms/Ss)=-.6037E+03 -.4140E+03
   Vt=0.2423E+03 0.3215E+03  Mt=0.2043E+04 0.2434E+04  (Mt/St)=-.1004E+03 0.1196E+03
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =-.4888E+04 -.5057E+04
                                                        Smin  =-.6297E+04 -.6124E+04
3490     [ 1049  ,   1094 ]
   Fr=-.1026E+06 0.1026E+06  Tr=0.2173E+02 -.2173E+02  (P/A) =0.5155E+04 0.5155E+04
   Vs=-.3136E+01 0.3136E+01  Ms=0.8453E+04 -.1570E+05  (Ms/Ss)=-.4026E+03 -.7478E+03
   Vt=0.3543E+03 0.2102E+03  Mt=0.3144E+03 -.6298E+03  (Mt/St)=-.1546E+02 -.3096E+02
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =0.5573E+04 0.5934E+04
                                                        Smin  =0.4737E+04 0.4377E+04
3491     [ 1093  ,   1092 ]
   Fr=0.1141E+06 -.1141E+06  Tr=-.3042E+02 0.3042E+02  (P/A) =-.5735E+04 -.5733E+04
   Vs=-.5567E+02 0.5561E+02  Ms=0.8680E+04 -.2126E+05  (Ms/Ss)=-.4134E+03 -.1012E+04
   Vt=0.4071E+03 0.1574E+03  Mt=-.2433E+04 -.3173E+04  (Mt/St)=0.1196E+03 -.1560E+03
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =-.5202E+04 -.4565E+04
                                                        Smin  =-.6268E+04 -.6902E+04
3492     [ 1094  ,   1048 ]
   Fr=-.1015E+06 0.1015E+06  Tr=-.9360E+01 0.9360E+01  (P/A) =0.5100E+04 0.5100E+04
   Vs=0.1924E+00 -.1924E+00  Ms=0.1513E+05 0.3521E+04  (Ms/Ss)=-.7203E+03 0.1677E+03
   Vt=0.1101E+03 0.4706E+03  Mt=0.6298E+03 -.6099E+03  (Mt/St)=-.3096E+02 -.2998E+02
                    (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00  Smax  =0.5852E+04 0.5298E+04
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                                                            Smin  =0.9091E+03 0.9091E+03
3742     [   61  ,   1058 ]
     Fr=-.3791E+04 0.3791E+04  Tr=-.4941E+02 0.4941E+02   (P/A) =0.9077E+03 0.9077E+03
     Vs=0.1369E-15 -.1369E-15  Ms=0.0000E+00 0.0000E+00  (Ms/Ss)=0.0000E+00 0.0000E+00
     Vt=-.9336E+02 -.9336E+02  Mt=0.0000E+00 0.0000E+00  (Mt/St)=0.0000E+00 0.0000E+00
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.9077E+03 0.9077E+03
                                                            Smin  =0.9077E+03 0.9077E+03
3743     [   49  ,   1761 ]
     Fr=-.3303E+04 0.3303E+04  Tr=0.4492E+01 -.4492E+01   (P/A) =0.7911E+03 0.7911E+03
     Vs=0.1066E+01 -.1066E+01  Ms=0.0000E+00 0.3607E+05  (Ms/Ss)=0.0000E+00 0.7043E+04
     Vt=-.3092E+03 0.1032E+03  Mt=0.0000E+00 0.1865E+03  (Mt/St)=0.0000E+00 0.1348E+03
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.7911E+03 0.7969E+04
                                                            Smin  =0.7911E+03 -.6387E+04
3744     [ 1763  ,   1761 ]
     Fr=-.3305E+04 0.3305E+04  Tr=0.1596E+01 -.1596E+01   (P/A) =0.7915E+03 0.7915E+03
     Vs=0.1067E+01 -.1067E+01  Ms=0.0000E+00 -.3600E+05  (Ms/Ss)=0.0000E+00 -.7029E+04
     Vt=0.3089E+03 -.1029E+03  Mt=0.0000E+00 0.1865E+03  (Mt/St)=0.0000E+00 0.1348E+03
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.7915E+03 0.7955E+04
                                                            Smin  =0.7915E+03 -.6372E+04
3745     [ 1773  ,   1749 ]
     Fr=0.2547E+03 -.2547E+03  Tr=-.6077E+01 0.6077E+01   (P/A) =-.6100E+02 -.6100E+02
     Vs=-.1675E+00 0.1675E+00  Ms=0.0000E+00 0.3496E+05  (Ms/Ss)=0.0000E+00 0.6826E+04
     Vt=-.3044E+03 0.1014E+03  Mt=0.0000E+00 -.2886E+02  (Mt/St)=0.0000E+00 -.2086E+02
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =-.6100E+02 0.6786E+04
                                                            Smin  =-.6100E+02 -.6908E+04
3746     [ 1771  ,   1725 ]
     Fr=-.2404E+04 0.2404E+04  Tr=-.5610E+01 0.5610E+01   (P/A) =0.5756E+03 0.5756E+03
     Vs=-.1419E+00 0.1419E+00  Ms=0.0000E+00 0.3462E+05  (Ms/Ss)=0.0000E+00 0.6759E+04
     Vt=-.3029E+03 0.1009E+03  Mt=0.0000E+00 -.2433E+02  (Mt/St)=0.0000E+00 -.1759E+02
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.5756E+03 0.7352E+04
                                                            Smin  =0.5756E+03 -.6201E+04
3747     [ 1763  ,   1718 ]
     Fr=-.3798E+04 0.3798E+04  Tr=-.3651E+01 0.3651E+01   (P/A) =0.9096E+03 0.9096E+03
     Vs=-.1332E-02 0.1332E-02  Ms=0.0000E+00 0.3532E+05  (Ms/Ss)=0.0000E+00 0.6896E+04
     Vt=-.3059E+03 0.1019E+03  Mt=0.0000E+00 -.2307E+00  (Mt/St)=0.0000E+00 -.1668E+00
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.9096E+03 0.7805E+04
                                                            Smin  =0.9096E+03 -.5986E+04
3748     [ 1759  ,   1711 ]
     Fr=-.5766E+04 0.5766E+04  Tr=-.5628E+01 0.5628E+01   (P/A) =0.1381E+04 0.1381E+04
     Vs=-.4827E-02 0.4827E-02  Ms=0.0000E+00 0.3604E+05  (Ms/Ss)=0.0000E+00 0.7036E+04
     Vt=-.3090E+03 0.1030E+03  Mt=0.0000E+00 -.8445E+00  (Mt/St)=0.0000E+00 -.6104E+00
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.1381E+04 0.8418E+04
                                                            Smin  =0.1381E+04 -.5656E+04
3749     [ 1757  ,   1703 ]
     Fr=-.6762E+04 0.6762E+04  Tr=-.3178E+01 0.3178E+01   (P/A) =0.1619E+04 0.1619E+04
     Vs=0.9014E-02 -.9014E-02  Ms=0.0000E+00 0.3532E+05  (Ms/Ss)=0.0000E+00 0.6896E+04
     Vt=-.3059E+03 0.1019E+03  Mt=0.0000E+00 0.1561E+01  (Mt/St)=0.0000E+00 0.1128E+01
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.1619E+04 0.8516E+04
                                                            Smin  =0.1619E+04 -.5278E+04
3750     [ 1755  ,   1697 ]
     Fr=-.4831E+04 0.4831E+04  Tr=-.4894E+01 0.4894E+01   (P/A) =0.1157E+04 0.1157E+04
     Vs=0.1354E+00 -.1354E+00  Ms=0.0000E+00 0.3462E+05  (Ms/Ss)=0.0000E+00 0.6759E+04
     Vt=-.3029E+03 0.1009E+03  Mt=0.0000E+00 0.2322E+02  (Mt/St)=0.0000E+00 0.1678E+02
                      (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.1157E+04 0.7933E+04
                                                            Smin  =0.1157E+04 -.5619E+04

ELEMENT          FORCES                    MOMENTS                     STRESSES
NUMBER      NODE1      NODE2          NODE1      NODE2             NODE1      NODE2
3751     [   71  ,   1730 ]
     Fr=-.1947E+04 0.1947E+04  Tr=-.4286E+01 0.4286E+01   (P/A) =0.4662E+03 0.4662E+03
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ATTACHMENT D
CALC S4TB300BLDG01
DISPOSITION 00B

ELEMENT NUMBER	FORCE	STRESS	ENERGY	ENERGY DENSITY
4211	-0.247069E+05	-0.361212E+04	0.1894E+03	0.2175E+00
4212	0.329197E+05	0.481283E+04	0.4112E+03	0.3861E+00
4213	0.330113E+05	0.482622E+04	0.4133E+03	0.3882E+00
4214	-0.247912E+05	-0.362444E+04	0.1907E+03	0.2189E+00
4215	-0.248083E+05	-0.362694E+04	0.1910E+03	0.2192E+00
4216	0.330497E+05	0.483183E+04	0.4144E+03	0.3891E+00
4217	0.317647E+05	0.464396E+04	0.3826E+03	0.3594E+00
4218	-0.238375E+05	-0.348502E+04	0.1763E+03	0.2024E+00
4219	-0.238389E+05	-0.348522E+04	0.1764E+03	0.2024E+00
4220	0.317821E+05	0.464650E+04	0.3832E+03	0.3598E+00
4221	0.317616E+05	0.464350E+04	0.3826E+03	0.3594E+00
4222	-0.238351E+05	-0.348466E+04	0.1763E+03	0.2024E+00
4223	-0.238377E+05	-0.348505E+04	0.1763E+03	0.2024E+00
4224	0.317805E+05	0.464628E+04	0.3832E+03	0.3598E+00
4225	0.324659E+05	0.474648E+04	0.3997E+03	0.3755E+00
4226	-0.243677E+05	-0.356253E+04	0.1843E+03	0.2115E+00
4227	-0.243516E+05	-0.356018E+04	0.1840E+03	0.2112E+00
4228	0.324610E+05	0.474576E+04	0.3998E+03	0.3754E+00
4229	0.337326E+05	0.493167E+04	0.4315E+03	0.4054E+00
4230	-0.253534E+05	-0.370663E+04	0.1995E+03	0.2290E+00
4231	-0.253722E+05	-0.370938E+04	0.1998E+03	0.2293E+00
4232	0.337733E+05	0.493762E+04	0.4328E+03	0.4063E+00
4233	0.561802E+05	0.480172E+04	0.6620E+03	0.3843E+00
4234	0.561719E+05	0.480102E+04	0.6618E+03	0.3842E+00
4235	0.561782E+05	0.480156E+04	0.6620E+03	0.3842E+00
4236	0.561777E+05	0.480152E+04	0.6620E+03	0.3842E+00
4237	0.590182E+05	0.504429E+04	0.7306E+03	0.4241E+00
4238	0.589890E+05	0.504179E+04	0.7299E+03	0.4237E+00
4239	0.578866E+05	0.494757E+04	0.7029E+03	0.4080E+00
4240	0.579159E+05	0.495008E+04	0.7036E+03	0.4084E+00
4241	0.561770E+05	0.480145E+04	0.6620E+03	0.3842E+00
4242	0.561808E+05	0.480177E+04	0.6620E+03	0.3843E+00
4243	0.561766E+05	0.480142E+04	0.6619E+03	0.3842E+00
4244	0.561822E+05	0.480189E+04	0.6621E+03	0.3843E+00
4245	0.561771E+05	0.480146E+04	0.6620E+03	0.3842E+00
4246	0.561766E+05	0.480142E+04	0.6619E+03	0.3842E+00
4247	0.584098E+05	0.499229E+04	0.7156E+03	0.4154E+00
4248	0.583587E+05	0.498792E+04	0.7144E+03	0.4147E+00
4249	0.584965E+05	0.499970E+04	0.7177E+03	0.4166E+00
4250	0.585392E+05	0.500335E+04	0.7188E+03	0.4172E+00
4251	0.561787E+05	0.480160E+04	0.6620E+03	0.3843E+00
4252	0.561755E+05	0.480132E+04	0.6619E+03	0.3842E+00
4253	0.561748E+05	0.480126E+04	0.6619E+03	0.3842E+00
4254	0.561735E+05	0.480115E+04	0.6619E+03	0.3842E+00
4255	0.576819E+05	0.493008E+04	0.6979E+03	0.4051E+00
4256	0.576949E+05	0.493119E+04	0.6982E+03	0.4053E+00
4257	0.596827E+05	0.510108E+04	0.7472E+03	0.4337E+00
4258	0.596620E+05	0.509932E+04	0.7466E+03	0.4334E+00

S O L U T I O N   T I M E   L O G   I N   S E C   FOR STRESS CALCULATIONS

READING GENERAL INFORMATION AND ELEMENT DATA. . . = 56
STRESS CALCULATION AND PRINTOUT . . . . = 26
UPDATING DATABASE . . . . = 0

ORIGINAL

NIAGARA MOHAWK NUCLEAR ENGINEERING

DISPOSITION COVER SHEET

Page 1 (Next) 2
Total 134
Last G-128

Project: NINE MILE POINT NUCLEAR STATION Unit (1,2 or 0=Both): 1 Discipline: STRUCTURAL

Title: EVALUATION OF REACTOR BUILDING SUPERSTRUCTURE FOR 93 PSF INTERNAL PRESSURE	Calculation No.: S4RX340BLDG01 — Rev: 02 — Disp: 02B
	Originator: CE Stroup — Date: 9-10-96
(Sub)System(s): N/A — Index No.: 54	Checker: C.R. AGOSTA — Date: 9/10/96
Design Change No.: N/A	Approver: Mohammed Alvi — Date: 9-10-96

NMPC Acceptance/Date: N/A /

Superseded Document(s): NONE

Description of Change

INCORPORATION OF NRC NRR COMMENTS ON REVISION 2.

Resolution

SEE ATTACHED PAGES 2-6

Cross Reference Change(s):

LDCR 1-96-UFS-035

Confirmation Required (Yes/No): N See Page(s):	Final Issue Status (APP/FIO/VOI): APP	File Location (Calculation/Hold): C	Operations Accepted on Issue (Yes/No): Y

Safety Evaluation Number(s)/Revision:
Copy of Applicability Review Attached? Yes ___ N/R ✓

Component ID(s)/EPN(s)/Line Numbers: N/A

Key Words: PRESSURE RELIEF PANELS, NMP1, REACTOR BUILDING, INTERNAL PRESSURE, COSMOSM

NIAGARA MOHAWK NUCLEAR ENGINEERING | CALCULATION CONTINUATION SHEET | Page 2

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
CE Strop 8-28-96	SARX340BLDG01	2

Checked	Date	Disposition
A	9/3/96	02B

Ref.

OBJECTIVE:

1) Revision 2 extrapolated the internal pressure which would cause structure failure using linear extrapolation of results [member forces and moments], which included both deadweight and pressure loadings.

This Calc removes the effect of deadweight when extrapolating the 93 psf upwards to the failure pressure.

2) Revision 2 included a 1.05 increase factor of the internal pressure based on a strain-rate effect.

This Calc eliminates this factor for the governing structural members.

NIAGARA MOHAWK NUCLEAR ENGINEERING | CALCULATION CONTINUATION SHEET | Page 3

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
CES 9-10-96	S4RX340 BLDG 01	2

Checked	Date	Disposition
CA	9/10/96	Φ2B

Ref.

Member 3288 SEE PAGE G-126 FOR DEADWEIGHT FORCE

Deadweight + 93 psf : −27.3^k (C)
Deadweight only : 21.69^k (T)
93 PSF ONLY: 48.99^k (C)

From Page 48B: $P_{critical}$ = 39.79^k (C) ← 42^k from page 48B times 0.9/0.95
Deadweight = + 21.69 T
61.48 (C)

NOTE: The Pcrit on page 48B is multiplied by 0.9 instead of 0.95 to conform with FSAR Functional Failure

$$\frac{61.48}{48.99} \times 93 = 116.71 \text{ psf}$$

Note that the 1.05 strain-rate factor was not used here.

P = 116.71 psf
≈ 117 psf

0.9 FOR USED IN COMPUTING THE FAILURE LOAD.

NIAGARA MOHAWK
NUCLEAR ENGINEERING

CALCULATION CONTINUATION SHEET

Page 4

Project: *NINE MILE POINT NUCLEAR STATION* Unit: 1

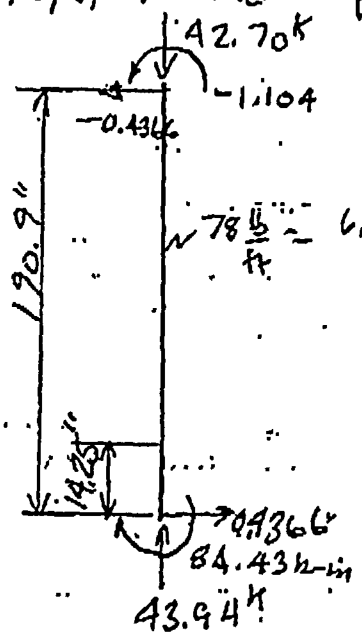
Originator/Date	Calc. No.	Rev
CAS 9-10-96	SARX340 BLDG-Φ1	2

Checked	Date	Disposition
A	9/10/96	Φ2B

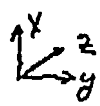
Ref.

Member 29: 14WF78

Determine deadweight forces and moments @ 14.25" from bottom to match page 83 results for 93psf + Deadweight:



SEE PAGE G-61 FOR DEAD WEIGHT FORCES & MOMENTS



AXIAL @ 14.25" = $43.94^k - (14.25")(\frac{6.5}{1000}\ ^k/_{in}) = 43.85^k$ (C)

Moment @ 14.25" = $84.43^{k\text{-}in} - (0.436^k)(14.25") = 78.21^{k\text{-}in}$

From page 84: M = 3354k-in @ 14.25" } 93 PSF + DEADWEIGHT
P = 4.33^k (T)

F_y = 37.3ksi [Page 82, With No Strain rate Increase]

$\phi_t P_n = (0.9)(22.9\,in^2)(37.3\,ksi) = 768.75^k$ (Tension) [LRFD Chapter H]

NIAGARA MOHAWK NUCLEAR ENGINEERING | CALCULATION CONTINUATION SHEET | Page 5

Project: NINE MILE POINT NUCLEAR STATION Unit: 1

Originator/Date	Calc. No.	Rev
SES 9-10-96	S4RX340 BLDG-Φ1	2

Checked	Date	Disposition
CA	9/10/96	Φ2B

Ref.

$$\phi_b M_n = \overset{\phi_b}{(0.9)}\overset{Z}{(134\,in^3)}\overset{F_y}{(37.3\,ksi)} = 4,498.38\ k\text{-}in$$

[Full lateral support as concluded on Page 73]

	93 PSF + DW	=	DW	+	93 PSF ONLY
AXIAL	4.33^k (T)		43.85^k (C)		48.18 (T)
M	+3,354 k-in		+78.21 k-in		+3,275.79 k-in

USE LRFD EQ H1-1b since $\frac{P_u}{\phi P_n} < 0.2$

For 93 PSF + Deadweight: $\frac{4.33^k}{768.75^k} = 0.0056 < 0.2$

$$\frac{4.33}{768.75} + \frac{3,354}{4,498.38} = 0.751 \le 1.0 \quad \text{93 PSF + Deadweight}$$

	93 PSF + DW / 0.751	=	DW	+	X, PSF ONLY
M:	4,464.6		78.21 k-in		4,386.44

$$X,\ \text{PSF Failure Pressure} = \frac{4,386.44}{3,275.79} \times 93 = 124.53\ psf$$

Check results:

	124.53 psf ONLY	+ DW	= 124.53 psf + DW
AXIAL	$(124.53/93)\,48.18 = 64.52^k$ (T)	$+\ 43.85^k$ (C) =	20.67^k (T)
M	$(124.53/93)\,3,275.79 = 4,386.44$	+ 78.21 k-in =	4,464.65 k-in

NIAGARA MOHAWK NUCLEAR ENGINEERING	CALCULATION CONTINUATION SHEET	Page 6

Project: *NINE MILE POINT NUCLEAR STATION* Unit: 1

Originator/Date	Calc. No.	Rev
CES 9-10-96	SARX340BLDG01	2

Checked	Date	Disposition
A	9/10/96	02B

Ref.

EQ. H1-16: $\frac{P_u}{2\Phi_t P_n} + \frac{M_u}{\Phi_b M_n} \leq 1.0$

$\frac{20.67}{2(768.75)} + \frac{4,464.65}{4,498.38} = 1.006$ OK

USE 124 PSF

This result does not use strain-rate factor and is in compliance with FSAR FUNCTIONAL FAILURE CRITERIA OF $0.9F_y$ & $0.9P_{critical}$.

CONCLUSION: Reactor Building Internal Pressure Failure = 117PSF

ATTACHMENT G
CALC S4RX340BLDG01
DISPOSITION 02B

```
                                                        Smin  =-.1830E+04 -.2403E+04
29      [  233  ,    244 ]
  Fr=0.4394E+05 -.4270E+05  Tr=0.4508E-02 -.4508E-02   (P/A) =-.1919E+04 -.1865E+04
  Vs=0.4366E+03 -.4366E+03  Ms=0.3831E+04 0.4593E+04  (Ms/Ss)=-.1110E+03 0.1331E+03
  Vt=-.4413E+02 0.4413E+02  Mt=0.8443E+05 -.1104E+04  (Mt/St)=-.6975E+03 -.9120E+01
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =-.1110E+04 -.1722E+04
                                                        Smin  =-.2727E+04 -.2007E+04
39      [    5  ,     12 ]
  Fr=-.4076E+04 0.4076E+04  Tr=0.0000E+00 0.0000E+00   (P/A) =0.4606E+03 0.4606E+03
  Vs=-.1502E+04 -.1502E+04  Ms=0.0000E+00 0.0000E+00  (Ms/Ss)=0.0000E+00 0.0000E+00
  Vt=0.4204E-16 -.4204E-16  Mt=0.0000E+00 0.0000E+00  (Mt/St)=0.0000E+00 0.0000E+00
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.4606E+03 0.4606E+03
                                                        Smin  =0.4606E+03 0.4606E+03
40      [   12  ,     23 ]
  Fr=-.3793E+04 0.3793E+04  Tr=0.0000E+00 0.0000E+00   (P/A) =0.4286E+03 0.4286E+03
  Vs=-.1502E+04 -.1502E+04  Ms=0.0000E+00 0.0000E+00  (Ms/Ss)=0.0000E+00 0.0000E+00
  Vt=0.8892E-16 -.8892E-16  Mt=0.0000E+00 0.0000E+00  (Mt/St)=0.0000E+00 0.0000E+00
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.4286E+03 0.4286E+03
                                                        Smin  =0.4286E+03 0.4286E+03
41      [   23  ,     24 ]
  Fr=-.2361E+04 0.2361E+04  Tr=0.0000E+00 0.0000E+00   (P/A) =0.2667E+03 0.2667E+03
  Vs=-.1502E+04 -.1502E+04  Ms=0.0000E+00 0.0000E+00  (Ms/Ss)=0.0000E+00 0.0000E+00
  Vt=0.2614E-15 -.2614E-15  Mt=0.0000E+00 0.0000E+00  (Mt/St)=0.0000E+00 0.0000E+00
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.2667E+03 0.2667E+03
                                                        Smin  =0.2667E+03 0.2667E+03
42      [   24  ,     56 ]
  Fr=-.2400E+03 0.2400E+03  Tr=0.0000E+00 0.0000E+00   (P/A) =0.2712E+02 0.2712E+02
  Vs=-.1502E+04 -.1502E+04  Ms=0.0000E+00 0.0000E+00  (Ms/Ss)=0.0000E+00 0.0000E+00
  Vt=0.4701E-15 -.4701E-15  Mt=0.0000E+00 0.0000E+00  (Mt/St)=0.0000E+00 0.0000E+00
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.2712E+02 0.2712E+02
                                                        Smin  =0.2712E+02 0.2712E+02
43      [   66  ,     31 ]
  Fr=0.3085E+05 -.2951E+05  Tr=0.0000E+00 0.0000E+00   (P/A) =-.1244E+04 -.1190E+04
  Vs=-.4447E+03 0.4447E+03  Ms=0.2645E+04 0.2082E+04  (Ms/Ss)=-.1242E+03 0.9783E+02
  Vt=-.2476E+02 0.2476E+02  Mt=-.3715E+05 -.4772E+05  (Mt/St)=0.1741E+03 -.2236E+03
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =-.9455E+03 -.8685E+03
                                                        Smin  =-.1542E+04 -.1511E+04
44      [   31  ,     39 ]
  Fr=0.2114E+05 -.1981E+05  Tr=0.0000E+00 0.0000E+00   (P/A) =-.8524E+03 -.7988E+03
  Vs=0.2709E+03 -.2709E+03  Ms=-.2082E+04 -.3683E+04  (Ms/Ss)=0.9783E+02 -.1730E+03
  Vt=0.3035E+02 -.3035E+02  Mt=0.4772E+05 0.3738E+04  (Mt/St)=-.2236E+03 0.1752E+02
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =-.5310E+03 -.6083E+03
                                                        Smin  =-.1174E+04 -.9894E+03
45      [   39  ,     68 ]
  Fr=0.1228E+05 -.1123E+05  Tr=0.0000E+00 0.0000E+00   (P/A) =-.4953E+03 -.4530E+03
  Vs=0.5733E+03 -.5733E+03  Ms=0.3683E+04 0.6774E+04  (Ms/Ss)=-.1730E+03 0.3182E+03
  Vt=-.6968E+02 0.6968E+02  Mt=-.3738E+04 0.8977E+05  (Mt/St)=0.1752E+02 0.4207E+03
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =-.3048E+03 0.2859E+03
                                                        Smin  =-.6859E+03 -.1192E+04
46      [   68  ,     56 ]
  Fr=0.6342E+04 -.5579E+04  Tr=0.0000E+00 0.0000E+00   (P/A) =-.2557E+03 -.2250E+03
  Vs=-.8236E+03 0.8236E+03  Ms=-.6774E+04 0.7276E-11  (Ms/Ss)=0.3182E+03 0.3418E-12
  Vt=0.6215E+02 -.6215E+02  Mt=-.8977E+05 -.8731E-10  (Mt/St)=0.4207E+03 -.4091E-12
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =0.4832E+03 -.2250E+03
                                                        Smin  =-.9946E+03 -.2250E+03
47      [   69  ,     70 ]
  Fr=0.4584E+05 -.4460E+05  Tr=-.1204E-02 0.1204E-02   (P/A) =-.2002E+04 -.1948E+04
  Vs=0.2720E+03 -.2720E+03  Ms=0.3040E+04 0.3596E+04  (Ms/Ss)=-.8813E+02 0.1042E+03
  Vt=-.3477E+02 0.3477E+02  Mt=0.5257E+05 -.6443E+03  (Mt/St)=-.4343E+03 -.5323E+01
                  (Tr*CTOR/Jp)=0.0000E+00 0.0000E+00    Smax  =-.1479E+04 -.1838E+04
```

3286	0.115067E+05	0.324133E+04	0.1070E+03	0.1751E+00
3287	-0.109220E+05	-0.307662E+04	0.9639E+02	0.1578E+00
3288	0.216882E+05	0.610934E+04	0.4279E+03	0.6221E+00
3302	-0.216744E+04	-0.355902E+03	0.2379E+01	0.2111E-02
3303	-0.421811E+04	-0.823849E+03	0.8394E+01	0.1131E-01
3304	0.655591E+04	0.128045E+04	0.2511E+02	0.2733E-01
3305	-0.120792E+05	-0.198346E+04	0.5501E+02	0.6557E-01
3306	0.175173E+05	0.342135E+04	0.1738E+03	0.1951E+00
3307	-0.201720E+05	-0.285722E+04	0.1254E+03	0.1361E+00
3308	0.288445E+05	0.421703E+04	0.3419E+03	0.2964E+00
3309	-0.294537E+05	-0.407946E+04	0.2471E+03	0.2774E+00
3310	0.456081E+05	0.480085E+04	0.5966E+03	0.3841E+00
3311	-0.407286E+05	-0.428722E+04	0.3381E+03	0.3063E+00
3312	0.605314E+05	0.838385E+04	0.1340E+04	0.1171E+01
3326	-0.312857E+04	-0.513723E+03	0.4956E+01	0.4399E-02
3327	-0.342635E+04	-0.669208E+03	0.5539E+01	0.7464E-02
3328	0.552446E+04	0.107900E+04	0.1783E+02	0.1940E-01
3329	-0.100607E+05	-0.165200E+04	0.3816E+02	0.4548E-01
3330	0.170467E+05	0.332944E+04	0.1646E+03	0.1848E+00
3331	-0.197734E+05	-0.280076E+04	0.1205E+03	0.1307E+00

ELEMENT NUMBER	FORCE	STRESS	ENERGY	ENERGY DENSITY
3332	0.282931E+05	0.413641E+04	0.3290E+03	0.2852E+00
3333	-0.289153E+05	-0.400490E+04	0.2381E+03	0.2673E+00
3334	0.424881E+05	0.447244E+04	0.5177E+03	0.3334E+00
3335	-0.383997E+05	-0.404208E+04	0.3006E+03	0.2723E+00
3336	0.571664E+05	0.791778E+04	0.1195E+04	0.1045E+01
3345	0.180644E+03	0.508857E+02	0.2799E-01	0.4316E-04
3346	0.354101E+03	0.997469E+02	0.1075E+00	0.1658E-03
3347	0.294566E+03	0.829763E+02	0.7011E-01	0.1148E-03
3348	0.243322E+03	0.685413E+02	0.4784E-01	0.7830E-04
3362	-0.296532E+04	-0.486917E+03	0.4452E+01	0.3951E-02
3363	-0.345021E+04	-0.673869E+03	0.5616E+01	0.7568E-02
3364	0.551598E+04	0.107734E+04	0.1777E+02	0.1934E-01
3365	-0.783491E+04	-0.128652E+04	0.2314E+02	0.2759E-01
3366	0.119253E+05	0.232916E+04	0.8054E+02	0.9042E-01
3367	-0.156540E+05	-0.221728E+04	0.7553E+02	0.8194E-01
3368	0.226163E+05	0.330648E+04	0.2102E+03	0.1822E+00
3369	-0.229850E+05	-0.318351E+04	0.1505E+03	0.1689E+00
3370	0.368323E+05	0.387708E+04	0.3891E+03	0.2505E+00
3371	-0.341060E+05	-0.359010E+04	0.2371E+03	0.2148E+00
3372	0.509147E+05	0.705190E+04	0.9482E+03	0.8288E+00
3381	0.212281E+04	0.597975E+03	0.3865E+01	0.5960E-02
3382	-0.158289E+04	-0.445885E+03	0.2149E+01	0.3314E-02
3383	0.207740E+03	0.585183E+02	0.3487E-01	0.5707E-04
3384	0.335266E+03	0.944410E+02	0.9082E-01	0.1487E-03
3398	-0.451136E+04	-0.740782E+03	0.1031E+02	0.9146E-02
3399	-0.206576E+04	-0.403469E+03	0.2013E+01	0.2713E-02
3400	0.367320E+04	0.717421E+03	0.7881E+01	0.8578E-02
3401	-0.889695E+03	-0.146091E+03	0.2984E+00	0.3557E-03
3402	0.562968E+04	0.109955E+04	0.1795E+02	0.2015E-01
3403	-0.105122E+05	-0.148897E+04	0.3406E+02	0.3695E-01
3404	0.155286E+05	0.227027E+04	0.9910E+02	0.8590E-01
3405	-0.127808E+05	-0.177019E+04	0.4652E+02	0.5223E-01
3406	0.197956E+05	0.208375E+04	0.1124E+03	0.7237E-01
3407	-0.212486E+05	-0.223670E+04	0.9203E+02	0.8338E-01
3408	0.322330E+05	0.446441E+04	0.3800E+03	0.3322E+00

[illegible]

NOTE OF EXPLANATION ON CALCULATION S4RX340BLDG01, PAGE 6:

The result on page 6 for Member 29 shows a stress interaction of 1.006 for an internal pressure of 124psf. This result was denoted as "OK". Stress ratio interactions must be less than or equal to 1.000 for acceptability. This result was accepted because it is not the controlling member. Member 3288 is the controlling member with an internal pressure of 117psf. At 117psf, the Member 29 stress ratio interaction is less than 1.000.

USAGE OF REDUCTION OR OVERCAPACITY FACTORS (ϕ) IN CALCULATION S7RX340WO1 - PRESSURE RELIEF PANELS

A review of Calculation S7RX340W01 indicates that no reduction or overcapacity factors were used in calculating the internal building pressure which would cause the panels to release. The panel components are designed to have relatively low stresses in the elastic range with the exception of the panel shear bolts which are designed to fail when the internal building pressure reaches the reported limits. The failure load of the shear bolts is based on ultimate failure determined by load tests on the bolts as described in the calculation. No reduction or overcapacity factor was applied to the bolt failure loads. The reduction factor of ϕ=0.90 is not applicable for this calculation as it is based on ultimate failure load of the bolts and not the bolt yield strength. No reduction factor was used as this calculation determined the upper bound values of the panel release pressures.