TRANSNUCLEAR
AN AREVA COMPANY

January 9, 2008
E-25988

U. S. Nuclear Regulatory Commission
Director of the Office of Nuclear Material Safety and Safeguards
Attn: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Subject: ASME Code Alternative Request, Temporary Welded Attachment Records Docket 72-1030 – Non-proprietary Version of a Transnuclear, Inc. Calculation

Reference: Letter from Tara Neider (TN) to Document Control Desk, "ASME Code Alternative Request, Temporary Welded Attachment Records Docket 72-1030," dated December 27, 2007

To Whom It May Concern:

The referenced letter provided a proprietary version of a Transnuclear, Inc. (TN) calculation and indicated our intentions to submit a non-proprietary version to the Document Control Desk within 30 days.

This submittal provides that non-proprietary version, as Enclosure 1.

Should the NRC staff require additional information regarding this submittal, please do not hesitate to contact Mr. Don Shaw at 410-910-6878 or me at 410-910-6860.

Sincerely,

Tara Neider

Tara Neider
President – Transnuclear, Inc.

cc: Ms. Jennifer Davis (without attachment)

Enclosures:

1. Non-Proprietary Version of TN Calculation 10494-162, Rev. 0, Effect of Reduced Shell Thickness on the Stresses for the NUHOMS® 32PTH DSC

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Enclosure 1

Non-Proprietary Version of TN Calculation 10494-162, Rev. 0, Effect of Reduced Shell Thickness on the Stresses for the NUHOMS® 32PTH DSC

AREVA TRANSNUCLEAR INC.	**Form 3.2-1 Calculation Cover Sheet** TIP 3.2 (Revision 2)	**Calculation No.:** 10494-162 **Revision No.:** 0 **Page:** 1 of 11

DCR NO (If applicable): N/A	**PROJECT NAME:** NUH32PTH
PROJECT NO: 10494	**CLIENT:** Dominion

CALCULATION TITLE:

Effect of Reduced Shell Thickness on the Stresses for the NUHOMS® 32PTH DSC

SUMMARY DESCRIPTION:

1) Calculation Summary

Calculation evaluates the effect on DSC ASME Code stress analysis for a reduced wall thickness due to local wall thinning or assumed defects on the shell OD.

2) Storage Media Description

1 CD

If original issue, is licensing review per TIP 3.5 required?

Yes ☒ No ☐ (explain below) Licensing Review No.: LR 721030-167

Software Utilized:	**Version:**
ANSYS	6.0
Calculation is complete: Originator Name and Signature: Peter J. Quinlan / Veeresh G. Sayagavi	Date: 12/26/07
Calculation has been checked for consistency, completeness and correctness: Checker Name and Signature: Steven Streutker / Abby Honrao	Date: 12/27/07
Calculation is approved for use: Project Engineer Name and Signature: Raheel Haroon	12/27/07 Date:

REVISION SUMMARY

REV.	DATE	DESCRIPTION	AFFECTED PAGES	AFFECTED DISKS
0	12/27/07	Initial Issue	All	All

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1.0 PURPOSE

The purpose of this calculation is to determine the effect on stresses in the canister from reduced wall thickness on the OD of the DSC shell caused by local thinning due to fabrication or assumed defects (e.g., at temporary welded attachment removal areas). The results of this calculation are intended to be utilized as a basis for dispositioning nonconforming conditions regarding local reductions in shell wall thickness below the minimum design value of [redacted].

2.0 REFERENCES

2.1 TN Calculation 10494-24, Rev. 1, "NUHOMS® 32PTH – Canister Transfer Load Stress Analysis."

2.2 TN Calculation 10494-35, Rev. 2, "NUHOMS® 32PTH – Canister Storage Load Stress Analysis."

2.3 TN Calculation 10494-4, Rev. 1," NUHOMS® 32PTH – Basket Stress Analysis for Storage Load."

2.4 TN Drawing 10494-30-6, Rev. 2, "NUHOMS® 32PTH – Shell Assembly

2.5 Matco Associates Inc. Report, "Dry Fuel Storage Canister Weld Evaluation" for Project No. 907-50759, dated 10/31/07.

2.6 ANSYS Computer Code and Users Manual, Release 6.0.

2.7 ANSYS Output Files

3.0 METHODOLOGY

[redacted]

4.0 ASSUMPTIONS

- The wall thinning and/or assumed defect is applied on the OD of the canister.
- The nominal wall thickness of .500" is utilized for this calculation, consistent with the practice utilized for the balance of structural calculations. This is conservative since the typical wall thickness measured during fabrication is on the order of .500 to .520".

- [redacted]
- For the purpose of addressing the lack of documentary evidence of PT surface examinations in areas of temporary welded attachments, a flaw depth is assumed equivalent to the depth of the weld pool plus heat affected zone caused by the installation of the temporary welded attachment. [redacted]

5.0 COMPUTATIONS

5.1 Shell Section Property Reduction

Stresses in the shell wall are governed by one of the following relationships.

R/t, where R is average radius of the shell and t is shell thickness.

S, where S is the section modulus of the shell.

t^2, where t is the shell thickness.

Therefore, the stresses from the structural design calculations of record will be increased by the governing ratio of the difference between the nominal parameter and reduced parameter due to local wall thinning/assumed defect using a minimum wall thickness of .440".

Nominal parameters from Reference [2.4],

OD_{nom} = 69.75 in

Wall thickness t_{nom} = .500 in

ID_{nom} = 68.75 in

Determine ratio between nominal and reduced configuration for R/t,

Calculate R/t for the nominal configuration

$R_{nom} = ½[OD_{nom} + ID_{nom}]1/2 = 1/2[(69.75 + 68.75)1/2] = 34.625$ in

t_{nom} = .500 in

$R_{nom}/t_{nom} = 34.625/.500 = 69.25$

Calculate R/t for the reduced/thinned configuration

[redacted]

5.2 Stress Calculation

The structural design calculations of record References [2.1 thru 2.3] were reviewed to identify the most limiting margins to ASME Code stress allowables. Table 1 provides a summary of the primary stresses – general membrane (P_m) and local membrane plus bending ($P_L + P_b$) and secondary stresses ($P_L + P_b + Q$) for the worst case normal, off-normal and accident loading for DSC transfer conditions. Similarly, Table 2 provides a summary for the DSC storage conditions.

[redacted]

The results indicate the shell stresses remain within Code allowable values conservatively considering a gross reduction in shell wall thickness. [redacted]

Tables 1 and 2 summarize the bounding load cases for transfer and storage conditions. Load Case 2, which includes the secondary thermal stresses, is rerun with reduced shell thickness.. For storage load case (2+3+4) it could be concluded that using a factor of 1.291 is conservative since the rerun LS2 results in lower thermal stresses when the canister shell thickness is reduced.

5.3 Finite Element Analysis

[redacted]

[redacted] The contour plot of stress intensities is shown in Figure 2.

6.0 CONCLUSIONS

The reduction in shell wall thickness may cause increases in primary and secondary stresses, however the maximum stress in the canister shell remains below the ASME Code allowable stress limits for the governing load cases. [redacted] The governing stresses are summarized in Tables 1 and 2.

7.0 LISTING OF COMPUTER FILES

Files used in analyses.

File Name	Date	Time	Size
Dsc_tr_30ip_hot.db	2/26/2004	2:47 PM	6,208
32pth_tr_hot_30ip_can_thin.db	12/26/2007	13:36 PM	4,480
32pth_tr_hot_30ip_can_thin.rst	12/26/2007	13:36 PM	4,352

ANSYS was run on a Windows XP machine with Service Pack 1.

Table 1 – Transfer Load Cases – Governing Normal, Off-Normal & Accident Conditions

Load Case	Description	Stress Intensity from Analysis	Revised Stress Intensity w/ Reduced Wall Thickness (.440")	Allowable Stress Intensity
2 (1)	Handling 2g's + 30 psig int. pressure + thermal (115°F)	$P_L + P_b + Q$ = 45,959 psi	[redacted] (2)	$P_L + P_b + Q < 3S_m$ ($3S_m$ = 52,500 psi)
12 (1)	Side drop 75g at 180° + 15 psig ext. pressure (top end)	P_m = 29,354 psi	[redacted]	$P_m < 0.7S_u$ ($0.7S_u$ = 41,400 psi)
20 (1)	30 psig int. pressure + 60 kip pull	P_m = 11,484 psi	[redacted]	$P_m < S_m$ (S_m = 17,500 psi)
22 (1)	30 psig int. pressure + 80 kip pull	$P_L + P_b$ = 13,790 psi	[redacted]	$P_L + P_b < 1.5S_m$ ($1.5S_m$ = 26,250 psi)
24 (1)	30 psig int. pressure + 110 kip pull	P_m = 21,025 psi	[redacted]	$P_m < 0.7S_u$ ($0.7S_u$ = 41,400 psi)

Notes:

(1) Load Case, Maximum Stress Intensity and Allowable Stress Intensity taken from Reference [2.1].

(2) [redacted]

Table 2 – Storage Load Cases – Governing Normal, Off-Normal & Accident Conditions

Load Case	Description	Stress Intensity from Analysis	Revised Stress Intensity w/ Reduced Wall Thickness (.440")	Allowable Stress Intensity
1+6+7 (3)	Deadweight + 70 psig int. pressure + thermal (blocked vent)	[redacted]	[redacted]	$P_m < S_m$ (S_m = 18,100 psi)
1+6+7 (3)	Deadweight + 70 psig int. pressure + thermal (blocked vent)	[redacted]	[redacted]	$P_L + P_b < 1.5S_m$ ($1.5S_m$ = 27,150 psi)
2+3+4 (3)	30 psig int. pressure + seismic + thermal (-20°F)	[redacted]	[redacted]	$P_L + P_b + Q < 3S_m$ ($3S_m$ = 54,300 psi)

Notes:

(3) Load Case, Maximum Stress Intensity and Allowable Stress Intensity taken from Reference [2.2]. Revised Stress Intensity includes a factor of 1.291 for reduced wall thickness.

Figure 1 – ANSYS Boundary Conditions for Transfer Load Case No. 2

[redacted]

Figure 2 – ANSYS Results Stress Intensity Contour for Transfer Load Case No. 2

[redacted]