Enclosure 3 to E-55004

NUHOMS®-MP197HB SAR, Revision 20, Replacement Pages and Drawings

(Public Version)

NON-PROPRIETARY

NUHOMS®-MP197 TRANSPORTATION PACKAGING SAFETY ANALYSIS REPORT NUH09.0101

Revision *20*

***September* 2019**

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Revision Log

Rev. No.	Date	Description
0	4/2001	Original Issue for CoC Revision 0
1	1/2002	Various Changes CoC Revision 0
2	2/2002	Various Changes CoC Revision 0
3	4/2002	Various Changes CoC Revision 0
4	5/2002	Various Changes CoC Revision 0
5	3/2009	Application for CoC Revision 3 Added Appendix A for the MP197HB
6	6/2009	Various Changes for CoC Revision 3
7	4/2010	Various Changes for CoC Revision 3
8	7/2010	Various Changes for CoC Revision 3
9	3/2011	Various Changes for CoC Revision 3
10	8/2011	Consolidated SAR Submittal for CoC Revision 3
11	9/2011	Various Changes for CoC Revision 4
12	2/2012	Application for CoC Revision 7
13	8/2012	Various Changes for CoC Revision 7
14	8/2013	Various Changes for CoC Revision 7
15	1/2014	Various Changes for CoC Revision 7
16	3/2014	Various Changes for CoC Revision 7
17	4/2014	Various Changes for CoC Revision 7
18	4/2017	Application for CoC Revision 8 <u>Revised pages as follows</u>: SAR pages A.1.4.8-3a, A.1.4.8.13a, A.1.4.8-14, A.1.4.9-i, A.1.4.9-2, A.1.4.9-2a, A.1.4.9-3, A.1.4.9-9, A.1.4.9-9a, A.1.4.9-10, A.1.4.10-1, A.1.4.10-6 SAR pages A.2.13.11-ii, A.2.13.11-1 through A.2.13.11-6, A.2.13.11-12, A.2.13.11-13, A.2.13.11-18, A.2.13.11-22 through A.2.13.11-24, A.2.13.11-31, A.2.13.11-41, A.2.13.11-43 SAR pages A.3-i through A.3-v, A.3-1, A.3-3, A.3-4, A.3-6, A.3-7, A.3-28, A.3-55, A.3-62, A.3-77, A.3-78, A.3-80, A.3-81, A.3-97, A.3-98, A.3-99, A.3-102, A.3-175, A.3-176 SAR pages A.5-i through A.5-v, A.5-1, A.5-2, A.5-3, A.5-5, A.5-7, A.5-8, A.5-11, A.5-12d, A.5-16, A.5-16a, A.5-16b, A.5-20b, A.5-29a, A.5.-29c, A.5-29d through A.5-29h, A.5-32b, A.5-34, A.5-37, A.5-38, A.5-40, A.5-41, A.5-41a, A.5-70, A.5-75, A.5-80l, A.5-80m, A.5-80p, A.5-80q, A.5-80t, A.5-105

Revision Log

Rev. No.	Date	Description
		Revised drawings as follows: Drawing MP197HB-71-1005 Drawing NUH69BTH-71-1004 New pages as follows: Proprietary Information Notice Revision Log Appendix A Master Table of Contents, pages i through xix SAR pages A.1.4.9-9b through A.1.4.9-9g, A.1.4.9-15a SAR pages A.3-60a, A.3-102a, A.3-102b SAR pages A.5-2a, A.5-29i, A.5-38a, A.5-41b, A.5-41c, A.5-42a, A.5-79b, A.5-102a
19	04/2019	Application for CoC Revision 9 Revised pages as follows: SAR cover page P, SAR cover page NP Proprietary Information Notice Revision Log, MP197 SAR Overall TOC SAR pages 1-i, 1-13, 1-14, 1-15, 1-16 SAR pages 3-1 to 3-38 SAR pages 6-i to 6-11 Appendix A Master Table of Contents pages ii, v, vi, x, xi, xvii, and xix SAR pages A.1-2, A.1-3, A.1-4, A.1-8, A.1-9, A.1.4.9Ai, A.1.4.9A-1 through A.1.4.9A-5, A.1.4.10-i, A.1.4.10-1, and A.1.4.10-6 SAR pages A.2-3, A.2-6, A.2-7, A.2-13, A.2-16, A.2-23, A.2.13.1-3, A.2.13.2-1, A.2.13.2-4, A.2.13.2-13, A.2.13.2-15, A.2.13.2-18, A.2.13.2-30, A.2.13.2-31, A.2.13.5-18, A.2.13.5-20, A.2.13.5-22, A.2.13.5-26, A.2.13.5-29, A.2.13.7-i, A.2.13.7-ii, A.2.13.7-1, A.2.13.7-3a, A.2.13.7-4, A.2.13.7-4a, A.2.13.7-5, A.2.13.7-6, A.2.13.7-6a, A.2.13.7-7, A.2.13.7-8, A.2.13.7-8a, A.2.13.7-9, A.2.13.7-10, A.2.13.7-11, A.2.13.7-13, A.2.13.7-14, A.2.13.7-40, A.2.13.7-43, A.2.13.7-43a, A.2.13.7-43b, A.2.13.7-43c, A.2.13.7-44, A.2.13.7-48, A.2.13.7-48a, A.2.13.7-49, A.2.13-7-49a,

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		A.2.13.7-57a, A.2.13.9-2, A.2.13.9-4, A.2.13.9-6, A.2.13.9-7, A.2.13.9-9, A.2.13.9-12, A.2.13.12-10, A.2.13.12-18, A.2.13.14-5, and A.2.13.14-7 SAR pages A.3-27, A.4-i, A.4-1, A.4-3, A.4-4, A.4-5, and A.4-6 SAR pages A.5-i, A.5-iv, A.5-1b, A.5-1c, A.5-3, A.5-3a, A.5-6, A.5-6a. A.5-6b, A.5-38a, A.5-38b, A.5-80a, A.5-80v, and A.5-80w SAR pages A.7i, A.7.ii, A.7-1a, A.7-2, A.7-3, A.7-3a, A.7-4, A.7-4a, A.7-5b, A.7-5c, A.7-6, A.7-6a, A.7-7, A.7-8, A.7-8a, A.7-9 through A.7-14, A.7-17, A.7-18, A.7-18a, A.7-18b, A.7-18c, A.7-21, A.7.7.10.i, and A.7.7.10-1 through A.7.7.10-3 SAR pages A.8-i, A.8-3, A.8-4, A.8-4a, A.8-5, A.8-15, A.8-15a, A.8-16, and A.8-17 <u>Revised drawings as follows</u>: MP197HB-71-1001, MP197HB-71-1002, MP197HB-71-1003, MP197HB-71-1004, MP197HB-71-1005, MP197HB-71-1006, MP197HB-71-1008, MP197HB-71-1009, MP197HB-71-1011, MP197HB-71-1014 and NUHRWC-71-1001 <u>New pages as follows:</u> Section cover pages for drawings listed in Section 1.4 and Appendix A.1.4.10. SAR page A.1.4.9A-3a and A.1.4.9A-5 SAR pages A.2.13.7-3a, A.2.13.7-4a, A.2.13.7-6a, A.2.13.7-8a, A.2.13.7-43a, A.2.13.7-43b, A.2.13.7-43c, A.2.13.7-48a, A.2.13.7-49a, and A.2.13.7-57a SAR pages A.4.6.1-i and A.4.6.1-1 through A.4.6.1-11 SAR pages A.5-1b, A.5-1c, A.5-3a, A.5-6a, A.5-6b, A.5-38a, A.5-38b, A.5-80u, A.5-80v, and A.5-80w SAR pages A.7-3a, A.7-4a, A.7-6a, A.7-18a, A.7-18b, and A.7-18c SAR pages A.8-4a and A.8-15a

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Rev. No.	Date	Description
		Deleted Pages as follows: A.1.4.10-7, A.1.4.10-24, A.1.4.10-42, A.1.4.10-77, A.1.4.10-113, A.1.4.10-159, A.1.4.10-194, A.1.4.10-229, A.1.4.10-244, A.1.4.10-274, and A.1.4.10-308 Deleted Drawings as follows: MP197HB-71-1007, NUHRWC-71-1002, and NUHRWC-71-1003
20	09/2019	Application for CoC Revision 10 Revised pages as follows: SAR cover page P, SAR cover page NP Revision Log, MP197 Appendix A TOC (pages ii and viii) SAR page A.1-5 SAR pages A.2-2, A2-29, A.2-32 and A.2-49 SAR page A.2.13.12-24 SAR pages A.7-2, A.7-12 and A.7-18 SAR Appendix A.1.4.10 SAR Appendix A.2.13.18 (new) Revised SAR Drawings as follows: MP197HB-71-1002, MP197HB-71-1008 and MP197HB-71-1009

Appendix A.1.4.6

Appendix A.1.4.7

Appendix A.1.4.8

Appendix A.1.4.9

Appendix A.1.4.9A

Appendix A.1.4.10

Appendix A.2.13.13

Appendix A.2.13.14

Appendix A.2.13.15

Appendix A.2.13.16

Appendix A.2.13.17

Appendix A.2.13.18

Noncontainment welds are inspected in accordance with the NDE acceptance criteria of ASME B&PV Code Subsection NF [8].

The structural analysis of the NUHOMS®-MP197HB cask body is presented in Chapter A.2.

A.1.2.1.2 Tiedown and Lifting Devices

There are four trunnion sockets on the cask; two front trunnion sockets, and two rear trunnion sockets. They accommodate removable trunnions for handling, lifting, and rotating the cask. These trunnion sockets are attached to the structural shell. Two types of trunnions are provided for the NUHOMS®-MP197HB transport package lifting. One type of trunnion has a double shoulder (non-single failure proof). The other type of trunnion has a single shoulder (single failure proof). The front (lifting) set of trunnions could be either type, depending on site and transfer operation requirements. The rear set of trunnions may also be of either type. The trunnions are fabricated and tested in accordance with ANSI N14.6 [7]. During transport, four trunnion plugs, containing neutron shielding material, are bolted to the four trunnion sockets.

When the cask is in the horizontal position, a shear key receptacle on the bottom of the cask reacts the longitudinal tiedown loads. The shear key receptacle is welded to the structural shell and protrudes through the neutron shield. During transport the receptacle interfaces with the shear block attached to the transport skid.

A.1.2.1.3 Impact Limiters

The front and rear impact limiters, shown in Drawings MP197HB-71-1001, -1002, -1003, -1008, and -1009, absorb energy during impact events by crushing balsa and redwood. The two impact limiters are identical. Each has an outside diameter of 126 inches and a height of 58 inches. The inner and outer shells are Type 304 stainless steel joined by radial gussets of the same material. The gussets limit the stresses in the 0.25 in. thick stainless steel outer cylinder and end plates due to pressure differentials caused by elevation and temperature changes during normal transport. The metal structure locates, supports, confines, and protects the wood energy absorption material.

Each impact limiter is attached to the NUHOMS®-MP197HB cask by twelve (12) attachment bolts. The attachment bolts are designed to keep the impact limiters attached to the cask body during all normal conditions of transport and hypothetical accident conditions.

Each impact limiter is provided with seven fusible plugs that are designed to melt during a fire accident, thereby relieving excessive internal pressure. Each impact limiter has three hoist rings for handling, and two support angles for supporting the impact limiter in a vertical position during storage. The hoist rings are threaded into the impact limiter shell, while the support angles are welded to the shell. Prior to transport, the impact limiter hoist rings are removed and replaced with bolts.

An aluminum thermal shield is added to each impact limiter to reduce the impact limiter wood temperature. *Due to the low maximum allowable heat load for the secondary containers, i.e. 5 kW compared to 32 kW for DSCs, secondary containers such as the RWC can be transported using the thermal shield designed for DSCs or the RWC specific thermal shield.* The details of the thermal shield *including the RWC-only option thermal shield* are included in Drawing MP197HB-71-1002, -1003 and -1009.

Appendix A.1.4.10
Drawings of Transport Packaging and DSCs

TABLE OF CONTENTS

A.1.4.10.1 NUHOMS®-MP197HB Drawings

The following drawings for the NUHOMS®-MP197HB Cask are included in Section A.1.4.10.1.

Drawing Number	Title
MP197HB-71-1001 Rev 5	NUHOMS®-MP197HB Packaging Transport Configuration (2 sheets)
MP197HB-71-1002 Rev *9*	NUHOMS®-MP197HB Packaging Parts List (2 sheets)
MP197HB-71-1003 Rev 3	NUHOMS®-MP197HB Packaging General Arrangement (1 sheet)
MP197HB-71-1004 Rev 7	NUHOMS®-MP197HB Packaging Cask Body Assembly (1 sheet)
MP197HB-71-1005 Rev 9	NUHOMS®-MP197HB Packaging Cask Body Details (3 sheets)
MP197HB-71-1006 Rev 5	NUHOMS®-MP197HB Packaging Lid Assembly and Details (1 sheet)
MP197HB-71-1008 Rev *5*	NUHOMS®-MP197HB Packaging Impact Limiter Assembly (1 sheet)
MP197HB-71-1009 Rev *5*	NUHOMS®-MP197HB Packaging Impact Limiter Details (1 sheet)
MP197HB-71-1011 Rev 1	NUHOMS®-MP197HB Packaging Transport Configuration Outer Sleeve With Fins Option (1 sheet)
MP197HB-71-1014 Rev 3	NUHOMS®-MP197HB Packaging Internal Sleeve Design (1 sheet)

A.1.4.10.2 NUHOMS® 24PT4 DSC Drawings

The following drawings for the NUHOMS® 24PT4 DSC are included in Section A.1.4.10.2.

Drawing Number	Title
NUH24PT4-71-1001 Rev 0	NUHOMS® 24PT4 Transportable Canister For PWR Fuel Basket Assembly (5 sheets)
NUH24PT4-71-1002 Rev 0	NUHOMS® 24PT4 Transportable Canister For PWR Fuel Main Assembly (8 sheets)
NUH24PT4-71-1003 Rev 0	NUHOMS® 24PT4 Transportable Canister For PWR Fuel Failed Fuel Can (4 sheets)

A.1.4.10.3 NUHOMS® 32PT DSC Drawings

The following drawings for the NUHOMS® 32PT DSC are included in Section A.1.4.10.3.

Drawing Number	Title
NUH32PT-71-1000 Rev 0	NUHOMS® 32PT Transportable Canister For PWR Fuel Summary Dimensions (1 sheet)
NUH32PT-71-1001 Rev 1	NUHOMS® 32PT Transportable Canister For PWR Fuel Main Assembly (5 sheets)
NUH32PT-71-1002 Rev 1	NUHOMS® 32PT Transportable Canister For PWR Fuel Shell Assembly (3 sheets)
NUH32PT-71-1003 Rev 1	NUHOMS® 32PT Transportable Canister For PWR Fuel "A" Basket Assembly (16 Poison/16 Compartment Plates) (8 sheets)
NUH32PT-71-1004 Rev 1	NUHOMS® 32PT Transportable Canister For PWR Fuel Aluminum Transition Rail – R90 (2 sheets)
NUH32PT-71-1005 Rev 1	NUHOMS® 32PT Transportable Canister For PWR Fuel Aluminum Transition Rail – R45 (1 sheet)
NUH32PT-71-1006 Rev 1	NUHOMS® 32PT Transportable Canister For PWR Fuel "A/B/C/D" Basket Assembly (20 Poison/12 Compartment Plates) (6 sheets)
NUH32PT-71-1007 Rev 1	NUHOMS® 32PT Transportable Canister For PWR Fuel "A/B/C/D" Basket Assembly (24 Poison/8 Compartment Plates) (8 sheets)

A.1.4.10.4 NUHOMS® 24PTH DSC Drawings

The following drawings for the NUHOMS® 24PTH DSC are included in Section A.1.4.10.4.

Drawing Number	Title
NUH24PTH-71-1000 Rev 1	NUHOMS® 24PTH Transportable Canister For PWR Fuel Main Assembly (5 sheets)
NUH24PTH-71-1001 Rev 1	NUHOMS® 24PTH Transportable Canister For PWR Fuel Basket-Shell Assembly (4 sheets)
NUH24PTH-71-1002 Rev 1	NUHOMS® 24PTH Transportable Canister For PWR Fuel Shell Assembly (4 sheets)
NUH24PTH-71-1003 Rev 2	NUHOMS® 24PTH Transportable Canister For PWR Fuel Basket Assembly (8 sheets)
NUH24PTH-71-1004 Rev 1	NUHOMS® 24PTH Transportable Canister For PWR Fuel Transition Rails (4 sheets)
NUH24PTH-71-1008 Rev 1	NUHOMS® 24PTHF Transportable Canister For PWR Fuel Failed Fuel Can (2 sheets)
NUH24PTH-71-1009 Rev 1	NUHOMS® 24PTHF Transportable Canister For PWR Fuel Basket Assembly (8 sheets)

A.1.4.10.5 NUHOMS® 32PTH DSC Drawings

The following drawings for the NUHOMS® 32PTH DSC and the 32PTH Type 1 DSC are included in Section A.1.4.10.5.

Drawing Number	Title
NUH32PTH-71-1001 Rev 2	NUHOMS®32PTH Transportable Canister for PWR Fuel Parts List (1 Sheet)
NUH32PTH-71-1002 Rev 1	NUHOMS®32PTH Transportable Canister for PWR Fuel Main Assembly (1 Sheet)
NUH32PTH-71-1003 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Siphon Pipe Details (1 Sheet)
NUH32PTH-71-1004 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Inner Top Cover Details (2 sheets)
NUH32PTH-71-1005 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Outer Top Cover Details (1 Sheet)
NUH32PTH-71-1006 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Shell Assembly (1 Sheet)
NUH32PTH-71-1007 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Shell Bottom Details (1 Sheet)
NUH32PTH-71-1008 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Grapple Ring Details (1 Sheet)
NUH32PTH-71-1009 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Basket Assembly (1 Sheet)
NUH32PTH-71-1010 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Basket Assembly Details (1 Sheet)
NUH32PTH-71-1011 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Basket Assembly Details (1 Sheet)
NUH32PTH-71-1012 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Basket Assembly – Details (1 Sheet)
NUH32PTH-71-1013 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Basket Rail A180 (1 Sheet)
NUH32PTH-71-1014 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Basket Rail A90 (1 Sheet)
NUH32PTH-71-1015 Rev 0	NUHOMS®32PTH Transportable Canister for PWR Fuel Damaged Fuel End Caps (1 Sheet)
NUH32PTH Type 1-71-1000 Rev 1	NUHOMS® 32PTH Type 1 Transportable Canister For PWR Fuel Main Assembly (4 sheets)
NUH32PTH Type 1-71-1001 Rev 2	NUHOMS® 32PTH Type 1 Transportable Canister For PWR Fuel Basket Shell Assembly (4 sheets)

NUH32PTH Type 1-71-1002 Rev 1	NUHOMS® 32PTH Type 1 Transportable Canister For PWR Fuel Shell Assembly (4 sheets)
NUH32PTH Type 1-71-1003 Rev 2	NUHOMS® 32PTH Type 1 Transportable Canister For PWR Fuel Basket Assembly (7 sheets)
NUH32PTH Type 1-71-1004 Rev 2	NUHOMS® 32PTH Type 1 Transportable Canister For PWR Fuel Transition Rails (4 sheets)
NUH32PTH Type 1-71-1010 Rev 1	NUHOMS® 32PTH Type 1 Transportable Canister For PWR Fuel Alternate Top Closure (6 sheets)

A.1.4.10.6 NUHOMS® 32PTH1 DSC Drawings

The following drawings for the NUHOMS® 32PTH1 DSC are included in Section A.1.4.10.6.

Drawing Number	Title
NUH32PTH1-71-1000 Rev 1	NUHOMS® 32PTH1 Transportable Canister For PWR Fuel Main Assembly (4 sheets)
NUH32PTH1-71-1001 Rev 1	NUHOMS® 32PTH1 Transportable Canister For PWR Fuel Basket Shell Assembly (5 sheets)
NUH32PTH1-71-1002 Rev 1	NUHOMS® 32PTH1 Transportable Canister For PWR Fuel Shell Assembly (4 sheets)
NUH32PTH1-71-1003 Rev 2	NUHOMS® 32PTH1 Transportable Canister For PWR Fuel Basket Assembly (8 sheets)
NUH32PTH1-71-1004 Rev 1	NUHOMS® 32PTH1 Transportable Canister For PWR Fuel Transition Rails (7 sheets)
NUH32PTH1-71-1010 Rev 1	NUHOMS® 32PTH1 Transportable Canister For PWR Fuel Alternate Top Closure (6 sheets)

A.1.4.10.7 NUHOMS® 37PTH DSC Drawings

The following drawings for the NUHOMS® 37PTH DSC are included in Section A.1.4.10.7.

Drawing Number	Title
NUH37PTH-71-1001 Rev 2	NUHOMS® 37PTH Transportable Canister For PWR Fuel Main Assembly (4 sheets)
NUH37PTH-71-1002 Rev 3	NUHOMS® 37PTH Transportable Canister For PWR Fuel Basket Shell Assembly (5 sheets)
NUH37PTH-71-1003 Rev 3	NUHOMS® 37PTH Transportable Canister For PWR Fuel Shell Assembly (4 sheets)
NUH37PTH-71-1004 Rev 3	NUHOMS® 37PTH Transportable Canister For PWR Fuel Alternate Top Closure (6 sheets)
NUH37PTH-71-1011 Rev 2	NUHOMS® 37PTH Transportable Canister For PWR Fuel Basket Assembly (7 sheets)

Drawing Number	Title
NUH37PTH-71-1012 Rev 1	NUHOMS® 37PTH Transportable Canister For PWR Fuel Transition Rails (7 sheets)
NUH37PTH-71-1015 Rev 0	NUHOMS® 37PTH Transportable Canister For PWR Fuel Damaged Fuel End Caps (1 sheet)

A.1.4.10.8 NUHOMS® 61BT DSC Drawings

The following drawings for the NUHOMS® 61BT DSC are included in Section A.1.4.10.8.

Drawing Number	Title
NUH61BT-71-1000 Rev 1	NUHOMS® 61BT Transportable Canister For BWR Fuel Parts List (1 sheet)
NUH61BT-71-1001 Rev 1	NUHOMS® 61BT Transportable Canister For BWR Fuel Basket Assembly (1 sheet)
NUH61BT-71-1002 Rev 0	NUHOMS® 61BT Transportable Canister For BWR Fuel Basket Details (1 sheet)
NUH61BT-71-1003 Rev 0	NUHOMS® 61BT Transportable Canister For BWR Fuel General Assembly (1 sheet)
NUH61BT-71-1004 Rev 0	NUHOMS® 61BT Transportable Canister For BWR Fuel General Assembly (1 sheet)
NUH61BT-71-1005 Rev 0	NUHOMS® 61BT Transportable Canister For BWR Fuel Shell Assembly (1 sheet)
NUH61BT-71-1006 Rev 0	NUHOMS® 61BT Transportable Canister For BWR Fuel Shell Assembly (1 sheet)
NUH61BT-71-1007 Rev 0	NUHOMS® 61BT Transportable Canister For BWR Fuel Canister Details (1 sheet)
NUH61BT-71-1008 Rev 0	NUHOMS® 61BT Transportable Canister For BWR Fuel Canister Details (1 sheet)
NUH61BT-71-1009 Rev 0	NUHOMS® 61BT Transportable Canister For BWR Fuel Basket Details (1 sheet)
NUH61BT-71-1010 Rev 1	NUHOMS® 61BT Transportable Canister For BWR Fuel Additional Basket Details – Damaged Fuel (4 sheets)

A.1.4.10.9 NUHOMS® 61BTH DSC Drawings

The following drawings for the NUHOMS® 61BTH DSC are included in Section A.1.4.10.9.

Drawing Number	Title
NUH61BTH-71-1000 Rev 1	NUHOMS® 61BTH Type 1 Transportable Canister For BWR Fuel Main Assembly (5 sheets)
NUH61BTH-71-1100 Rev 2	NUHOMS® 61BTH Type 2 Transportable Canister For BWR Fuel Main Assembly (7 sheets)
NUH61BTH-71-1101 Rev 1	NUHOMS® 61BTH Type 2 Transportable Canister For BWR Fuel Shell Assembly (2 sheets)

NUH61BTH-71-1102 Rev 2	NUHOMS® 61BTH Type 2 Transportable Canister For BWR Fuel Basket Assembly (8 sheets)
NUH61BTH-71-1103 Rev 1	NUHOMS® 61BTH Type 2 Transportable Canister For BWR Fuel Transition Rails (2 sheets)
NUH61BTH-71-1104 Rev 1	NUHOMS® 61BTH Type 2 Transportable Canister For BWR Fuel Damaged Fuel End Caps (1 sheet)
NUH61BTH-71-1105 Rev 1	NUHOMS® 61BTHF Type 2 Transportable Canister For BWR Fuel Failed Fuel Can (2 sheets)
NUH61BTH-71-1106 Rev 2	NUHOMS® 61BTH Type 2 Transportable Canister For BWR Fuel Top Grid Assembly Alternate 3 (2 sheets)

A.1.4.10.10 NUHOMS® 69BTH DSC Drawings

The following drawings for the NUHOMS® 69BTH DSC are included in Section A.1.4.10.10.

Drawing Number	Title
NUH69BTH-71-1001 Rev 3	NUHOMS® 69BTH Transportable Canister For BWR Fuel Main Assembly (4 sheets)
NUH69BTH-71-1002 Rev 3	NUHOMS® 69BTH Transportable Canister For BWR Fuel Basket – Shell Assembly (4 sheets)
NUH69BTH-71-1003 Rev 3	NUHOMS® 69BTH Transportable Canister For BWR Fuel Shell Assembly (4 sheets)
NUH69BTH-71-1004 Rev 6	NUHOMS® 69BTH Transportable Canister For BWR Fuel Alternate Top Closure (7 sheets)
NUH69BTH-71-1011 Rev 3	NUHOMS® 69BTH Transportable Canister For BWR Fuel Basket Assembly (5 sheets)
NUH69BTH-71-1012 Rev 4	NUHOMS® 69BTH Transportable Canister For BWR Fuel Transition Rail Assembly And Details (6 sheets)
NUH69BTH-71-1013 Rev 4	NUHOMS® 69BTH Transportable Canister For BWR Fuel Holddown Ring Assembly (2 sheets)
NUH69BTH-71-1014 Rev 2	NUHOMS® 69BTH Transportable Canister For BWR Fuel Damaged Fuel Modification (1 sheet)
NUH69BTH-71-1015 Rev 2	NUHOMS® 69BTH Transportable Canister For BWR Fuel Damaged Fuel End Caps (1 sheet)

A.1.4.10.11 Radioactive Waste Canister Drawing

The following drawing for the Radioactive Waste Canister is included in Section A.1.4.10.11.

Drawing Number	Title
NUHRWC-71-1001 Rev 5	NUHOMS® System Radioactive Waste Canister (2 sheets)

Proprietary and Security Related Information for Drawing MP197HB-71-1002 Rev 9 Withheld Pursuant to 10 CFR 2.390

Proprietary and Security Related Information for Drawing MP197HB-71-1008 Rev 5 Withheld Pursuant to 10 CFR 2.390

Proprietary and Security Related Information for Drawing MP197HB-71-1009 Rev 5 Withheld Pursuant to 10 CFR 2.390

Appendix A.2.13.3 NUHOMS®-MP197HB Cask Lead Slump and Containment Boundary Buckling Analysis

Appendix A.2.13.4 NUHOMS®-MP197HB Structural Analysis of the Shield Shell

Appendix A.2.13.5 NUHOMS®-MP197HB Cask Lifting and Tie-Down Devices Structural Evaluation

Appendix A.2.13.6 NUHOMS®-MP197HB Cask Containment Boundary Fatigue Evaluation

Appendix A.2.13.7 NUHOMS®-MP197HB DSC (Shell Assembly) Structural Evaluation

Appendix A.2.13.8 NUHOMS®-MP197HB DSC (Basket) Structural Evaluation

Appendix A.2.13.9 NUHOMS®-MP197HB Dynamic Load Factor Determination

Appendix A.2.13.10 NUHOMS®-MP197HB Transport Package Thermal Expansion Evaluation

Appendix A.2.13.11 NUHOMS®-MP197HB Evaluation of Fuel Assembly

Appendix A.2.13.12 MP197HB *Transport* Package Impact *Limiter* Analysis using LS-DYNA

Appendix A.2.13.13 NUHOMS®-MP197HB ASME Code Alternatives

Appendix A.2.13.14 MP197HB Lid Closure Evaluation Due to Delayed Impact

Appendix A.2.13.15 NUHOMS®-MP197HB DSC Shell Buckling Analysis under Deep Water Immersion and Fatigue Evaluation during Storage

Appendix A.2.13.16 NUHOMS® -MP197HB Package Impact Sensitivity Analyses

Appendix A.2.13.17 NUHOMS® -MP197HB Cask Puncture Evaluation Using LS-DYNA

Appendix A.2.13.18 NUHOMS®-MP197HB Package Impact Limiter Bolt Tunnel Sensitivity Analyses

A.2.1.1.1 Transportation Package (Cask)

Drawing MP197HB-71-1001 shows the overall transport configuration of the NUHOMS®-MP197HB packaging. Drawings MP197HB-71-1002 and 1003 show the parts list and the general arrangement, respectively, of the NUHOMS®-MP197HB packaging. Drawing MP197HB-71-1004 shows the cask body assembly. Drawings MP197HB-71-1005 and -1006 show the cask body and lid assembly and details. Drawing MP197HB-71-1007 presents the regulatory plate. Drawings MP197HB-71-1008 and -1009 provide the assembly and details of the impact limiter. The external fin and internal sleeve are shown on drawings MP197HB-71-1011 and -1014. ASME Code compliance and alternatives are provided in Section A.2.1.4 and Appendix A.2.13.13.

The shell or cask body cylinder assembly is an open ended (at the top) cylindrical unit with an integral closed bottom end. This assembly consists of concentric inner and outer shells, both SA-203 Gr E, welded to a massive closure flange (SA-350 LF3) at the lid end and a flat steel plate (SA-350 LF3) at the bottom end. The closure lid material is SA-350 LF3 or SA-203 Gr E. The

A.2.7 Hypothetical Accident Conditions

Overview

This section describes the response of the NUHOMS®-MP197HB package to the hypothetical accident condition loads specified by 10CFR71.73. The design criteria established for the NUHOMS®-MP197HB packaging for the HAC are described in Section A.2.1.2. These criteria are selected to ensure that the packaging performance standards specified by 10CFR71.51 are satisfied.

The presentation of the HAC analyses and results is accomplished in the same manner as that used for the NCT analysis. Table A.2-9 provides an overview of the performance evaluations presented in this section. The detailed analyses of the various packaging components under different loading conditions are presented in the Appendices to this Chapter. The limiting results for the specified HAC load are taken from the Appendices and summarized here along with comparisons with the established design criteria. In all cases, the acceptability of the NUHOMS®-MP197HB packaging design with respect to HAC loads is demonstrated.

An analytical evaluation of the impact limiters is presented in Appendix A.2.13.12*, supplemented by Appendix A.2.13.18*. The analytical results are used to determine the baseline g loads used in the cask, canister and basket structural evaluations.

Reporting Method for Containment Vessel Stresses

Appendix A.2.13.1 provides the detailed description of the structural analyses of the NUHOMS®-MP197HB cask body. Table A.2-9 provides a matrix of the loads that were analyzed to determine the cask body stresses for the hypothetical accident conditions. The combined load cases for the accident conditions of transport were performed in load cases 27 - 42, as shown in Table A.2-9. The stress results are presented in Table A.2.13.1-32 to A.2.13.1-47 of Appendix A.2.13.1. Refer to Section A.2.13.1.10 of Appendix A.2.13.1 for the method of obtaining the stress results from the ANSYS runs.

A.2.7.1 Free Drop

The response of the NUHOMS®-MP197HB Packaging is evaluated for a free drop from a height of 30 feet onto an unyielding surface at various orientations. The inertial loading applied to the NUHOMS®-MP197HB components is determined in the dynamic analysis presented in Appendix A.2.13.12.

The stresses in the cask body are reported for the following drop orientations:

- End drop onto bottom end
- End drop onto lid end
- Side drop
- C. G. over corner drop on bottom end
- C. G. over corner drop on lid end
- 10° slap down impact on lid end
- 10° slap down impact on bottom end

shown to meet the ASME Code allowable stress limits for plastic analysis, as shown in Table A.2.13.1-45.

A.2.7.1.6 Lid and Ram Access Cover Plate Bolts

The lid bolts are analyzed for the following loadings: operating pre-load, gasket seating load, internal pressure, temperature changes, impact loads, and puncture loads. The analysis is based on NUREG/CR 6007 [16].

The lid bolt preload is calculated to withstand the worst case load combination and to maintain a clamping (compressive) force on the closure joint. Based upon the load combination results (see Appendix A.2.13.2, Section A.2.13.2.9) it is shown that a positive (compressive) load is maintained on the clamped joint for all load combinations except for the accident condition impact plus pressure load. A more detailed finite element analysis is performed in Section A.2.13.2 7 of Appendix A.2.13.2. It is concluded that there is no decompression of the seal during the accident condition impact plus pressure loading condition. Since the seal exists all along the circumference of the cask lid seal, the internal contents will not leak during the worst case loading condition.

A summary of the calculated stresses is listed in the Table A.2.13.2-7 of Appendix A.2.13.2. The lid bolt evaluation due to delayed impact is presented in Appendix A.2.13.14.

The ram access cover plate bolts are also evaluated (Section A.2.13.2.9) using the same methodology as described above. The results show the bolt loads are bounded by the preload and that the bolt stresses remain below allowables.

A.2.7.1.7 Impact Limiter Attachments

The impact limiters must remain attached to the cask body before, during, and after each HAC drop. The limiting loading condition for the impact limiter attachments is the secondary impact (slap-down) associated with the 10° slap down 30 foot drop. This loading condition applies the greatest separating moment between the impact limiter and cask body interface. Although this loading condition is not limiting with respect to any other cask component, an evaluation of the attachments is performed to demonstrate that the effected impact limiter remains in place to insulate the cask during the subsequent hypothetical thermal accident.

The analysis and results are provided in detail in Section A.2.13.12.11 of Appendix A.2.13.12*, supplemented by Appendix A.2.13.18*.

The analysis concludes that the impact limiter attachment design is sufficiently strong to ensure that the impact limiters remain attached to the cask body during and following all HAC loads.

A.2.7.1.8 Cask Lead Slump and Containment Buckling Analyses

In the event of a drop of the NUHOMS®-MP197HB package, permanent deformation of the lead gamma shield may result for certain impact orientations. An analysis is performed to evaluate the inner cylindrical shell stability and lead slump when subject to the end drop impact loads.

A.2.13 Appendices

The detailed structural analyses of the NUHOMS®-MP197HB packaging are included in the following appendices:

Appendix A.2.13.1 NUHOMS®-MP197HB Cask Body Structural Evaluation

Appendix A.2.13.2 NUHOMS®-MP197HB Cask Lid Bolt/Ram Access Closure Plate Bolt Analyses

Appendix A.2.13.3 NUHOMS®-MP197HB Cask Lead Slump and Containment Boundary Buckling Analysis

Appendix A.2.13.4 NUHOMS®-MP197HB Structural Analysis of the Shield Shell

Appendix A.2.13.5 NUHOMS®-MP197HB Cask Lifting and Tie-Down Devices Structural Evaluation

Appendix A.2.13.6 NUHOMS®-MP197HB Cask Containment Boundary Fatigue Evaluation

Appendix A.2.13.7 NUHOMS®-MP197HB DSC (Shell Assembly) Structural Evaluation

Appendix A.2.13.8 NUHOMS®-MP197HB DSC (Basket) Structural Evaluation

Appendix A.2.13.9 NUHOMS®-MP197HB Dynamic Load Factor Determination

Appendix A.2.13.10 NUHOMS®-MP197HB Transport Package Thermal Expansion Evaluation

Appendix A.2.13.11 NUHOMS®-MP197HB Evaluation of Fuel Assembly

Appendix A.2.13.12 MP197HB *Transport* Package Impact *Limiter* Analysis using LS-DYNA

Appendix A.2.13.13 NUHOMS®-MP197HB ASME Code Alternatives

Appendix A.2.13.14 MP197HB Lid Closure Evaluation Due to Delayed Impact

Appendix A.2.13.15 NUHOMS®-MP197HB DSC Shell Buckling Analysis under Deep Water Immersion and Fatigue Evaluation during Storage

Appendix A.2.13.16 NUHOMS® -MP197HB Package Impact Sensitivity Analyses

Appendix A.2.13.17 NUHOMS® -MP197HB Cask Puncture Evaluation Using LS-DYNA

Appendix A.2.13.18 NUHOMS®-MP197HB Package Impact Limiter Bolt Tunnel Sensitivity Analyses

The *minimum* threaded length is *2.0* in, which *ensures an engagement length* greater than 1.86 in *since the bolt length is sized to ensure the bolt threads are completely engaged with the thread insert in the attachment block.*

A.2.13.12.11.3 Bolt Torque

A bolt tensile stress σ_t of 15,000 psi is assumed.

$$F_a = \sigma_t \times A_t = 15{,}000 \times 1.405 = 21{,}075 \text{ lb}$$

Where A_t is the bolt tensile stress area.

$$Q = K \times D_b \times F_a = 0.135 \times 1.50 \times 21{,}075 = 4{,}268 \text{ in.lb} = 356 \text{ ft.lb}$$

Where F_a is the bolt force, Q is the applied torque, K is the nut factor, and D_b the nominal bolt diameter at the threads.

A bolt torque of 350 to 375 ft.lb is specified.

For a bolt torque of 350 ft.lb:

$$F_a = \frac{Q}{K \times D_b} = \frac{350 \times 12}{0.135 \times 1.50} = 20{,}741 \text{ lb}$$

For a bolt torque of 375 ft.lb:

$$F_a = \frac{Q}{K \times D_b} = \frac{375 \times 12}{0.135 \times 1.50} = 22{,}222 \text{ lb}$$

Therefore, the maximum tensile stress in the bolt is:

$$\sigma = \frac{22{,}222}{1.405} = 15.8 \text{ ksi}$$

This is less than the yield stress of the bolts, 144 ksi.

A.2.13.12.11.4 Conclusions

The stresses are summarized in Table A.2.13.12-10. All of the stresses calculated for the impact limiter bolts, attachment bolt blocks, and lifting lugs are less than the allowable stresses regardless of the method used. *Additional confirmatory analysis is performed using a detailed LS-DYNA model of the attachment bolts and the bolt tunnels is provided in Appendix A.2.13.16 and A.2.13.18.* Therefore, the NUHOMS® – MP197HB impact limiter attachments are structurally adequate.

The required engagement length is 1.86 in, which is less than the threaded length of *2.0* in.

Appendix A.2.13.18
NUHOMS®-MP197HB Package Impact Limiter Bolt Tunnel Sensitivity Analyses

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Appendix A.2.13.18
NUHOMS®-MP197HB Package Impact Bolt Tunnel Sensitivity Analyses

Sensitivity studies are performed to address the impact of the increased ID of the inner bolt tunnel (SAR Drawing MP197HB-71-1002, Part #23V) on the impact limiter attachment bolts. The following analyses are performed:

Sensitivity Analysis #1

Impact Limiter Bounding Case: The impact limiter attachment bolts are evaluated in Appendix A.2.13.12.11. The worst loading occurs during the second impact of a shallow angle slap–down drop. This case is reevaluated increasing the ID of the inner bolt tunnel. The bolt forces are compared to the original analysis.

Sensitivity Analysis #2

Detailed Bolt Model Analysis: The impact limiter bolts sensitivity analysis using detailed bolt model is performed in Appendix A.2.13.16. The bolt stress results are compared to the original analysis. This case is reevaluated increasing the ID of the inner bolt tunnel. The bolt combined stress ratios are compared to the original analysis.

A.2.13.18.1 LS-DYNA Model Description (for Sensitivity Analyses)

The LS-DYNA models which were originally developed for use in the delayed impact of a shallow angle slap–down drop were modified for the two Sensitivity Analyses described above. The details about the LS-DYNA models are presented in Appendix A.2.13.12 and A.2.13.16. The modifications to the LS-DYNA models are noted below.

Based on Note 4 in Drawing MP197HB-71-1009, the inner diameter Ø1.75" of item 23V may be enlarged up to Ø2.00" over a length of up to 8" on the cask side. However, in Sensitivity Analysis # 1 and 2, conservatively, the entire length of the Inner Bolt Tunnel diameter is enlarged. In addition, Appendix A.2.13.16 model evaluated a smaller bolt shank diameter of 1.125″ which is also updated to match the actual bolt shank diameter of 1.293″ for Sensitivity Analysis # 2.

Appendix A.2.13.18 is newly added as a result of CoC Revision 10.

A.2.13.18.2 Analysis Results

A.2.13.18.2.1 Sensitivity Analysis #1 - Impact Limiter Bounding Case

The sensitivity analysis bolt forces at various positions around the impact limiter are plotted for the bounding Slap Down 10º case in Figure A.2.13.18-1. For the original analysis the bolt forces are plotted in Figure A.2.13.12-51. The results show that there is no significant adverse effect on the bolt tensile forces as a result of increase in the bolt tunnel ID. The maximum tensile force for the bolt was considered to be 210,000 lb in the bolt stress evaluation in A.2.13.12.11.1, which remains bounding.

A.2.13.18.2.2 Sensitivity Analysis #2 - Detailed Bolt Model Analysis

The combined bolt stress results for the detailed bolt model sensitivity analysis are shown in Table A.2.13.18-1. The bolt stress results indicate that all of the attachment bolts on the bottom limiter (first impact) and 8 attachment bolts on the top limiter (second impact) remain below allowable stress values. The combined ratio results conservatively use the peak axial and shear forces throughout the length of each bolt, even though they may occur at different points in time and at different locations along the bolt. This ensures that the impact limiters will remain attached to the cask body during the worst-case 30-foot drop accident condition.

The results show that there is no significant adverse effect on the impact limiter bolts as a result of increase in the bolt tunnel ID.

Table A.2.13.18-1
Summary of Bolt Stresses and Combined Loading Stress Ratios for the Detailed Bolt Model Sensitivity Study

Bolt		Axial Stress (psi)	Axial Allowable (psi)	Axial Ratio	Shear Stress (psi)	Shear Allowable (psi)	Shear Ratio	Combined Ratio	Strain		
									Min	Ave	Max
Bottom	0º	47,770	140,700	0.34	57,100	84,420	0.68	0.76	0.00	0.02	0.05
	30º	40,200	140,700	0.29	57,500	84,420	0.68	0.74	0.00	0.00	0.02
	60º	53,300	140,700	0.38	70,500	84,420	0.84	0.92	0.00	0.00	0.00
	90º	49,000	140,700	0.35	63,400	84,420	0.75	0.83	0.00	0.00	0.00
	120º	46,800	140,700	0.33	29,400	84,420	0.35	0.48	0.00	0.00	0.00
	150º	34,100	140,700	0.24	43,900	84,420	0.52	0.57	0.00	0.00	0.01
	180º	29,000	140,700	0.21	69,300	84,420	0.82	0.85	0.00	0.01	0.02
Top	0º	118,000	140,700	0.84	31,400	84,420	0.37	0.92	0.00	0.03	0.07
	30º	116,000	140,700	0.82	57,800	84,420	0.68	1.07	0.01	0.02	0.06
	60º	137,000	140,700	0.97	60,000	84,420	0.71	1.21	0.06	0.10	0.15
	90º	70,700	140,700	0.50	71,800	84,420	0.85	0.99	0.01	0.01	0.02
	120º	28,000	140,700	0.20	44,900	84,420	0.53	0.57	0.00	0.00	0.00
	150º	13,600	140,700	0.10	48,200	84,420	0.57	0.58	0.00	0.02	0.07
	180º	13,100	140,700	0.09	60,500	84,420	0.72	0.72	0.00	0.02	0.05

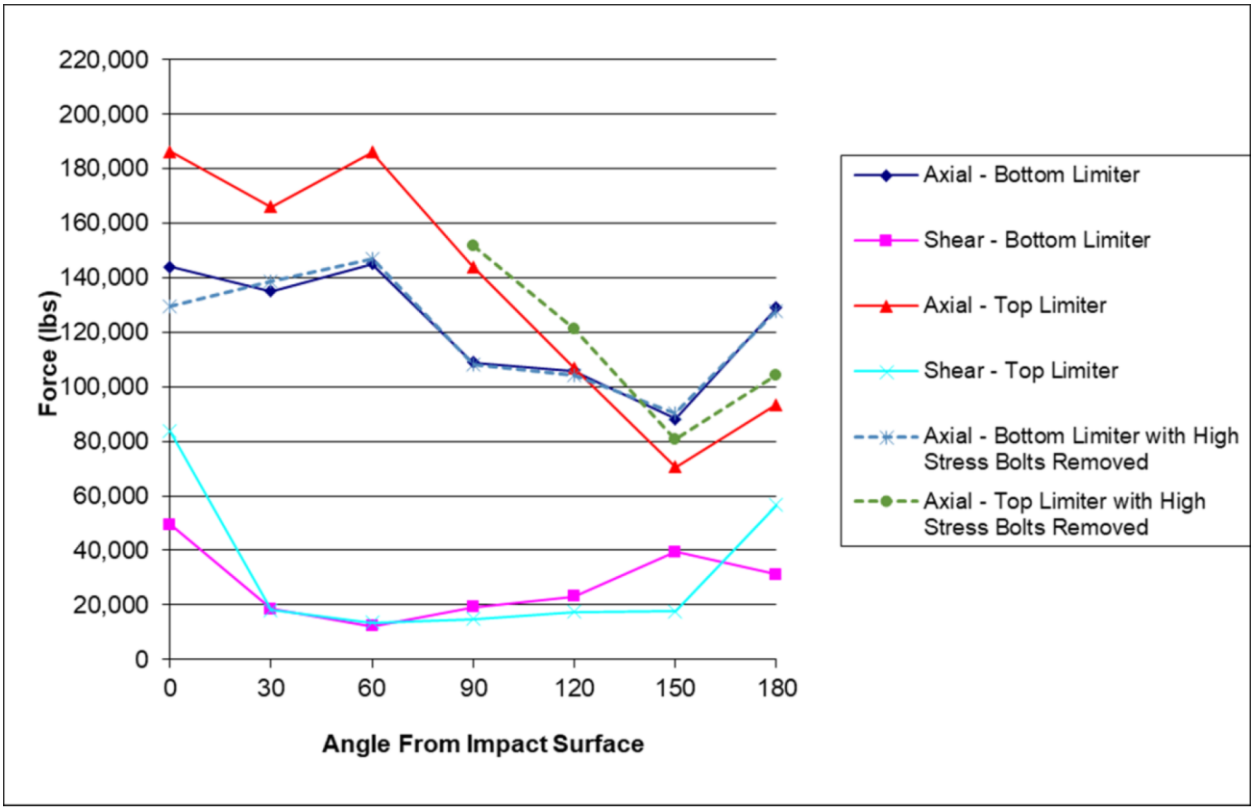

Figure A.2.13.18-1
Bolt Forces Around Top and Bottom Impact Limiters for 10º Slap Down Drop

Appendix A.2.13.18 is newly added as a result of CoC Revision 10.

1. Remove the impact limiters from the cask.
2. NOT USED.
3. Remove the transportation skid personnel barrier and tie down assembly.
4. Take contamination smears on the outside surfaces of the cask. If necessary, decontaminate the cask.
5. Elastomer O-ring seals may be reused. Metallic seals shall be discarded after each use.
6. Install the front and rear trunnions, if required, and torque the bolts as specified in Drawing MP197HB-71-1002, Chapter A.1, Appendix A.1.4.10.1 following the torquing sequence shown in Figure A.7-1.
7. Lift the cask and place it on the onsite transfer trailer or upending frame, or lift the cask/transport skid and place them in the appropriate location.
8. NOT USED.
9. *If transporting a DSC, verify that each impact limiter has been configured with the appropriate Thermal Shield. The RWC-Only option shall not be used with DSC shipments.*
10. If transporting any of the smaller diameter DSC models (NUHOMS®-24PT4, 32PT, 24PTH, 61BT, or 61BTH) or an RWC, verify that the MP197HB cask has been fitted with an internal sleeve. This step, if required, can be performed at any time prior to placing the DSC or RWC in the cask.
11. If transporting a NUHOMS®-69BTH DSC with heat load greater than 26 kW, verify that the removable external aluminum fins are available to be fitted to the cask after the cask is closed (Refer to Drawing MP197HB-71-1011 provided in Appendix A.1.4.10.1). Note that fins are not required to meet the 10 CFR 71 requirements and are optional.
12. For a specific DSC model to be loaded inside the MP197HB cask, verify the canister/basket type (A, B, C, D, E, or F as applicable) is appropriate for the fuel to be transported.
13. The candidate intact, damaged and failed fuel assemblies to be transported in a specific DSC model must be evaluated (by plant records or other means) to verify that they meet the criteria of the applicable fuel specification as listed in Table A.7-2a.
14. For the transportation of fuel within the NUHOMS®-32PT, 24PTH, 32PTH, 32PTH1, or 37PTH DSCs where burnup credit is employed for criticality safety, additional administrative controls to prevent misloading are also outlined in the applicable appendices of this chapter.

A.7.1.2 NUHOMS®-MP197HB Cask Wet Loading

NOTE: The wet loading procedure described in this section is applicable only when using the MP197HB cask for loading fuel from a spent fuel pool into any one of the DSCs listed in Chapter A.1 or for loading irradiated waste into a RWC. This section also provides steps for closure of the DSC/RWC.

Site specific conditions and requirements may require the use of different equipment and ordering of steps than those described below to accomplish the same objectives or acceptance criteria which must be met to ensure the integrity of the package.

A.7.4.2 Pre-shipment Verification Leakage Testing of the NUHOMS®-MP197HB Cask Containment Boundary

The procedure for assembly verification leakage testing of the cask containment boundary prior to shipment is given in this section. Assembly verification leakage testing shall conform to the requirements of ANSI N14.5 [1] or ISO -12807 [11]. A flow chart of the assembly verification leakage test for DSC shipments is provided in Figure A.7-2. The order in which the leakage tests of the various seals are performed may vary. If more than one leakage detector is available then more than one seal may be tested at a time. Personnel performing the leakage test shall be specifically trained in leakage testing in accordance with SNT-TC-1A [7]. The acceptance criterion for pre-shipment leakage rate testing shall be either (a) a leakage rate of not more than the reference air leakage rate, or (2) no detected leakage when tested to a sensitivity of at least 10^{-3} ref-cm^3/s.

The following steps present one method of performing the pre-shipment verification leakage testing. Alternate methods and order of testing are acceptable as long as the above criteria is satisfied for the MP197HB containment boundary seals.

1. Remove the port plugs from the lid test port, vent port, drain port, and the bottom test port.
2. Attach a suitable vacuum pump to the cask lid test port.
3. Evacuate the volume between the lid O-rings and perform the pre-shipment leak test in accordance with Section A.8.2.2. If either O-ring was replaced, the maintenance leak test in Section A.8.2.2 shall be performed.
4. After meeting the leak test criteria, disconnect the vacuum pump and either tighten the port bolt, or verify it has been tightened, in accordance with Drawing MP197HB-71-1002 in Chapter A.1.
5. Install the port plug.
6. Repeat steps 2-5 for the bottom test port.
7. Attach a suitable vacuum pump to the vent port.
8. Either tighten the port bolt, of verify it has been tightened, in accordance with Drawing MP197HB-71-1002 in Chapter A.1.
9. Evacuate the volume outside of the closed port bolt seal and perform the pre-shipment leak test in accordance with Section A.8.2.2. If the O-ring was replaced, the maintenance leak test in Section A.*8*.2.2 shall be performed.
10. After meeting the leak test criteria, disconnect the vacuum pump and install the port plug.
11. Repeat steps 7-10 for the drain port.

This concludes the assembly verification leakage test procedure.

Table A.7-2a
Applicable Fuel Specification for Various DSCs

DSC MODEL	**Applicable Fuel Specification from Chapter A.1**
NUHOMS®-24PT4	Tables A.1.4.1-1 and A.1.4.1-2
NUHOMS®-32PT	Table A.1.4.2-2
NUHOMS®-24PTH	Table A.1.4.3-2
NUHOMS®-32PTH	Table A.1.4.4-2
NUHOMS®-32PTH1	Table A.1.4.5-2
NUHOMS®-37PTH	Table A.1.4.6-2
NUHOMS®-61BT	Table A.1.4.7-2
NUHOMS®-61BTH	Table A.1.4.8-2
NUHOMS®-69BTH	Table A.1.4.9-1

Table A.7-2b
Applicable Content Specification for RWC

Type and Form of Material	The NUHOMS®-MP197HB packaging is designed for shipment of various types of irradiated and contaminated reactor hardware. The payload will vary from shipment to shipment. Typical composition of the payload consists of the following components either individually or in combinations: 1. BWR Control Rod Blades 2. BWR Local Power Range Monitors (LPRMs) 3. BWR Fuel Channels 4. BWR Poison Curtains 5. PWR Burnable Poison Rod Assemblies (BPRAs) 6. PWR and BWR Reactor Vessel and Internals
Decay Heat load	≤ 5 kW
Loading	Components with high specific activity are generally placed near the center of the RWC. For each shipment, the RWC is normally filled to capacity, which prevents shifting of the contents during transport. If the RWC is not full, appropriate component spacers or shoring is used to prevent significant movement of the contents.
Maximum Quantity of Material per Package	(a) For containment, the quantity of radioactive material is limited to a maximum of 8, 182 A2. The radioactive material is primarily in the form of neutron activated metals, or metal oxides in solid form. Surface contamination may also be present on the irradiated components. When a wet load procedure (i.e., in-pool) is followed for cask loading, the cask cavity and RWC are drained and dried to ensure that there are no free liquids in the package during transport. (b) The NUHOMS®-MP197HB packaging is designed to transport a payload of up to 56.0 tons of dry irradiated and/or contaminated non-fuel bearing solid materials in the RWC. The center of gravity (CG) of the loaded NUHOMS®-MP197HB package is to be 102 ± 4 inches from the bottom of the cask. (c) The quantity of radioactive material is limited to a maximum of 90,000 Ci of cobalt-60 or equivalent, except for MP197HB Unit 01 where the limit is reduce to 70,000 Ci of cobalt-60 or equivalent. Equivalent activity limits as a function of gamma energy for isotopes other than Co- 60 are shown in Table A.7-2c for the 90,000 Ci limit and Table A.7-2d for the 70,000 Ci limit.