71-9235

NAC INTERNATIONAL

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May 31, 2002

U.S. Nuclear Regulatory Commission
11555 Rockville Pike
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Attn: Document Control Desk

Subject: Submittal of the NAC International Responses to the Conference Call Request for CY-STC SAR Clarifications

Docket No. 71-9235

References:
1. Certificate of Compliance No. 9235 for the Model No. NAC-STC, Revision 3, United States Nuclear Regulatory Commission, August 8, 2001
2. NRC/NAC Conference Calls to Discuss CY-STC Closeout Questions and NAC Responses, April 24 and May 8, 2002
3. E-mails from the NRC to NAC Regarding Additional SAR Clarification Questions and Administrative Corrections, May 2002

NAC International (NAC) herewith submits eight copies of the responses to the conference call questions (References 2 and 3) resulting from the NRC review of the NAC-STC Amendment Application. The amendment incorporates Connecticut Yankee Nuclear Power Plant spent fuel and GTCC waste as approved contents.

This submittal includes the SAR clarification questions and NAC's responses presented in the standard NAC response format, followed by the associated NAC-STC Safety Analysis Report (SAR) changed pages, which are designated as Revision STC-02A, and which include one revised drawing, 414-887 Revision 3. Note: The enclosed SAR changed pages are to be inserted as replacement or new additional pages, as applicable, into the existing CY-STC SAR binders. After replacement/insertion of the changed pages provided in this submittal, the List of Effective Pages should be used to ensure that the correct page revisions are included in the SAR binders.

The changed pages have been prepared in accordance with the following conventions:

- Revision indicators (revision bars) are used to highlight changes. Revision bars are not used to indicate text flow.
- The changed pages for this submittal are designated as Revision STC-02A to provide a unique identification of the pages and changes.

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- All of the pages in the List of Effective Pages are designated Revision STC-02A and no revision bars are used on those pages.

One revised license drawing is included in this submittal. On 414-887 Revision 3, the bevel weld size was changed from 1/2 to 3/16. This change was necessary to respond to Question #16. The drawing change does not affect the form, fit, or function of the components, and they do not change the component designs, as analyzed in the SAR.

If you have any comments or questions, please contact me on my direct line at 678-328-1321.

Sincerely,

Thomas C. Thompson
Director, Licensing
Engineering & Design Services

Enclosure

cc: E. Glasbergen, Bechtel

NAC-STC
Docket # 71-9235

NAC INTERNATIONAL

RESPONSE TO THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

REQUEST FOR SAR CLARIFICATIONS

(APRIL 16, 2002)

NAC STORAGE TRANSPORT CASK (NAC-STC) CONNECTICUT YANKEE AMENDMENT

(DOCKET NO. 71-9235)

MAY 2002

NAC INTERNATIONAL RESPONSE
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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.1.1-1

Item 1 Change the wording "all balsa wood" to "balsa wood."

NAC Response

Text on Pages 2.1.1-1 and 2.6.7.4-1 changed to read "balsa wood" instead of "all balsa wood".

In the fourth sentence in Section 2.6.7.4.1, the word "approximately" is added to clarify the description of package geometry.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.3.7-1

Item 2 Rewrite the paragraph; needs to discuss stress-strain curves rather than deformation and acceleration time history curves.

NAC Response

The text for Section 2.3.7 has been revised to clarify the description of the redwood and balsa wood impact limiters. The text concerning the deformation and acceleration time history curves has been replaced with text describing the stress-strain curves and data for redwood and balsa wood.

NAC INTERNATIONAL RESPONSE TO REQUEST FOR SAR CLARIFICATIONS

CHAPTER 2: STRUCTURAL EVALUATION

Page 2.5.1-17

Item 3 The thread engagement length is changed from 2.5" to 2.2" for the Yankee MPC. This is a design change not associated with CY-STC; to facilitate staff review **NAC to provide a summary to list all design changes**, which could have easily been overlooked by the staff. See also, as an example, Page 2.1.3-8 where bolt stresses are revised.

NAC Response

The Yankee-MPC drawings specify that the hoist-ring holes in the structural lid have a thread length of 2.25 inches. The analysis presented in Section 2.5.1.3.1 for the Yankee-MPC has been revised to indicate that the hoist ring bolt thread length is 2.23 inches, which is equal to the calculated thread engagement length of 2.23 inches that is required to develop the full load capacity of the hoist ring. The required thread engagement length for the actual applied load is determined to be 1.69 inches, which is significantly less than the actual thread engagement length of 2.23 inches.

The FSAR changes associated with the Yankee-STC that are incorporated in the CY-STC amendment are summarized in the following table. Note that there is no design change made for the Yankee-STC. These changes are either for clarification/correction purpose or for revision of the evaluation based on the bounding conditions of the Yankee-STC and the CY-STC.

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<u>NAC Response to Item 3 (continued)</u>

SAR Section	Description of Change	Reason for Change
2.1.3.2.3 2.6.7.5 2.7.1.6 2.10.8	Cask Lid Bolt Evaluations	Evaluation revised based on the Bounding Condition of the Yankee-MPC and the CY-MPC.
2.5.1.3.1	Canister lift – Hoist Ring Bolt Thread Engagement Length	Clarification/Correction -
2.6.1.1 2.6.2.1 2.6.7.1.1 2.6.7.2.1 2.6.7.3.1 2.7.1.1.1 2.7.1.2.1 2.7.1.3 2.7.1.4 2.10.2.1.2.2 2.10.2.2.3	Cask Lid Bolt Preload used in the cask body finite element model (See response to Item No. 3 for more details)	Clarification/Correction - To show preload values on a per bolt basis.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.7.1-11

Item 4 Minimum stress margins are 2.1 and 0.27 for the top and bottom end drops, respectively, for CY-MPC; on Page 2.6.7.1-8, the corresponding margins are 0.4 and 1.1. Why are the margins so different?

NAC Response

The difference in the calculated margins is due to the differences in the ANSYS models of the two configurations. The modeling differences between the CY-STC and the Directly Loaded NAC-STC finite element models are:

1. The Directly Loaded NAC-STC analysis was performed with a two-dimensional axisymmetric model. The CY-STC is modeled using a three-dimensional half-model with a symmetry plane. For the CY-STC model, the bottom plates and the inner and outer lids are modeled with a 1.0-inch diameter hole at the center of the lids to remove wedge shape elements, which produces a stress concentration at the center of the lid that does not actually exist. The Directly Loaded NAC-STC is modeled without the hole and, therefore, has a slightly increased stiffness at the center of the lid. The resulting increased stiffness creates a stress distribution different from the CY-STC model.

2. The applied external boundary conditions are different between the two models. For the Directly Loaded NAC-STC analysis, the interaction of the top and bottom of the cask and the ground is modeled with a distributed pressure load on either the outer lid or bottom plate, depending on the drop orientation. For the CY-STC, three-dimensional gap elements (CONTAC52) are used to represent the interaction between the top or bottom of the cask and the hypothetical unyielding surface. Modeling methodology using gap elements develop stress based on the stiffness of the lids and substructure. Modeling methodology using a distributed pressure produces stress contours based upon the applied load.

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NAC Response to Item 4 (continued)

The differences in analysis methodologies between the Directly Loaded NAC-STC and the CY-STC analyses contribute to the different results. However, both analysis methodologies are conservative and are based on common finite element modeling techniques. Therefore, no additional analysis is required.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.7.4-1

Item 5 Revise the discussion, "The second configuration. . . incorporates only. . ."

NAC Response

The subject paragraph is revised to clarify the differences between the two impact limiter configurations.

NAC INTERNATIONAL RESPONSE TO REQUEST FOR SAR CLARIFICATIONS

CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.7.3-9

Item 6 Is the center of gravity location identical for CY-MPC and Yankee-MPC? Tables 2.2-2 and –4 list 96" and 98.9", respectively, for Yankee and CY.

NAC Response

The center of gravity for the CY-MPC and Yankee–MPC are not the same. The overall length of the STC is 192.96 inches. The difference in the CG locations is 2.9 inches, which is less than 3% of the total STC length. This difference is negligible in calculating the impact loads during the 1-foot and 30-foot drop events. Section 2.6.7.4.1 is revised to clarify the difference and to remove the implication that the cg's of the two configurations have identical locations.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.7.4-43

Item 7 Include, **in the SAR**, the stress-strain curves used for the CY-MPC impact limiter LS-DYNA analysis for both redwood and balsa wood, including considerations of strain-rate effects.

NAC Response

There are 16 individual curves for the stress-strain data for redwood and balsa wood representing compressive stresses for different strain rates and temperature conditions. To conserve space and provide the actual stress-strain data points used in the LS-DYNA analyses, summary tables for both redwood and balsa wood have been added to Section 2.6.7.4 as Tables 2.6.7.4.2-1 and 2.6.7.4.2-2, respectively.

NAC INTERNATIONAL RESPONSE TO REQUEST FOR SAR CLARIFICATIONS

NAC Response to Item 7 (continued)

Table Item 7-1 Redwood Stress Strain Properties

Strain (in/in)	Parallel to Grain—Stress (psi)			
	Hot Static	Hot 25 ε/sec	Cold Static	Cold 25 ε/sec
0.000	0	0	0	0
0.100	3736	5859	9294	8506
0.400	3685	4996	8531	10734
0.700	10004	15458	22085	19683

Strain (in/in)	Perpendicular to Grain—Stress (psi)			
	Hot Static	Hot 25 ε/sec	Cold Static	Cold 25 ε/sec
0.000	0	0	0	0
0.100	542	968	1396	1629
0.400	849	1363	2054	2608
0.700	7433	13553	17631	19017

NAC INTERNATIONAL RESPONSE TO REQUEST FOR SAR CLARIFICATIONS

NAC Response to Item 7 (continued)

Table Item 7-2 Balsa Wood Stress Strain Properties

Strain (in/in)	Parallel to Grain—Stress (psi)			
	Hot Static	Hot 25 ε/sec	Cold Static	Cold 25 ε/sec
0.000	0	0	0	0
0.100	1724	1385	2306	2546
0.400	1550	1150	2073	2805
0.700	1550	1040	2073	2370

Strain (in/in)	Perpendicular to Grain—Stress (psi)			
	Hot Static	Hot 25 ε/sec	Cold Static	Cold 25 ε/sec
0.000	0	0	0	0
0.100	121	105	161	215
0.400	109	144	145	293
0.700	109	300	145	611

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.7.4-45

Item 8 How is the steel billet modulus of 1.0E7 psi used in the analysis?

<u>NAC Response</u>

The finite element model for the cask body in the LS-DYNA analysis used brick elements having an elastic property. The table on page 2.6.7.4-45 contained the values used in the finite element model. The term "Steel Billet Property" in the table has been changed to read "NAC-STC Cask Body Properties". The text of page 2.6.7.4-45 has also been changed to clarify the use of the material properties.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.10.1-1

Item 9 Why will the redwood impact limiter undergo a larger penetration of 1.7" than the balsa wood penetration of 0.57"?

NAC Response

The calculation for the penetration of the 13-pound cylinder into the redwood used the perpendicular to the grain properties, whereas the penetration calculation for the balsa wood used the parallel to the grain properties. The balsa wood parallel to the grain crush strength is larger than the redwood perpendicular to the grain crush strength. Since the penetration evaluation for both cases uses the same weight and drop height, the penetration for redwood is larger than the penetration for balsa wood, as expected. This explanation has been added to Sections 2.6.10.1.1 and 2.6.10.1.2.

NAC INTERNATIONAL RESPONSE
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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.15.1-1

Item 10 The TSC is not considered as a "separate inner container."

NAC Response

The NAC analyses of the Transportable Storage Canister consider it to be a separate inner container in accordance with 10 CFR 71.63(b).

In both the Yankee-MPC and CY-MPC configurations, fuel classified as damaged will be contained within the Transportable Storage Canister. Fuel assemblies classified as damaged will be placed in Damaged Fuel Cans. To be classified as damaged, the fuel rods will have defects greater than pinhole leaks and hairline cracks. Individual fuel rods classified as damaged will be held in Reconfigured Fuel Assemblies. NAC does not consider fuel classified as damaged to be included under the exemption provided for reactor fuel elements (10 CFR 71.63(b)(1)).

Consequently, the Transportable Storage Canister is designed to retain its containment boundary for the normal conditions of transport specified in 10 CFR 71.71 (Subpart F) and is shown to be leaktight in accordance with ANSI N14.5-1997 at the time the canister is closed (See Table 4.1-1). The containment boundary is maintained in these conditions as shown in Sections 2.6.15 and 4.2.1. Since the containment boundary is maintained for both normal conditions of transport and accident (Section 2.7.1.2) conditions, the canister meets the requirement for a separate inner container that the canister not release plutonium as demonstrated to a sensitivity of 10^{-6} A_2/hr in transport.

The NAC-STC transport cask is, and meets the requirements for, the outer packaging required by 10 CFR 71.63. See the NAC Response to Item 21.

NAC INTERNATIONAL RESPONSE TO REQUEST FOR SAR CLARIFICATIONS

CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.16.10

Item 11 Signs for all x-coordinates in Table 2.6.16.2-1 appear to have been reversed.

NAC Response

Table 2.6.16.2-1 is correct. Figure 2.6.16.2-5 is revised to show the correct orientation and coordinate system.

NAC INTERNATIONAL RESPONSE
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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.16-29

Item 12 Why aren't stress intensities in Sections 55 and 57 identical? See Figure 2.6.16.5-1 for section locations.

NAC Response

The mesh of the CY-MPC support disk is not symmetric about the X and Y axis as shown in Figure 2.6.16.2-4. The difference in the meshing in the various quadrants of the support disk causes slight variations in the stress results.

In reviewing the analysis results for the end drop, it was determined that the rotations and in-plane displacements at the tie rods had been constrained. This conservatively increases the stresses due to the thermal expansion. It was also determined that the end drop post-processing had conservatively reported the extreme fiber stresses as the membrane stresses. In the end drop orientation, the support disk is subjected to a pure bending condition, which would reduce the membrane stresses to an insignificant level. The end drop analyses and post-processing were reperformed to report the correct membrane and membrane plus bending stresses for the support disk. Tables in Sections 2.6.16.4 through 2.6.16.14 have been revised to consistently show the updated results.

Sections 55 and 57 are no longer critical for the P+Q results in Table 2.6.16.5-1. However Sections 61 and 63 do not report identical results due to the asymmetric meshing. The difference in the margins of safety for the two sections is 1.5%, which is not significant.

NAC INTERNATIONAL RESPONSE TO REQUEST FOR SAR CLARIFICATIONS

CHAPTER 2: STRUCTURAL EVALUATION

Item 13 Change the deceleration of 18.1g to 16.5g, based on revised analyses.

NAC Response

Deceleration value in Section 2.6.16.7 (Page 2.6.16-32) is changed from 18.1g to 16.5g.

NAC INTERNATIONAL RESPONSE
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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.16-60

Item 14 Why are the reported margins different from those of Table 2.6.16.17-3 for the same sections, such as Section 73? The stress intensity calculations appear to yield different results.

NAC Response

The values reported in Sections 2.6.16.13 and 2.7.13.1.4 were not correctly reported due to a transcription error.

As described in Item 12, the post-processing for the end drop condition was reperformed. The tables in Sections 2.6.16 and 2.7.13 are revised to incorporate the revised stresses for the end drop conditions.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.19-22

Item 15 How is the allowable stress intensity of 1,580 lbs determined, on the basis of the maximum temperature of 380°F referenced in p. 2.6.19-11?

NAC Response

The allowable weld force is calculated in accordance with Table NF-3324.5(a)-1 of the ASME Code. The allowable stress is based on $0.4S_y$. To obtain the allowable weld force, the allowable stress ($0.4S_y$) is multiplied by the weld size. The weld size is the effective throat of the weld (0.7071 × 0.25). Therefore, the allowable weld force at 380°F is:

$$F_{allow} = 0.4(S_y)(0.7071 \times 0.25) = 0.4 \times 21060 \times 0.7071 \times 0.25 = 1490 \text{ lbs/in}$$

Table 2.6.19-3 has been revised to incorporate the updated allowable.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.19-13

Item 16 3/16" partial penetration groove welds? (1/2" welds on licensing drawing)

<u>NAC Response</u>

The licensing drawing 414-887 is revised to show a 3/16-inch weld.

NAC INTERNATIONAL RESPONSE
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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.6.19-19

Item 17 90° drop configuration? The boundary condition suggests otherwise.

<u>NAC Response</u>

Figure 2.6.19-6 is revised to show the 75° impact orientation during a side drop.

NAC INTERNATIONAL RESPONSE
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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.7.1.1-2

Item 18 The Yankee-MPC preload design change from 6.47 to 6.02E5 lbs should be called out. See Item 3 above.

NAC Response

Several sections of the SAR are revised to report the preload on a "load per bolt" basis to be consistent with the calculation, which deals with individual bolt loads. The following sections are revised to reflect bolt preload on a per bolt basis:

Section 2.6.1.1—Heat Condition for the NAC-STC Cask in the Directly Loaded Fuel and Yankee-MPC Configurations

Section 2.6.1.2—Heat Condition for the NAC-STC Cask in the CY-MPC Configuration

Section 2.6.2.1—Cold Condition for the NAC-STC Cask in the Directly Loaded Fuel and Yankee-MPC Configurations

Section 2.6.2.2—Cold Condition for the NAC-STC Cask in the CY-MPC Configuration

Section 2.6.7.1.1—One-Foot End Drop Evaluation of the NAC-STC Cask in the Directly Loaded and Yankee-MPC Canistered Fuel Configurations

Section 2.6.7.1.2—One-Foot End Drop Evaluation of NAC-STC in the CY-MPC Configuration

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NAC Response Item 18 (continued)

Section 2.6.7.2.1—One-Foot Side Drop Evaluation of the NAC-STC Cask in the Directly Loaded and Yankee-MPC Canistered Fuel Configurations

Section 2.6.7.2.2—One-Foot Side Drop Evaluation for the CY-MPC Configuration

Section 2.6.7.3.1—NAC-STC Cask One-Foot Corner Drop Evaluation for the Directly Loaded and Yankee-MPC Configurations

Section 2.7.1.1.1—Thirty-Foot End Drop – NAC-STC Directly Loaded and Yankee-MPC Configurations

Section 2.7.1.2.1—Thirty-Foot Side Drop – NAC-STC Directly Loaded and Yankee-MPC Configurations

Section 2.7.1.3—Thirty-Foot Corner Drop

Section 2.7.1.4—Thirty-Foot Oblique Drop

Section 2.10.2.1.2.2—Top Fine Mesh Model

Section 2.10.2.2.3—Bolt Initial Strain Determination

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.7.1.1-9

Item 19 Is the small margin of 0.06 related to the modeling anomaly (singularity) inherent to the bottom plate finite element model? If so, it should not be considered for comparison of margins.

NAC Response

The subject margin (0.06) is the result of an artifact of the finite element model. The model uses small holes (1.00-inch diameter) in the lids and bottom plates to avoid wedge shaped solid elements. A section cut taken at the hole produces a higher stress than actually exists because the hole causes a stress concentration. The analysis results are post-processed again to move the section cuts away from the hole, thereby removing the artificial stress concentration from the results. Both the 1-foot and 30-foot end drop tables (Tables 2.6.7.1-1 through 2.6.7.1-5 and Tables 2.7.1.1-1 through 2.7.1.1-5) are revised to reflect these changes.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.7.10-9

Item 20 2-1/4-inch plates? (1-1/4-inch × ???-inch bar)

<u>NAC Response</u>

The outer ribs on the GTCC cylinder are made from 1-1/4 inch thick × 2.4 inch wide × 141.5 inch long Type 304 stainless steel. The ribs can be made from either plate or bar stock. The description in Section 2.7.10.2 is revised to correct the dimensions.

NAC INTERNATIONAL RESPONSE
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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.7.12-1

Item 21 Remove reference to 10 CFR 71.63(b) for a separate inner container. See also Item 10 above.

NAC Response

See the NAC Response to Item 10.

The NAC analyses of the Transportable Storage Canister consider it to be a separate inner container in accordance with 10 CFR 71.63(b).

Fuel rods held in Reconfigured Fuel Assemblies and Fuel Assemblies held in Damaged Fuel Cans are not considered to be included under the exemption provided for reactor fuel elements (10 CFR 71.63(b)(1)). Consequently, separate containment is required.

The Transportable Storage Canister is designed to retain its containment boundary for the hypothetical accident conditions specified in 10 CFR 71.73 (Subpart F) and is shown to be leaktight in accordance with ANSI N14.5-1997 at the time the canister is closed (See Table 4.1-1). That the containment boundary is maintained in these conditions is shown in Sections 2.7.12 and 4.3.3. Since the containment boundary is maintained for both normal conditions of transport (Section 2.6.15) and accident conditions, the canister meets the requirement for a separate inner container that the canister not release plutonium as demonstrated to a sensitivity of 10^{-6} A_2 in one week in transport.

The NAC-STC transport cask is, and meets the requirements for, the outer packaging required by 10 CFR 71.63. See the NAC Response to Item 10.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.7.13-1

Item 22 Revise the SAR text to reflect the use of the bounding 55g side drop deceleration, on the basis of the calculated 48.5g (p. 2.6.7.4-58) and the associated DLF for the support disk. (Note: If the **design basis** side drop of 55g is considered, deceleration values for the support disk must be calculated using appropriate DLFs.

NAC Response

The DLF for the basket support disk corresponding to the side and end drops is computed and added to Section 2.6.7.4.2.6. Table 2.6.7.4.2-4 (previously Table 2.6.7.4.2-2) is revised to reflect these changes. In all cases the calculated acceleration times the DLF is less than the design acceleration.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.7.13.1-8

Item 23 Why isn't the stress at Section 61, 38°/0°, not picked up in Table 2.7.13.1.3-1?

NAC Response

The stresses in Table 2.7.13.1.3-1 are a summary of side drop analysis results taken from Tables 2.7.13.1.3-2 through 2.7.13.1.3-9. Table 2.7.13.1.4-1 (page 2.7.13.1-18) is a summary of the 30-foot oblique drop results. Section 61 in Table 2.7.13.1.4-1 refers to the 30-foot end drop results presented in Tables 2.7.13.1.2-1 and 2.7.13.1.2-2. Referring to the response for Item 14, Table 2.7.13.1.4-1 is revised.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.10.5-2

Item 24 Change "331°F and 331°F" to "331°F and 294°F".

NAC Response

The temperature values of "331°F and 331°F" are correct. The first 331°F temperature corresponds to the inner shell and the second 331°F temperature corresponds to the transition section. These two temperatures for the CY-MPC fuel configuration were obtained from Table 3.4-5. Table 3.4-5 shows the inner shell and the transition shell temperatures to be 331°F and 331°F, respectively. Table 3.4-5 contains a footnote, which indicates that the transition shell temperature was assumed to be equal to the maximum inner shell temperature.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.10.12-14

Item 25 Clarify the wording, "The elastic modulus of the cask body. . ."

NAC Response

The subject text in the second paragraph of Section 2.10.12.7 reads:

"The cask body section of the model consists of a single shell using an elastic material. The elastic modulus of the cask body was adjusted to allow the cross-sectional modulus of the finite element model to be equal to that of the quarter-scale model."

The cask body model presented in Figure 2.10.12-15 (which is referenced in the paragraph previous to the one quoted above) shows the cask shell modeled with brick elements, which employ an elastic material represented by an elastic modulus. It is important that the shell thickness and elastic modulus used in the finite element model presented in Figure 2.10.12-15 allow the modeled cask shell to have the same cross-sectional modulus as the quarter-scale model used in the quarter-scale drop tests. Therefore, the elastic modulus was adjusted, so that the cross-sectional moment of the finite element model matches that of the cross-sectional moment of the quarter-scale test model.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.10.12.15

Item 26 Are strain rate effects considered in benchmarking LS-DYNA for impact limiter analysis through the ¼-scale model 30-ft drop test program? If not, what is the basis for considering strain rate effects for calculating cask impact responses as reported in Section 2.6.7.4?

NAC Response

Strain rate sensitive materials are used for all ¼-scale and full-scale LS-DYNA analyses. Section 2.10.3 has been revised to clarify the LS-DYNA computer code description and the following benchmark case has been added in that section. This case shows that strain rate dependent material models properly interpolate between stress-strain curves at a given strain rate.

LS-DYNA Modified Crushable Foam Material Model (Material No. 163)

The strain rate sensitive foam/wood is modeled using the LS-DYNA finite element model builder. The model is comprised of a steel block and a wooden cube. The model, Figure 26-1, is constructed of solid brick elements. The wooden cube measures 5 inches by 5 inches. The impacting steel plate is 5 inches tall and 7.5 inches across. Surface to surface contact interfaces are employed between the steel block and the wooden cube. The wooden cube sits on a rigid plane.

The Piecewise_Linear_Plasticity material model is used to represent the steel block. The wooden cube is represented as a homogeneous isotropic material, type number 163 in LS-DYNA (Modified_Crushable_Foam). For this example, three strain-rates are defined in the material model, 0 ε/sec, 20 ε/sec, 40 ε/sec with corresponding stress values of 2,000 psi, 7,000 psi, and 10,000 psi, respectively. A prescribed motion is applied to the steel block to model a constant strain rate to the wood cube. For a strain rate of 20 ε/sec, a prescribed motion equivalent to a velocity of 31 in/sec is applied to the

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NAC Response Item 26 (continued)

steel block. For a strain rate of 40 ε/sec, a velocity of 20 in/sec is applied to the steel block.

To demonstrate that the correct strain rate curve is used during the crushing of the wood cube for the two cases considered, the stress in the wood block should compare to the applied stress-strain curve at the strain rate of interest. For the 20 ε/sec case, the compressive stress in the cube is approximately 7,000 psi. For the 40 ε/sec case, the compressive stress in the cube is a value between 7,000 and 10,000 psi. Figures 26-2 and 26-3 show the stress plot for each case at an element located at the geometric center of the cube. As the figures show, LS-DYNA used the proper stress-strain curve for the applied strain rate. Therefore, the modified_crushable_foam material model is an acceptable method of accounting for the strain-rate variability of foam and wood crushable materials.

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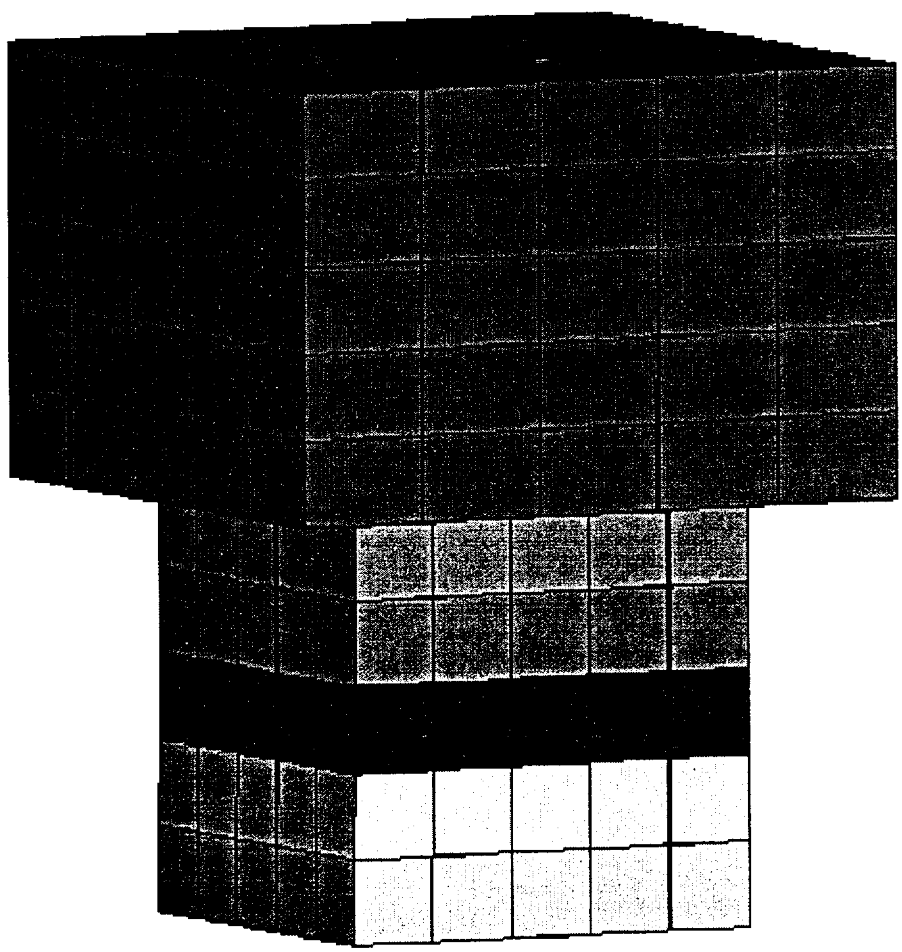
NAC Response Item 26 (continued)

Figure 26-1 Finite Element Model for Strain-Rate Dependent Crushable Foam/Wood Block Impact



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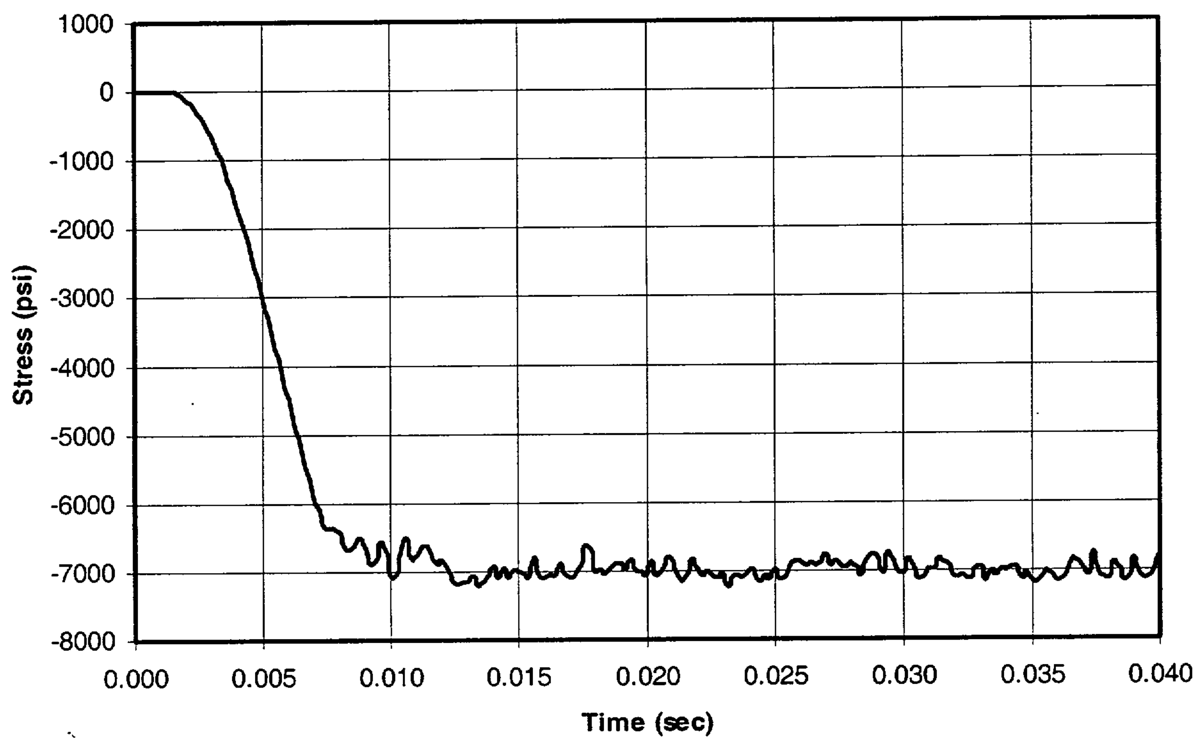
NAC Response Item 26 (continued)

Figure 26-2 Stress Time History at 20 ε/sec



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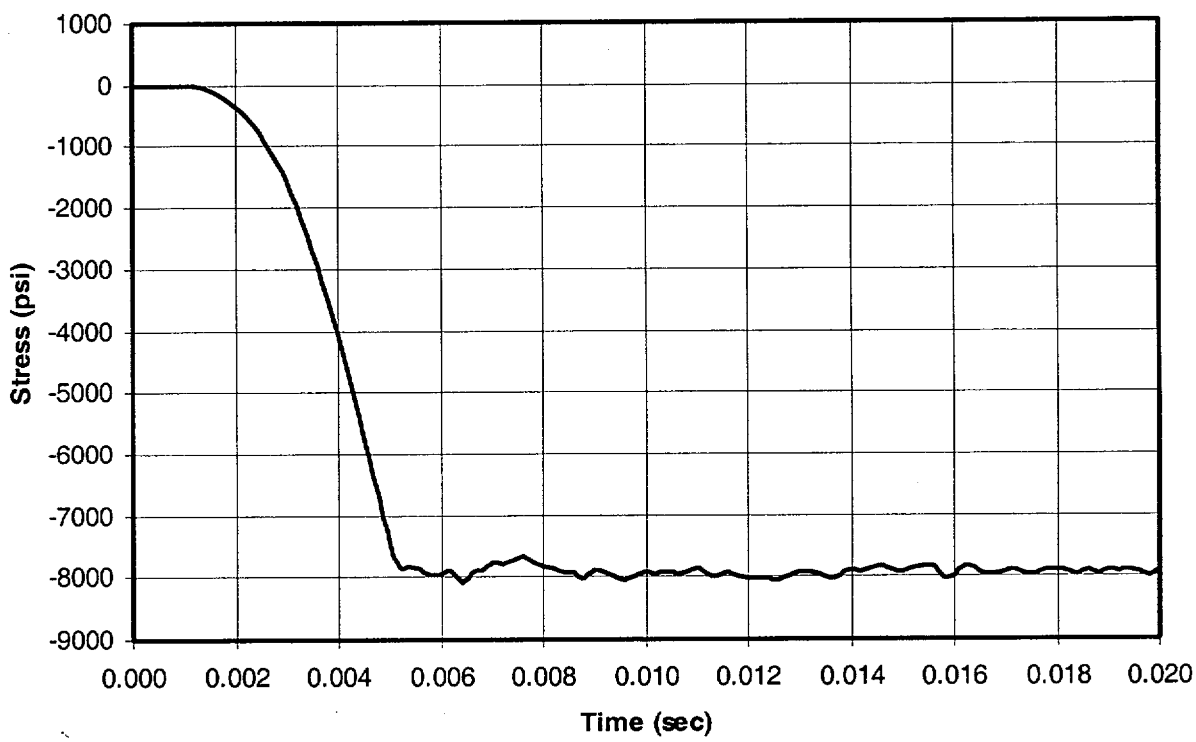
<u>NAC Response Item 26 (continued)</u>

Figure 26-3 Stress Time History at 40 ε/sec



NAC INTERNATIONAL RESPONSE
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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.10.12.15

Item 27 What are the material numbers for modeling the wood properties for the ¼-scale model and the prototype packaging? Is material number Fu_Chang_Foam (Material No. 83) used only for the model verification reported in Section 2.10.3?

NAC Response

The wood/foam materials used to model the impact limiters include the Fu_Chang_Foam (Material No. 83) and Modified_Crushable_Foam (Material No. 163). A benchmark problem for Material No. 163 has been added to Section 2.10.3. The benchmark problem is also presented in the NAC response to Item 26.

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CHAPTER 2: STRUCTURAL EVALUATION

Page 2.1.1-1

Item 28 The accelerations computed for the 30 foot end drops are contained in Table 2.6.7.4.2-2. The acceleration for the end drop hot condition is larger than the acceleration for the cold condition. Provide an explanation of the larger hot condition acceleration, since the balsa has a smaller crush strength fòr the hot condition than the cold condition.

NAC Response

Referring to RAI-1 2-11, the balsa impact limiter for the end drop condition is actually comprised of two sections, which have two diameters (see Drawings 423-257 and 423-258). The section that impacts the ground initially has a diameter of 70 inches. For the cold condition, with the stiffer properties of balsa, the crush is limited to this initial section of balsa. For the hot condition, the crush of the balsa is sufficient for the second section of balsa, which has a larger diameter of 128 inches, to be crushed. Of this 128-inch outer diameter, the neutron shield has a maximum diameter of 99 inches, which serves as backing for the crushing of the balsa. The larger diameter results in a larger crush force, which results in a larger acceleration. To prevent a sudden increase of the acceleration when the second section of the balsa limiter is crushed, the second section of the balsa limiter has a taper, to permit the area of crush to be gradually increased from the 70-inch diameter to the 128-inch diameter. Note: Table 2.6.7.4.2-2 is now Table 2.6.7.4.2-4.

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CHAPTER 4: CONTAINMENT

Table 4.1-1

Item 29 Table 4.1-1, Containment Condition B, indicates that the outer metal o-rings on the drain and vent ports and their associated test port plugs are part of the containment boundary. The leak testing procedure described in Sections 7.1.3.1 and 7.1.3.2 test the inner metal o-rings on the drain and vent ports. The containment boundary needs to be clearly defined and the proposed testing should be appropriate for the containment boundary.

NAC Response

The description of Containment Conditions A and B shown in Table 4.1-1 are both incorrect. Both Conditions refer to leak testing using a "sniffer probe" method. The sniffer probe method is limited in sensitivity to approximately 1 x 10^{-5} cm^3/sec (helium) and cannot be used in testing for a leaktight condition. Since the leak test method is revised to demonstrate a leaktight condition, the Remarks section is also revised. Table 4.1-1 is revised to correct the "Test Location/Method" and "Remarks" descriptions for the two Containment Conditions. The revised descriptions match the procedures provided in Section 7.1.3 (for immediate transport) and 7.2.2 (for transport after an extended period of storage).

Condition A refers to the transport of intact, directly loaded fuel after some period of storage, as described in Section 7.2.2. The containment boundary for this configuration consists of the outer o-rings of the inner lid, the outer o-rings of the vent and drain port covers and the interseal test ports of the inner lid and vent and drain port covers. It includes the interseal test ports, as these are inside of the boundary formed by the outer o-rings. These components are tested to be leaktight using the evacuated envelope method described in Section A.5.4 of ANSI N14.5-1997. As described in the procedure, the evacuated space is the interlid region formed using the outer lid.

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NAC Response to Item 29 (continued)

Condition B refers to the transport of intact, directly loaded fuel and the transport of canistered fuel or GTCC waste immediately after loading. (Note that canistered fuel or GTCC waste may not be stored in the NAC-STC.) Intact, directly loaded fuel is loaded in a spent fuel pool and canistered fuel and GTCC waste are loaded dry using a transfer cask. The difference between the pool loading and dry loading requirements leads to slight differences in the procedure used to close the cask and prepare it for transport. The procedures used for pool and dry loading are provided in Sections 7.1.3.1 and 7.1.3.2, respectively. For these two configurations, the containment boundary is formed by the inner o-rings of the inner lid and vent and drain port covers. This boundary is consistent with the design intent of the NAC-STC, which provides o-ring annulus test ports and backing outer o-rings, for the purpose of qualifying the inner o-ring containment boundary.

All of the leak tests performed to demonstrate the leaktight condition are performed in accordance with the requirements of ANSI N14.5-1997, by qualified personnel using detailed operating procedures that are approved by NAC and by the user.

In developing this Response, it was noted that Section 8.1.3 also required revision to clarify that, depending on the transport configuration, either the inner or outer o-rings, and the related interseal test ports could be part of the containment boundary. Consequently, Section 8.1.3 is revised to require the appropriate leak testing during post fabrication acceptance testing.

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CHAPTER 5: SHIELDING EVALUATION

Section 5.2.3.1

Item 30 On Page 5.2-9, Section 5.2.3.1, 1st sentence: it is stated that the fuel gamma source is from fission products and actinides. Is this a typo and should read "activation products"?

NAC Response

The current SAR wording intended to separate activated (related to hardware) and fuel sources (actinide and fission products, some of which are activation products). However, in the interest of clarity, NAC has reworded the sentence on Page 5.2-9.

NAC INTERNATIONAL RESPONSE
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CHAPTER 5: SHIELDING EVALUATION

Section 5.2.3.1

Item 31 On page 5.2-9 in Section 5.2.3.1 (CY Fuel Gamma Source) of SAR Revision STC-00A dated August 2000, the cobalt-59 impurity value for stainless steel fuel is listed as 0.5 g/kg. The documented value the NRC uses for stainless steel fuel is 0.8 g/kg. Provide the reasons/justifications for using the 0.5 g/kg value.

<u>NAC Response</u>

The material composition for the stainless steel cladding of the Connecticut Yankee (CY) fuel assemblies was provided as part of the design input to NAC. NAC received data sheets containing fuel assembly property inputs. These sheets included the material chemical composition limits of the fuel rod cladding, where applicable. The chemical composition of the stainless steel cladding indicates a maximum 0.05 wt % cobalt content, which translates to 0.5g cobalt-60 per kg steel. A sample fuel data sheet, as obtained from CY, is included in this response.

NAC INTERNATIONAL RESPONSE
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NAC Response Item 31 (continued)

R 135743

CY FUEL ASSEMBLIES

Assembly Number	N07
ANSI Number	NJ02S6
Initial Enrichment (%)	4.00100
Discharge Date	04-Jan-86
Initial U Mass (g)	412,285
U-235 Mass (g)	16,497
Total Burnup (MWd/mtU)	37,008
Comments	
Manufacturer	B & W
Assembly Cross-Section (in)	8.426 X 8.426
Total Fuel Assembly Weight (lbs)	
Fuel Rod Pitch (in)(max)	0.5675
Active Fuel Region Length (in)(max)	120.55
Pellet Diameter (in)	0.3825±0.0005
Cladding diameter (in)	OD-0.4220±0.0026
Cladding Thickness (in)	0.0165±0.0008
Cladding Materials	STAINLESS STEEL
Chemical Composition Limits	ASTM A 269-Except: (by % weight) Ni=9-12 ,Cr=18-20 , Co=0.05-Max, C=0.03-0.06 , B=0.001-Max, Si=0.1-Max, P=0.01-Max
Guide Thimble Dimensions (in) and Materials	OD-0.543±0.001, ID-0.519±0.001, STAINLESS STEEL
Instrument Tube Dimensions (in) and Materials	OD-0.422±0.003, ID-0.389±0.001, STAINLESS STEEL
Spacer Grid Masses and Materials	INCONEL-718
Plenum Spring Masses and Materials	SS-302
References Used	DOE/NRC 741, YNJ YEX 28, 7/17/81, Drawing No. 16103-29696, Sheets 2, 3, 4, 6, 15, 17, 20, 21, 27, 30, 34; Calcs. CY18-SPF-01247-FY, Rev. 0, C2-517-350-NA, Rev.2

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NAC INTERNATIONAL RESPONSE
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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.1 and Section 7.1.3.2

Item 32 Overall in Sections 7.1.3.1 and 7.1.3.2, the combined leak rate from all the penetrations cannot exceed 2×10^{-7} cc/sec (helium). The operating procedures should correctly reflect this.

NAC Response

The tests and criteria that are applied to the containment verification are based on ANSI N14.5-1997. This Standard provides that for packages meeting the leaktight criterion, the individual leak rates for individually tested components need not be summed (See Section 7.1, "General" of ANSI N14.5-1997). For the NAC-STC, the leaktight criterion is applied to all of the loaded configurations of the package.

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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.1, Step 11

Item 33 What if draining needs to be accomplished as lifting the cask out of the pool due to crane weight restrictions? If appropriate, an alternate method should be specified.

NAC Response

The calculated weight of the NAC-STC during pool loading is provided in Table 2.2-1. The total lift weight of the cask is considered in the site evaluation and planning associated with the handling of the cask. The cask would not be used if there was inadequate crane capacity to accommodate the cask loaded weight. The total lift weight is considered in planning because the design of the NAC-STC does not allow the water in the cavity to be removed while the cask is submerged.

The loaded weight assuming water in the cavity is applicable only to the directly loaded intact fuel configuration. The canistered fuel or GTCC waste configurations are loaded dry.

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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.1, Step 18

Item 34 Since its been changed everywhere else, change 1 atm absolute to 0 psig.

NAC Response

Step 18 is revised to change the reference to one atmosphere of pressure to 0 psig.

NAC INTERNATIONAL RESPONSE
TO
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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.1, Step 19

Item 35 Specify a pressure value for this step.

NAC Response

A vacuum pressure of 3 mbar is added to this step.

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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.1, Steps 18 and 19

Item 36 Between Steps 18 and 19, the step for installing the vent port coverplate (with new o-ring) appears to be missing.

NAC Response

A new Step 21 is added that provides for the installation of the vent port coverplate. The remaining steps of the procedure are renumbered to accommodate this change.

NAC INTERNATIONAL RESPONSE
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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.1, Steps 24 and 25

Item 37 Between Steps 24 and 25, the step for installing the pressure port cover (with new o-ring) appears to be missing.

NAC Response

The steps for installation and test of the pressure port cover are added to the procedure. As shown in the added steps, the pressure port cover is tested using a pressure drop test, since this port cover is not a part of the package containment boundary in the configuration in which fuel is directly loaded for immediate transport.

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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.2

Item 38 Throughout Section 7.1.3.2, the combined leak rate from all the penetrations cannot exceed 2×10^{-7} cc/sec (helium). The operating procedures should correctly reflect this.

NAC Response

ANSI N14.5-1997, Section 7.1, provides that for packages meeting the leaktight criterion, the individual leak rates for individually tested components need not be summed. For the NAC-STC, the leaktight criterion is applied to all of the loaded configurations of the package.

See the NAC Response to Item 32.

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TO
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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.2, Step 15

Item 39 Step 15 does not appear to be consistent. Shouldn't this step be similar to 7.1.3.1, Step 4? Doesn't the lid need to be lifted to remove the o-rings?

NAC Response

The observation is correct that the lids of the NAC-STC are removed (Similar to Step 4 of Section 7.1.3.1). That the lids are removed is an assumption of this procedure as the canister cannot be lowered into the cask with the lids installed. To clarify that cask lids are removed, the introductory text of Section 7.1.3.2 is revised to show that lid removal is a pre-condition.

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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.2, Step 21

Item 40 Specify a pressure value for this step. In addition, add in the steps of disconnecting the vacuum pump and connecting the helium supply.

NAC Response

Step 21 of Section 7.1.3.2 specifies a 3 mbar (approximately 3 mm of Hg) vacuum pressure and a helium pressure of 0 psig. However, in the review, it was noted that no vacuum pressure is specified in Step 23. Step 23 is revised to specify a vacuum pressure of 3 mbar for the inner lid interseal test port.

The vacuum pump and piping and the helium supply piping is provided on a single equipment skid to facilitate the transfer of equipment in and out of areas in which radiation and contamination controls are applied. The equipment skid piping includes a "christmas tree" arrangement of valves and gauges such that valving is used to switch between the vacuum and helium systems. Consequently, there is no physical disconnection or connection of the vacuum pump and helium supply systems.

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TO
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CHAPTER 7: OPERATING PROCEDURES

Section 7.1.3.2, Steps 27 and 28

Item 41 Between Steps 27 and 28, the step for installing the pressure port cover (with new o-ring) appears to be missing.

NAC Response

The loading of the canister in the NAC-STC cask described in this section (Section 7.1.3.2) is performed dry (i.e., the cask is not submerged in a spent fuel pool or cask loading area). Since the operation is performed dry, the pressure port cover and its interseal test port cover are not removed. Consequently, the pressure port cover is not reinstalled.

The pressure port is tested by the pressure test performed in Step 30.

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TO
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CHAPTER 7: OPERATING PROCEDURES

Section 7.2.2

Item 42 Overall, it is not clear that the leak test described in Section 7.2.2 accurately measures the leak rate. If the outer seals are leaking, following evacuation of the interlid region, how much helium remains in the interseal region such that it can be measured by a helium mass spectrometer?

NAC Response

The leak test strategy is test configuration A.5.4, "Evacuated Envelope," of ANSI N14.5-1997. This test configuration has the advantage of using the outer lid as a cover and testing all of the penetrations under the cover, including the test port plugs.

Steps 10,12 and 13 add helium to the o-ring annulus (for later possible detection), but the helium is added at atmospheric pressure (0 psig). Consequently, even if the outer o-rings are failed, there is no driver to force or even encourage the helium to leave the annulus volume. Once the outer lid is in place and a vacuum is established, there exists a pressure differential to draw helium through a postulated leak.

NAC INTERNATIONAL RESPONSE
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CHAPTER 7: OPERATING PROCEDURES

Section 7.2.2, Step 9

Item 43 Clarify what happens if the bolt torques are not at the values listed in Table 7-1.

NAC Response

The purpose of this step is solely to ensure that the specified bolts are torqued to the values that are considered in the transport analysis. There is no mechanical reason that the bolts would not be at these values, as there are no normal or accident storage events that would tend to loosen them. The installation and torquing of the bolts is performed by trained and qualified personnel and is controlled by procedure, with specified torque values and a requirement for calibrated torque wrenches.

There are two possible conditions that could occur, depending on the degree of "looseness." The first is that the seals remain compressed and there is no leakage. In this case, there is no consequence, the bolts are merely re-tightened to the appropriate values. The second case is that the seals become uncompressed and leakage occurs. (Note that leakage is into the cask due to the high pressure in the interlid volume.) On reduced pressure, the pressure monitoring system would provide notification to a control point allowing remedial action.

NAC INTERNATIONAL RESPONSE TO REQUEST FOR SAR CLARIFICATIONS

CHAPTER 7: OPERATING PROCEDURES

Section 7.3.1

Item 44 Cite the correct 10 CFR 20 reference. The receiver has additional responsibilities under 10 CFR Part 20, not only those required by 49 CFR 173.443.

NAC Response

Section 7.3.1 is revised to include reference to 10 CFR 20.1906, "Procedures for Receiving and Opening Packages."

NAC INTERNATIONAL RESPONSE
TO
REQUEST FOR SAR CLARIFICATIONS

CHAPTER 7: OPERATING PROCEDURES

Section 7.4

Item 45 Overall, mark this section with appropriate change bars. Entire section has changed significantly from Revision 10.

NAC Response

With the changes made due to this set of clarifications, NAC has revised the operating procedures in Revisions STC-00A, STC-01B and STC-02A.

Revision STC-00A primarily adds the discussion relative to the transport of canisters holding Connecticut Yankee fuel and establishes the different loading requirements for contents loaded immediately before transport and those transported after some period of storage.

Revision STC-01B incorporates changes made in response to the first set of Requests for Additional Information (RAI-1). These changes primarily clarified the leaktight leak rate applicable to the various configurations.

This revision, Revision STC-02A, provides the additional clarifications required.

The NAC procedure is to track changes of text between revisions using revision bars in the outside margin of each page. Each page with a newly marked change (revision bar) has a header (i.e., Revision STC-02A) that indicates its current state of revision. Consequently, within a Section, the pages may have different headers depending upon when a change was made. When a page is changed with a marked revision, all of the previous revision marks are removed. This is so the reviewer can tell what has changed on the current page since the last revision.

NAC INTERNATIONAL RESPONSE
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NAC Response to Item 45 (continued)

Text flow to a different page, caused by the addition or deletion of other text, was marked as a change in Revision STC-00A, but is not marked as a change in STC-01A and STC-02A.

Using this procedure, in this submittal, pages with the STC-02A header show the changes (by revision bar marking) made in this submittal. Revision bars marking changes made on the page by previous submittals are not retained when the page is subsequently revised.

Consequently, there is no direct correspondence between a Revision 10 page and a page provided in STC-01B or STC-02A, as the page may have been previously revised by the STC-00A submittal.

Chapter 7 has been reviewed and the revision marks shown conform to the procedure described.

NAC INTERNATIONAL RESPONSE
TO
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CHAPTER 8: ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

Item 46 At the time of the NAC-STC approval, the NRC staff had significant concerns about the design of the heat transfer fin welds. Primarily, the staff was concerned with how efficiently these welds would remove heat from the NAC-STC and how these welds would perform during repeated use of the NAC-STC overpack for transportation. The responses provided by NAC to RAI-1, Question 8-1, does not sufficiently justify deleting this test.

NAC Response

Prior to the initial NRC approval of the NAC-STC, 10 CFR 71 had included a requirement for periodic thermal tests of spent fuel transport casks with higher heat load capacities. Since that time, the periodic thermal test requirement was deleted from the regulations, so that for more recent spent fuel cask designs, a thermal test is required for the first fabricated unit of each series of a cask design.

As shown on NAC drawing 423-802, Revision 12, Sheet 6 of 6, Detail R-R, each heat transfer fin is attached at both ends (one end to the cask outer shell and the other end to the neutron shield shell) by full penetration welds that are liquid penetrant examined after completion to verify their integrity. Since the equivalent thickness of the welds is equal to, or greater than, the thickness of the stainless steel component of the fins, the heat transfer path efficiency is not impeded by the welds.

As noted in the response to RAI-1, Question 8-1, the analysis in SAR Section 2.6.7.6.1 demonstrates that that the conservatively calculated stress levels in the welds are quite low, resulting in significant positive margins of safety and that there are no design basis normal conditions of transport that would even approach the strength limits of the welds.

NAC INTERNATIONAL RESPONSE
TO
REQUEST FOR SAR CLARIFICATIONS

NAC Response to Item 46 (continued)

Also, based on the low stress levels and the inherent ductility of the austenitic stainless steel, cyclic failure is not a concern.

Based on the above considerations, successful completion of the thermal test at fabrication of the first unit, and consistent with the CoC/SAR requirements for other licensed transport casks, periodic thermal tests of NAC-STC casks are not required.

NAC INTERNATIONAL RESPONSE
TO
REQUEST FOR SAR CLARIFICATIONS

CHAPTER 8: ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

Section 8.1.7

Item 47 There is an inconsistency in the level of commitment for BORAL acceptance tests between the NAC-STC CY SAR and the NAC-MPC CY SAR. Kim Gruss would like to get clarification of this inconsistency.

Details: The NAC-STC CY canister and the NAC-MPC CY canister are one and the same because the system employs a dual-purpose cask. However, the NAC-MPC CY SAR (and preliminary SER now in rulemaking) has a slightly more prescriptive requirement, namely "test samples from each batch of BORAL. . . shall be tested using wet chemistry OR neutron absorption techniques to verify. . ." The NAC-STC CY SAR has a less prescriptive requirement, "test samples from each batch of BORAL. . . shall be tested using wet chemistry OR neutron absorption techniques [this text was removed from the SAR] to verify. . .".

NAC Response

The neutron absorber tests described in the NAC-MPC CY SAR have evolved since the similar tests for the NAC-STC CY SAR were prepared. For consistency, Section 8.1.7 of the NAC-STC CY SAR is revised to incorporate the neutron absorber tests as described in Section 9.1.6 of the NAC-MPC CY SAR.

Revision STC-02A

May 2002

NAC-STC

NAC Storable Transport Cask

SAFETY ANALYSIS REPORT

Volume 1 of 2

Amendment for
CONNECTICUT YANKEE ATOMIC POWER COMPANY

NAC INTERNATIONAL

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FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

ASSY	ASSY	ASSY
QUANTITY		

DIMENSIONING AND TOLERANCING SHALL BE PER ASME Y14.5–94
UNSPECIFIED DIMENSIONS AND TOLERANCES SHOWN BELOW.
DIMENSIONS ARE IN INCHES. FRACTIONAL TOLERANCE: ±1/8

SYM.	GEOMETRY	.XXX	TOL.	.XX	TOL.
		UNDER 3	±.003	UNDER 6	±.02
⏥	FLATNESS	3–12	±.005	6–18	±.03
—	STRAIGHTNESS	OVER 12	±.010	OVER 18	±.06
		.X	±.1	ANGLES ±0.5°	
∠	ANGULARITY	ALL UNSPECIFIED TOOL RADII: .015 – .030			
⊥	PERPENDICULARITY	BREAK ALL SHARP CORNERS .015 – .030			
//	PARALLELISM	ALL UNSPECIFIED MACHINED SURFACES SHALL BE ▽ OR BETTER			
◎	CONCENTRICITY	NEXT ASSEMBLY: 414–889			
⊕	TRUE POSITION	DRAWING TYPE: LICENSE			

GROUP	NAME	DATE
PREPARER	S. Graham	5-10-02
CHECKER	[illegible]	5-10-02
PROJECT MANAGER	[illegible]	5/28/02
DIRECTOR DESIGN AND ANALYSIS	MG for T.A. Danna	5/28/02
DIRECTOR, LICENSING	[illegible]	5/28/02
VICE PRESIDENT, QUALITY	[illegible]	5/28/02

NAC INTERNATIONAL

BASKET ASSEMBLY,
GTCC,
CY–MPC

PROJECT 414		DRAWING 887	REV 3
SCALE 1/8	EST. WT. NOTED	SH 1 OF 4	10:11AM 5-10-2002

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

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GTCC,
CY-MPC

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GTCC,
CY–MPC

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GTCC,
CY-MPC

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