

November 16, 2001

U.S. Nuclear Regulatory Commission  
 11555 Rockville Pike  
 Rockville, MD 20852-2738

Attn: Document Control Desk

Subject: Submittal of the NAC International Responses to the NRC Request for Additional Information on the UMS<sup>®</sup> Universal Transport Cask Application

Docket No. 71-9270 (TAC No. L22452)

- References:
1. Submittal of the NAC Responses to the NRC Request for Additional Information, not including Chapter 2 Structural Evaluation, Revision UMST-01A, NAC International, March 14, 2001
  2. Submittal of the NAC Responses to the NRC Request for Additional Information (RAI) on the UMS<sup>®</sup> Universal Transport Cask Application, Chapter 2 Structural Evaluation, Revision UMST-01B, NAC International, March 30, 2001
  3. Request for Additional Information related to the NAC-UMS<sup>®</sup> Transportation Package Certificate of Compliance Amendment Request, U.S. Nuclear Regulatory Commission, June 14, 2001

NAC International (NAC) herewith submits ten copies of the responses to the Reference 3, U.S. NRC Request for Additional Information related to the NAC-UMS<sup>®</sup> Transportation Package Application.

This submittal includes the RAI comments with NAC's responses presented in the standard NAC RAI response format, followed by the associated Safety Analysis Report (SAR) changed pages, which are designated as Revision UMST-01D of the UMS<sup>®</sup> Universal Transport Cask SAR. The two attachments referenced in the RAI 3-5 and RAI 3-14 responses are located at the end of the Responses section. A detailed list of the changes incorporated into the SAR is provided as Attachment 1. A large majority of the changed pages in Chapter 2 are the result of changes in the text flow with no other revisions. Note: The enclosed SAR changed pages are to be inserted as replacement or new additional pages, as applicable, into the existing SAR binders. The List of Effective Pages provided in this submittal can be used to ensure that the correct page revisions are incorporated in the SAR binders.

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

- Revision indicators (shading and revision bars) are used to highlight changes. Shading indicates a revision from SAR Revision 0; while a revision bar indicates a change in the SAR from a previous revision, other than Revision 0.
- The changed pages for this submittal are designated as Revision UMST-01D 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 UMST-01D and no revision bars are used on those pages.

This submittal includes two revised drawings:

790-575, Revision 7 BWR Fuel Tube, NAC-UMS®  
790-605, Revision 8 BWR Fuel Tube, Over-Sized Fuel, NAC-UMS®

Since their previous submittal, the revisions incorporated on these drawings are the same on both of the drawings, i.e., the length of the BORAL and the cladding (cover) is increased by 3.0 inches and the inside weld at the intersection of the Flange (Item 7) and the Tubing (Items 1 or 2) is defined as a 1/32 fillet weld in Zone C-5 of the drawing. Note: the intervening drawing revisions not submitted to the NRC incorporated, and subsequently removed, an alternate poison material.

As a part of the response to RAI 2-4, this submittal includes a NAC Proprietary Information Calculation Package, EA790-2239, "Reduction of Hot (200°F) and Cold (-40°F) Redwood Stress-Strain Test Data." Four copies of the calculation package are provided in appropriately marked separate packaging. In response to RAI 3-2, a CD containing the ANSYS input files for the UMS® Transport Cask is also submitted as NAC Proprietary information. The required Proprietary Information Affidavit is executed and attached.

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

cc: Paul Plante (MY)  
Tom Williamson (MY)

Attachment

Enclosures: NAC Proprietary Information Calculation Package: EA790-2239, Revision 0

CD containing the ANSYS input files for the UMS® Transport Cask thermal analyses

## **AFFIDAVIT**

### **IN SUPPORT OF PROPRIETARY INFORMATION CONTAINED IN A DESIGN CALCULATION PACKAGE SUBMITTED IN SUPPORT OF THE NAC INTERNATIONAL RESPONSES TO AN NRC REQUEST FOR ADDITIONAL INFORMATION ON THE NAC-UMS® UNIVERSAL TRANSPORT CASK APPLICATION**

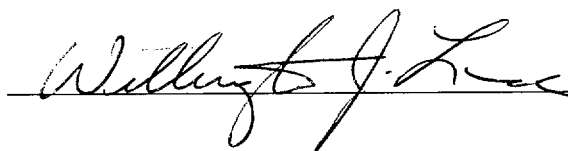
State of Georgia, County of Gwinnett

Willington J. Lee (Affiant), Vice President & Chief Engineer, of NAC International, hereinafter referred to as NAC, at 655 Engineering Drive, Norcross, Georgia 30092, being duly sworn, deposes and says that:

1. Affiant is personally familiar with the trade secrets and privileged information contained in the design calculation package being submitted in support of the NAC responses to a Nuclear Regulatory Commission Request for Additional Information on the NAC-UMS® Universal Transport Cask application. Affiant requests that the Nuclear Regulatory Commission, pursuant to Chapter 10 of the Code of Federal Regulations, Part 2.790 (10 CFR 2.790) "Public Inspections, Exemptions, Request for Withholding," withhold the information contained within the calculations being submitted as part of the subject application, hereafter referred to as the Proprietary Material, from public disclosure.
2. This information has been and is held in confidence by NAC.
3. The information contained within the Proprietary Material is the result of a design calculation including component design details and critical dimensions that were developed by NAC. This type of information is held in confidence based on the significant commercial investment of time and money expended in its development.
4. The Proprietary Material being transmitted to the Nuclear Regulatory Commission in confidence is NAC Calculation No. EA790-2239, Revision 0.
5. The information that is being claimed as trade secret and privileged information has not been and is not available in public sources.

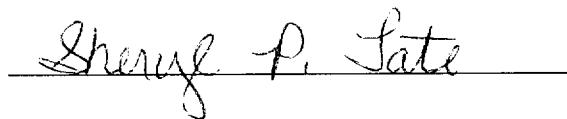
**AFFIDAVIT**  
(continued)

6. NAC has invested a considerable amount of time, engineering labor, and money in the development of this calculation. Public disclosure of this information would cause substantial harm to the competitive position of NAC. Others seeking to develop similar analysis would have to make similar investments to develop the information on their own as long as the information is not disclosed to the public.



Willington J. Lee  
Vice President & Chief Engineer  
NAC International

Subscribed and sworn to before me this 16th day of November 2001.



Notary Public in and for the  
County of Gwinnett  
State of Georgia

My commission expires the 12th day of May, 2003

## **AFFIDAVIT**

### **IN SUPPORT OF PROPRIETARY INFORMATION CONTAINED IN A CD-ROM SUBMITTED IN SUPPORT OF THE NAC INTERNATIONAL RESPONSES TO AN NRC REQUEST FOR ADDITIONAL INFORMATION ON THE NAC- UMS® UNIVERSAL TRANSPORT CASK APPLICATION**

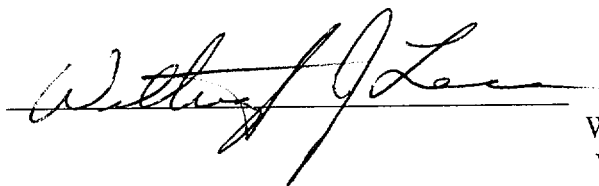
State of Georgia, County of Gwinnett

Willington J. Lee (Affiant), Vice President & Chief Engineer, of NAC International, hereinafter referred to as NAC, at 655 Engineering Drive, Norcross, Georgia 30092, being duly sworn, deposes and says that:

1. Affiant is personally familiar with the trade secrets and privileged information contained in the CD-ROM being submitted in support of the NAC responses to a Nuclear Regulatory Commission Request for Additional Information on the NAC-UMS® Universal Transport Cask application. Affiant requests that the Nuclear Regulatory Commission, pursuant to Chapter 10 of the Code of Federal Regulations, Part 2.790 (10 CFR 2.790) "Public Inspections, Exemptions, Request for Withholding," withhold the information contained within the calculations being submitted as part of the subject application, hereafter referred to as the Proprietary Material, from public disclosure.
2. This information has been and is held in confidence by NAC.
3. The information contained within the Proprietary Material is the result of ANSYS input files for thermal analyses developed by NAC. This type of information is held in confidence based on the significant commercial investment of time and money expended in its development.
4. The Proprietary Material being transmitted to the Nuclear Regulatory Commission in confidence is a CD-ROM containing ANSYS input files for thermal analyses of the UMS® Transport Cask for Hypothetical Fire Accident and Normal Transport conditions.
5. The information that is being claimed as trade secret and privileged information has not been and is not available in public sources.

**AFFIDAVIT**  
(continued)

6. NAC has invested a considerable amount of time, engineering labor, and money in the development of this CD-ROM. Public disclosure of this information would cause substantial harm to the competitive position of NAC. Others seeking to develop similar analysis would have to make similar investments to develop the information on their own as long as the information is not disclosed to the public.



Willington J. Lee  
Vice President & Chief Engineer  
NAC International

Subscribed and sworn to before me this 16th day of November 2001.



Notary Public in and for the  
County of Gwinnett  
State of Georgia

My commission expires the 12th day of May, 2003

**ATTACHMENT**

**UMST-01D List of Changes**

Reference NAC-UMS<sup>®</sup> Docket No. 71-9270

## UMST-01D List of Changes

Page/Section	Change
LOEP	Updated to reflect changes
MTOC	Updated to reflect changes
Chapter 1, Page 1.2-15	Step 8, changed “Cask spent fuel” to “Cask general spent fuel”
Chapter 1, Page 1.2-15	In table at bottom of page, line “Max Burnup (MWD/MTU)” changed to “45,000” for PWR and BWR
Chapter 1, Page 1.2-15	Step 9, text completely revised
Chapter 1, Page 1.3.4-2	Revisions changed in Drawings 790-575 and 790-605
Chapter 2, TOC	Updated to reflect changes
Chapter 2, Page 2.1-6	4 <sup>th</sup> paragraph, 3 <sup>rd</sup> sentence, change “54.9g” to “57.8g”, “oblique-drop orientation” to “top end drop orientation” and shade block to show deleted text
Chapter 2, Page 2.1-14	Table 2.1.2-1, “NB-2000” changed to “NF-2000” in two places
Chapter 2, Page 2.1-24	Added phrase “As shown in Table 2.6.7.5-6” to start paragraph and “equal to or”
Chapter 2, Page 2.1-24	1 <sup>st</sup> sentence, changed “54.9g” to “57.8g”
Chapter 2, Page 2.6-3	1 <sup>st</sup> paragraph, 1 <sup>st</sup> sentence, changed “Table 2.6.1.1-1” to “Table 3.4-1”
Chapter 2, Page 2.6-3	1 <sup>st</sup> paragraph, 2 <sup>nd</sup> sentence, changed “Tables 2.6.1.1-2 and 2.6.1.1-3” to “Tables 2.6.1.1-1 and 2.6.1.1-2”
Chapter 2, Page 2.6-3	Last sentence, changed “Table 4-1” to “Table 3.4-4”, “7.3 psig” to “6.91 psig”, and “Section 3.4.4.1.2.1” to “Section 3.4.4”
Chapter 2, Page 2.6-3	4 <sup>th</sup> paragraph, 1 <sup>st</sup> sentence, changed “398.7°F” to “408°F”
Chapter 2, Page 2.6-3	Equation starting with “Δd,” “398.7” changed to “408” and “0.203 in.” to “0.208 in.”
Chapter 2, Page 2.6-3	Last paragraph, changed “67.263” to “67.268” and “0.347” to “0.342”
Chapter 2, Page 2.6-4	1 <sup>st</sup> paragraph, 1 <sup>st</sup> sentence, changed “398.7°F” to “408°F”
Chapter 2, Page 2.6-4	1 <sup>st</sup> equation starting with “Δl,” changed “398.7” to “408” and “0.58 in.” to “0.60 in.”
Chapter 2, Page 2.6-4	2 <sup>nd</sup> paragraph, changed “0.58” to “0.60” and “192.53 in.” to “192.55”
Chapter 2, Page 2.6-4	3 <sup>rd</sup> paragraph, 1 <sup>st</sup> sentence, deleted “minimum” and changed “237.5°F” to “250°F”
Chapter 2, Page 2.6-4	4 <sup>th</sup> paragraph, 2 <sup>nd</sup> sentence, changed “192.53” to “192.55” and “0.1” to “0.08”
Chapter 2, Pages 2.6-7 through 2.6-382	Revision bars indicate text flow. Please see following for a listing of changes within these text flow pages.
Chapter 2, Page 2.6-7	Deleted Table 2.6.1.1-1, following table numeration revised accordingly
Chapter 2, Page 2.6-7	New Tables 2.6.1.1-1 and 2.6.1.1-2; all thermal analysis results associated with air inside the canister are deleted and table data revised accordingly



## UMST-01D List of Changes

Page/Section	Change
Chapter 2, Pages 2.6-8 and 2.6-9	Tables 2.6.1.3-1 and 2.6.1.3-2, deleted asterisk in title and added "Note:" in footnote
Chapter 2, Pages 2.6-11 and 2.6-12	Tables 2.6.1.3-4 and 2.6.1.3-5, deleted asterisk in title and added "Note:" in footnote
Chapter 2, Page 2.6-13	2 <sup>nd</sup> paragraph, 1 <sup>st</sup> sentence, changed "Table 2.6.2.1-1" to "Table 3.4-2" and deleted Note in parentheses; changed "Table 2.6.1.1-2" to "Table 2.6.1.1-1" and "Table 2.6.1.1-3" to "Table 2.6.1.1-2"; "Table 4-1" to "Table 3.4.4"; moved "[57]" reference to after "Table 3.4-4"; and changed "7.3 psig" to "6.91 psig"
Chapter 2, Page 2.6-14	Step 5, switched "0 ksi" and "less than 0.1 ksi"
Chapter 2, Page 2.6-14	Last paragraph, 2 <sup>nd</sup> sentence, added "cold" and changed "13.9" to "0.5"; last sentence, changed "35.5" to "22.1"
Chapter 2, Page 2.6-15	Updated Max. Stress and Margin of Safety in table
Chapter 2, Page 2.6-16	Deleted Table 2.6.2.1-1
Chapter 2, Pages 2.6-16 and 2.6-17	Tables 2.6.2.3-1 and 2.6.2.3-2, deleted asterisk in title and added "Note:" in footnote
Chapter 2, Pages 2.6-19 and 2.6-20	Tables 2.6.2.3-4 and 2.6.2.3-5, deleted asterisk in title and added "Note:" in footnote
Chapter 2, Page 2.6-22	1 <sup>st</sup> full paragraph, 3 <sup>rd</sup> sentence, changed "peak" to "maximum"
Chapter 2, Page 2.6-60	Added 1 <sup>st</sup> full paragraph, "A series of static and dynamic. . ."
Chapter 2, Page 2.6-62	Revised the 3 <sup>rd</sup> paragraph throughout
Chapter 2, Pages 2.6-62 and 2.6-63	Added 3 paragraphs starting with "For the end drop, the portion . . ." and ending with ". . . loading angle, strain rate and temperature."
Chapter 2, Page 2.6-65	Deleted 3 <sup>rd</sup> full sentence, "This filter frequency was used to filter the time histories of the impact tests for a steel billet in the side drop and end drop orientation (NUREG/CR-6608)"
Chapter 2, Page 2.6-70	1 <sup>st</sup> paragraph, last two sentences moved to create a new paragraph at the bottom of the page
Chapter 2, Page 2.6-70	2 <sup>nd</sup> paragraph, 1 <sup>st</sup> sentence, changed "employed in this evaluation" to "used"; 2 <sup>nd</sup> paragraph, 2 <sup>nd</sup> sentence, changed "These were" to "These filter frequencies were"; and 2 <sup>nd</sup> paragraph, 4 <sup>th</sup> sentence, changed "The results" to "The LS-DYNA analysis results"
Chapter 2, Page 2.6-70	Added 3rd paragraph
Chapter 2, Page 2.6-70	4th paragraph, completely revised throughout
Chapter 2, Page 2.6-70	4 <sup>th</sup> paragraph, 1 <sup>st</sup> sentence, changed "used" to assumed" and "typical value" to "typical published value"

## UMST-01D List of Changes

Page/Section	Change
Chapter 2, Page 2.6-70	4 <sup>th</sup> paragraph, 2 <sup>nd</sup> sentence and new 3 <sup>rd</sup> sentence, changed “An additional parametric study using the model. . .zero friction condition, which remains bounded by the side drop orientation.” To “An additional parametric study using the LS-DYNA model . . . zero friction condition, which is summarized in Table 2.6.7.5-9. The zero friction condition remains bounded by the side drop condition.”
Chapter 2, Page 2.6-77	Figure 2.6.7.5-7 revised.
Chapter 2, Page 2.6-79	Revised numbers in Table 2.6.7.5-1
Chapter 2, Page 2.6-80	Revised numbers in Table 2.6.7.5-3
Chapter 2, Page 2.6-82	Revised numbers in Table 2.6.7.5-6, revised title in Table 2.6.7.5-7 and deleted slap-down (75°) information
Chapter 2, Page 2.6-83	Added Tables 2.6.7.5-8 and 2.6.7.5-9
Chapter 2, Page 2.6-111	Fixed incorrect paragraph numbering
Chapter 2, Pages 2.6-117 and 2.6-118	Added “Bottom Plate” label for Figures 2.6.12-1 and 2.6.12-2
Chapter 2, Page 2.6-119	1 <sup>st</sup> paragraph, changed “399°F” to “408°F” in two places and “15.8 ksi” to “15.7 ksi”
Chapter 2, Page 2.6-119	Last line, changed “backing ring” to “spacer ring”
Chapter 2, Page 2.6-120	1 <sup>st</sup> paragraph, 3 <sup>rd</sup> full sentence, changed “backing ring” to “spacer ring”
Chapter 2, Page 2.6-127	Table 2.6.12.2-1, changed “backing ring” to “spacer ring”
Chapter 2, Page 2.6-129	1 <sup>st</sup> full paragraph and 2 <sup>nd</sup> paragraph, changed “399°F” to “408°F”
Chapter 2, Pages 2.6-136 through 2.6-141	Tables 2.6.12.4-2 through 2.6.12.4-7, in note changed “399°F” to “408°F”
Chapter 2, Pages 2.6-144 through 147	Tables 2.6.12.5-2 through 2.6.12.5-5, in note changed “399°F” to “408°F”
Chapter 2, Pages 2.6-151 through 2.6-152	Tables 2.6.12.6-2 through 2.6.12.6-3, in note changed “399°F” to “408°F”
Chapter 2, Pages 2.6-155 through 2.6-156	Tables 2.6.12.7-2 through 2.6.12.7-3, in note changed “399°F” to “408°F”
Chapter 2, Pages 2.6-159 through 2.6-162	Tables 2.6.12.8-2 through 2.6.12.8-5, in note changed “399°F” to “408°F”
Chapter 2, Pages 2.6-165 through 2.6-168	Tables 2.6.12.9-2 through 2.6.12.9-5, in note changed “399°F” to “408°F”
Chapter 2, Pages 2.6-242 and 2.6-243	Added “Bottom Plate” label for Figures 2.6.14-1 and 2.6.14-2
Chapter 2, Page 2.6-244	2 <sup>nd</sup> paragraph, 4 <sup>th</sup> sentence, changed “372°F” to “363°F”
Chapter 2, Page 2.6-252	Table 2.6.14.2-1, changed “backing ring” to “spacer ring”

## UMST-01D List of Changes

Page/Section	Change
Chapter 2, Page 2.6-293	1 <sup>st</sup> paragraph, last sentence, changed “399°F” to “408°F”
Chapter 2, Page 2.6-300	Figure replaced with a “cleaner” version
Chapter 2, Page 2.6-313	Added missing asterisk to table for note
Chapter 2, Page 2.7-62	2 <sup>nd</sup> paragraph, 1 <sup>st</sup> sentence, changed “Tables 2.7.3.1-1 and 2.7.3.1-2” to “Tables 3.5-1 and 3.5-2”
Chapter 2, Page 2.7-62	2 <sup>nd</sup> paragraph, 2 <sup>nd</sup> sentence, changed “tables 2.7.3.1-3 and 2.7.3.1-4” to “Tables 2.7.3.1-1 and 2.7.3.1-2”
Chapter 2, Page 2.7-62	2 <sup>nd</sup> paragraph, 3 <sup>rd</sup> sentence, replaced completely with two new sentences
Chapter 2, Pages 2.7-63 through 2.7-213	Revision bars indicate text flow. Please see following for a listing of changes within these text flow pages.
Chapter 2, Page 2.7-63	Deleted Tables 2.7.3.1-1 and 2.7.3.1-2, following table numeration revised accordingly
Chapter 2, Page 2.7-63	New Tables 2.7.3.1-1 and 2.7.3.1-2, table data revised accordingly
Chapter 2, Pages 2.7-64 through 2.7-67	Added Tables 2.7.3.1-3 through 2.7.3.1-6
Chapter 2, Pages 2.7-79 through 2.7-88	Tables 2.7.7.2-1 through 2.7.7.2-10, in note changed “399°F” to “408°F”
Chapter 2, Page 2.7-140	Last paragraph, last sentence, changed “372°F” to “363°F”
Chapter 2, Page 2.10.3-24	Revised numbers in table regarding final thickness and total crush for LS-DYNA
Chapter 2, Page 2.10.3-24	Renumbered section, “Accelerometer Data from the 30-Foot Side Drop Test” from “2.10.3.4.4” to “2.10.3.4.5” to prevent duplication
Chapter 2, Page 2.10.3-25	Numbers in tables have been revised
Chapter 2, Page 2.10.3-25	Renumbered section, “Energy Absorption Capacity of the Impact limiter in the 30-Foot Side Drop” from “2.10.3.4.5” to “2.10.3.4.6” to prevent duplication
Chapter 2, Page 2.10.3-26	Renumbered section, “Summary of the Side Drop Test” from “2.10.3.4.5” to “2.10.3.4.7” to prevent duplication
Chapter 2, Page 2.10.3-26	Added small table in center of the page
Chapter 2, Page 2.10.3-27	Section 2.10.3.7, 1 <sup>st</sup> paragraph revised throughout
Chapter 2, Page 2.10.3-28	Revision bar indicates text flow
Chapter 2, Page 2.10.3-29	Top revision bar indicates text flow and numbers in tables have been revised
Chapter 2, Page 2.10.3-30	All new text
Chapter 2, Page 2.10.3-38	Figure 2.10.3-8 updated
Chapter 2, Page 2.10.3-39	Figure 2.10.3-9 updated
Chapter 2, Page 2.10.3-40	Figure 2.10.3-10 title revised

## UMST-01D List of Changes

Page/Section	Change
Chapter 2, Pages 2.10.3-45 through 2.10.3-48	Figures 2.10.3-15 through 2.10.3-18 added
Chapter 3, TOC	Updated to reflect changes
Chapter 3, Page 3.1-1	2 <sup>nd</sup> paragraph, 1 <sup>st</sup> sentence, added “which are already sealed in a Transportable Storage Canister (canister)”
Chapter 3, Page 3.1-1	4 <sup>th</sup> paragraph, 1 <sup>st</sup> sentence, changed “cavity” to “cavity and in the canister”
Chapter 3, Page 3.1-1	4 <sup>th</sup> paragraph, 2 <sup>nd</sup> sentence, deleted
Chapter 3, Page 3.2-4	4 <sup>th</sup> paragraph, 2 <sup>nd</sup> sentence, changed “[5]” to “[16, Eq. 4.4.12d, Page 4-88]”
Chapter 3, Page 3.2-4	Equation starting with “h <sub>c</sub> ”, changed “ $\Delta T^{0.33}$ ” to “ $\Delta T^{1/3}$ ” and added “[16, Eq. 4.4.12d, Page 4-88]”
Chapter 3, Page 3.2-5	Equation starting with “h <sub>c</sub> ”, changed “ $\Delta T^{0.33}$ ” to “ $\Delta T^{1/3}$ ”
Chapter 3, Page 3.4-4	2 <sup>nd</sup> full paragraph, last line, deleted “air” in “air gap”
Chapter 3, Page 3.4-5	2 <sup>nd</sup> full paragraph, 1 <sup>st</sup> sentence deleted and “The” added to 1 <sup>st</sup> and 2 <sup>nd</sup> sentence
Chapter 3, Page 3.4-7	1 <sup>st</sup> paragraph, 2 <sup>nd</sup> sentence, deleted “air” in “air gaps”
Chapter 3, Page 3.4-8	Revision bar indicates text flow
Chapter 3, Page 3.4-9	“A sensitivity study. . .” paragraph completely new
Chapter 3, Page 3.4-9	3 <sup>rd</sup> complete paragraph, 3 <sup>rd</sup> sentence, changed “modeled as air in one analysis and helium in another analysis” to “modeled as helium”
Chapter 3, Pages 3.4-9 and 3.4-10	Revision bar indicates text flow
Chapter 3, Page 3.4-11	Changed “air gaps” to “gaps” (in two places)
Chapter 3, Page 3.4-13	2 <sup>nd</sup> paragraph, 1 <sup>st</sup> sentence, changed “For the BWR configuration, two analyses are performed. Gas inside the canister is modeled as air in one analysis and helium in another analysis. Gas inside the cask cavity is modeled as helium, because the cavity will be backfilled with helium prior to transport.” to “For the BWR configuration, the gas inside the canister and the cask cavity is modeled as helium because the cavity will be backfilled with helium prior to transport.”
Chapter 3, Page 3.4-14	Deleted “3” in equation
Chapter 3, Page 3.4-16	1 <sup>st</sup> full paragraph, changed “modeled as air in one analysis and helium in another analysis” to “modeled as helium”
Chapter 3, Page 3.4-22	4 <sup>th</sup> paragraph, 2 <sup>nd</sup> sentence, changed “maximum internal operating pressures” to “maximum operating pressure”
Chapter 3, Page 3.4-22	Revision bar indicates text flow
Chapter 3, Pages 3.4-22 through 3.4-24	Shaded area indicates new text

## UMST-01D List of Changes

Page/Section	Change
Chapter 3, Page 3.4-25	Section 3.4.4.1.1 changed to Section 3.4.4.2 and added “and Transport Cask” to title
Chapter 3, Page 3.4-25	Information under Section 3.4.4.2 is all new text
Chapter 3, Pages 3.4-25 through 3.4-56	Revision bars indicate text flow. Please see following for a listing of changes within these text flow pages.
Chapter 3, Pages 3.4-50 through 3.5-51	Tables 3.4-5 through 3.4-10, new tables, revision bars indicate changes in the title
Chapter 3, Pages 3.4-52 through 3.4-55	Tables 3.4-11 through 3.4-16, these tables were previously Tables 3.4-5 through 3.4-10
Chapter 3, Page 3.4-55	Table 3.4-16, PWR numbers were rounded up
Chapter 3, Page 3.4-56	Added Table 3.4-17
Chapter 3, Page 3.5-2	In parentheses, changed “(Table 3.4-1, air cases)” to “(Table 3.4-1)”. Note the extra spacing with shading is to show the deletion of words.
Chapter 3, Page 3.5-3	2 <sup>nd</sup> paragraph, 5 <sup>th</sup> sentence, changed “0.01222ΔT <sup>(0.33)</sup> (Btu/hr in <sup>2</sup> °F [12] [5])” to “0.01222ΔT <sup>(1/3)</sup> Btu/hr in <sup>2</sup> °F [12]”
Chapter 3, Page 3.5-5	All shaded text in Section 3.5.4 is new
Chapter 3, Pages 3.5-5 through 3.5-28	Revision bars indicate text flow
Chapter 3, Page 3.6-8	Added paragraph, “Damaged high burnup fuel. . .”
Chapter 3, Page 3.7-2	Changed reference 16 to “9 <sup>th</sup> Edition” and a “1987” date
Chapter 4, TOC	Updated to reflect changes
Chapter 4, Page 4-1	2 <sup>nd</sup> paragraph, deleted 3 <sup>rd</sup> sentence. 4 <sup>th</sup> sentence revised to delete “design”
Chapter 4, Page 4-1	2 <sup>nd</sup> paragraph, added text “Evaluations are performed. . . (see Section 4.5.1.1).”
Chapter 4, Page 4-2	Revision bar indicates text flow
Chapter 4, Page 4.1-2	2 <sup>nd</sup> paragraph, 2 <sup>nd</sup> sentence, changed “2.4 x 10 <sup>-5</sup> ref-cm <sup>3</sup> /sec” to “4.2 x 10 <sup>-6</sup> ref-cm <sup>3</sup> /sec”
Chapter 4, Page 4.1-2	2 <sup>nd</sup> paragraph, 3 <sup>rd</sup> sentence completely revised
Chapter 4, Page 4.1-3	5 <sup>th</sup> paragraph, changed 3 <sup>rd</sup> sentence “BWR” to “PWR”, “2.4 x 10 <sup>-5</sup> ref cm <sup>3</sup> /sec” to “4.2 x 10 <sup>-6</sup> ref cm <sup>3</sup> /sec”; “1.2 x 10 <sup>-5</sup> ref-cm <sup>3</sup> /sec” to “2.1 x 10 <sup>-6</sup> ref-cm <sup>3</sup> /sec”; “3.3 x 10 <sup>-5</sup> cm <sup>3</sup> /sec” to “6.5 x 10 <sup>-6</sup> ref-cm <sup>3</sup> /sec”; and “1.6 x 10 <sup>-5</sup> cm <sup>3</sup> /sec” to “3.25 x 10 <sup>-6</sup> cm <sup>3</sup> /sec”
Chapter 4, Page 4.1-4	Revision bar indicated text flow
Chapter 4, Page 4.1-5	Table 4.1-1, revised text in 2 <sup>nd</sup> and 3 <sup>rd</sup> columns – 2.4 x 10 <sup>-5</sup> is now 4.2 x 10 <sup>-6</sup> and 3.3 x 10 <sup>-5</sup> is now 6.5 x 10 <sup>-6</sup> . Altered footnote 3 to change “GE 9x9 BWR fuel assembly” to “damaged high burnup PWR fuel assemblies”

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Page/Section	Change
Chapter 4, Page 4.2-1	1 <sup>st</sup> paragraph, 2 <sup>nd</sup> sentence, added “intact” before “PWR fuel”, changed “ $6.7 \times 10^{-5} \text{ cm}^3/\text{sec}$ ” to “ $6.6 \times 10^{-5} \text{ cm}^3/\text{sec}$ ”; changed “ $2.4 \times 10^{-5} \text{ cm}^3/\text{sec}$ ” to “ $3.3 \times 10^{-5} \text{ ref cm}^3/\text{sec}$ ”; changed “ $3.3 \times 10^{-5} \text{ cm}^3/\text{sec}$ ” to “ $4.5 \times 10^{-5} \text{ cm}^3/\text{sec}$ ”; added sentence “For the PWR cask containing up to . . .”; and in the following sentence changed “the BWR allowable leak rate” to “the PWR high burnup fuel allowable leak rate”
Chapter 4, Page 4.2-2	Revision bar indicates text flow
Chapter 4, Page 4.2-5	1 <sup>st</sup> paragraph, changed “design basis PWR and BWR fuel under normal conditions” to “standard or high burnup PWR and BWR standard fuel under normal conditions”; changed “ $5.0 \times 10^{-5} \text{ ref cm}^3/\text{sec}$ ” to “ $5.5 \times 10^{-6}$ ”; and changed “ $2.4 \times 10^{-5} \text{ ref cm}^3/\text{sec}$ ” to “ $1.3 \times 10^{-5} \text{ ref cm}^3/\text{sec}$ ”
Chapter 4, Page 4.2-5	2 <sup>nd</sup> paragraph, changed “BWR assemblies” to “high burnup damaged PWR assemblies” and added “failure rate associated. . .” to end
Chapter 4, Page 4.2-6	Revision bar on top indicates text flow
Chapter 4, Page 4.2-6	1 <sup>st</sup> full paragraph, Deleted 8 <sup>th</sup> sentence
Chapter 4, Page 4.2-7	Paragraph “This analysis is conservative. . .” is new text
Chapter 4, Page 4.2-7	Revision bar on top indicates text flow
Chapter 4, Page 4.2-7	Section 4.2.2, combined 1 <sup>st</sup> and 2 <sup>nd</sup> paragraphs and deleted 3 <sup>rd</sup> paragraph
Chapter 4, Page 4.2-8	Table 4.2-1, revised footnote 1
Chapter 4, Page 4.2-8	Table 4.2-2 revised throughout and footnote 1 added and the original footnote became footnote 2
Chapter 4, Page 4.2-9	Table 4.2-3 revised throughout
Chapter 4, Page 4.2-9	Table 4.2-4 revised throughout and footnotes updated
Chapter 4, Page 4.2-10	Table 4.2-5 revised throughout, footnote 2 updated and footnote 3 added
Chapter 4, Page 4.2-10	Deleted Table 4.2-6 and Table 4.2-7 becomes Table 4.2-6. Revision bar indicates text flow and B&W 15x15 numbers revised and footnote 2 updated.
Chapter 4, Page 4.3-1	1 <sup>st</sup> paragraph, changed “ $2.6 \times 10^{-3} \text{ ref cm}^3/\text{sec}$ ” to “ $2.0 \times 10^{-3} \text{ ref cm}^3/\text{sec}$ ” and changed “ $2.8 \times 10^{-3} \text{ ref cm}^3/\text{sec}$ ” to “ $2.2 \times 10^{-3} \text{ ref cm}^3/\text{sec}$ ”
Chapter 4, Page 4.3-1	2 <sup>nd</sup> paragraph, changed “average gas temperatures of 696K (PWR) and 644K (BWR) resulting from . . . to be 5.1 atm (PWR) or 3.7 atm (BWR)” to “average gas temperatures of 582K (PWR) and 542K (BWR) resulting from . . . to be 5.7 atm (PWR) or 3.9 atm (BWR)”
Chapter 4, Page 4.3-4	Table 4.3-1, revised Cask Volumetric Activity row
Chapter 4, Page 4.3-4	Table 4.3-2, revised Releasable Activity per Cask (Ci) and Cask Volumetric Activity rows
Chapter 4, Page 4.3-5	Tables 4.3-3 and 4.3-4 revised throughout

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Page/Section	Change
Chapter 4, Page 4.5.1-1	1 <sup>st</sup> paragraph, 3 <sup>rd</sup> sentence, changed “consolidated form” to “consolidated or damaged form”
Chapter 4, Page 4.5.1-1	Added 2 <sup>nd</sup> and 3 <sup>rd</sup> paragraphs
Chapter 5, Page 5.2-3	Added very last sentence
Chapter 5, Page 5.4-5	1 <sup>st</sup> paragraph, 1 <sup>st</sup> sentence, changed “50,000 MWD/MTU” to “45,000 MWD/MTU”
Chapter 5, Page 5.4-7	In “Burnup” row, deleted “50”
Chapter 5, Page 5.5.1-2	1 <sup>st</sup> full paragraph, 1 <sup>st</sup> sentence, added “discussed in Section 5.4.3.1”
Chapter 5, Page 5.5.1-2	1 <sup>st</sup> full paragraph, 2 <sup>nd</sup> sentence added
Chapter 5, Page 5.5.1-5	Changed Section 5.5.1.1.4 title to add “and Loading Table Analysis”
Chapter 5, Page 5.5.1-5	Section 5.5.1.1.4, 1 <sup>st</sup> paragraph, 1 <sup>st</sup> sentence, deleted “As shown in Section 5.4.3,” and added “for burnups up to 50,000 MWD/MTU”
Chapter 5, Page 5.5.1-7	3 <sup>rd</sup> full paragraph, 1 <sup>st</sup> sentence, deleted “design basis” and added “for consistency with the design basis fuel evaluated in Section 5.4.2”
Chapter 5, Page 5.5.1-19	Table 5.5.1.1-10, fixed less than and less than and equal to signs to be correct
Chapter 6, TOC	Updated to reflect changes
Chapter 6, Page 6.2-4	Table 6.2-3, Column 4: changed Active Length, Top End-Cap Height, and Gap Fuel Rod To Top Nozzle numbers; Column 5: changed Vendor, Array, Active Length, Fuel Rod Height, Top End-Cap Height, Bottom End-Cap Height, Fuel Assembly Height, Lower Nozzle Height, Upper Plenum Region Height and Gap Fuel Rod To Top Nozzle numbers; added footnotes 1 and 2; Changed 3 line from “Active Length” to “Active Fuel Length”
Chapter 6, Page 6.4-18	All information under Section 6.4.5 is new
Chapter 6, Pages 6.4-24 through 6.4-38	Revision bar indicates text flow
Chapter 6, Page 6.4-39	Added Tables 6.4-19 and 6.4-20
Chapter 6, Page 6.5-9	Last paragraph, added sentence, “The parameters of the most reactive configurations for the UMS <sup>®</sup> design basis PWR and BWR fuels and for the Maine Yankee fuel are presented in Table 6.5.3.”
Chapter 6, Page 6.5-33	Table 6.5-2, changed title
Chapter 6, Page 6.5-33	Table 6.5-3, changed title and revised table throughout
Chapter 6, Page 6.5-34	Table 6.5-4, changed title and revised table throughout
Chapter 7, TOC	Updated to reflect changes
Chapter 7, Page 7-3	Table 7-2 updated throughout and footnote one revised to add “high burnup Maine Yankee”

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Page/Section	Change
Chapter 7, Page 7.1-5	Step 21, changed " $1.6 \times 10^{-5} \text{ cm}^3/\text{sec}$ " to " $3.25 \times 10^{-6} \text{ cm}^3/\text{sec}$ " and " $3.3 \times 10^{-5} \text{ cm}^3/\text{sec}$ " to " $6.5 \times 10^{-6} \text{ cm}^3/\text{sec}$ "
Chapter 7, Page 7.1-5	Step 24, revision bar indicates text flow
Chapter 7, Page 7.1-6	Changed " $1.6 \times 10^{-5} \text{ cm}^3/\text{sec}$ " to " $3.25 \times 10^{-6} \text{ cm}^3/\text{sec}$ " and " $3.3 \times 10^{-5} \text{ cm}^3/\text{sec}$ " to " $6.5 \times 10^{-6} \text{ cm}^3/\text{sec}$ " in Steps 27 and 29
Chapter 7, Page 7.5-1	Original Section 7.5 deleted. Section 7.6 renumbered accordingly.
Chapter 8, TOC	Updated to reflect changes
Chapter 8, Page 8.1-5	1 <sup>st</sup> paragraph, added sentence "Personnel performing tests. . ."
Chapter 8, Pages 8.1-13 through 8.1-15	Section 8.1.7 information is new
Chapter 8, Page 8.1-16	Revision bar indicates text flow
Chapter 8, Page 8.1-5	2 <sup>nd</sup> paragraph, changed " $10^{-7} \text{ std cm}^3/\text{sec}$ " to " $10^{-7} \text{ cm}^3/\text{sec}$ "
Chapter 8, Page 8.1-6	1 <sup>st</sup> paragraph, 2 <sup>nd</sup> sentence, changed " $3.3 \times 10^{-5} \text{ std cm}^3/\text{sec}$ " to " $6.5 \times 10^{-6} \text{ cm}^3/\text{sec}$ "
Chapter 8, Page 8.1-6	1 <sup>st</sup> paragraph, 3 <sup>rd</sup> sentence, changed " $1.6 \times 10^{-5} \text{ std cm}^3/\text{sec}$ " to " $3.25 \times 10^{-6} \text{ cm}^3/\text{sec}$ "
Chapter 8, Page 8.1-6	4 <sup>th</sup> paragraph, 4 <sup>th</sup> sentence, changed "canister bottom" to "canister baseplate"
Chapter 8, Page 8.2-2	4 <sup>th</sup> paragraph, added sentence "Personnel performing tests. . ."
Chapter 8, Page 8.2-5	Table 8.2-1, 10 <sup>th</sup> row from top (starting with header), deleted "port coverplate", added 16 <sup>th</sup> and 17 <sup>th</sup> rows
Chapter 8, Page 8.3-1	Changed reference 5, original reference was, "American Society for Nondestructive Testing, SNT-TC-1A, "Recommended Practices, Nondestructive Testing, Personnel Qualifications and Certification, 1984."