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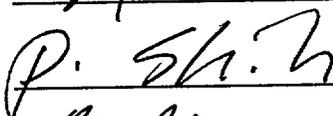
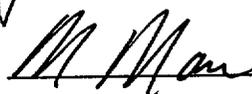
**NUHOMS<sup>®</sup>-MP197 TRANSPORT PACKAGING  
SAFETY ANALYSIS REPORT**

**Transnuclear Inc.  
Four Skyline Drive  
Hawthorne, NY 10532**



TRANSNUCLEAR, INC.

**NUHOMS®-MP197 TRANSPORT PACKAGING  
SAFETY ANALYSIS REPORT  
RECORD OF REVIEW  
Rev. 0**

<b>Thermal Analyst</b>	 _____	<b>Chapters 1, 3, 3.7.1, 3.7.2, 3.7.3, 3.7.4</b>
<b>Structural Analyst</b>	 _____	<b>Chapters 1, 2, 2.10.1, 2.10.2, 2.10.3, 2.10.4, 2.10.5, 2.10.6, 2.10.7, 2.10.8, 2.10.9, 8, 9</b>
<b>Nuclear Analyst</b>	 _____	<b>Chapters 1, 4, 5, 6, 8, 9</b>
<b>Project Engineer</b>	 _____	<b>All Chapters</b>
<b>Chief Engineer</b>	 _____	<b>All Chapters</b>

**NUHOMS®-MP197 PACKAGING  
SAFETY ANALYSIS REPORT**

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# NUHOMS®-MP197 TRANSPORT PACKAGING

## CHAPTER 1

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## CHAPTER 1

### GENERAL INFORMATION

#### 1.1 INTRODUCTION

This Safety Analysis Report (SAR) presents the evaluation of a Type B(U) spent fuel transport packaging developed by Transnuclear, Inc. and designated the NUHOMS<sup>®</sup>-MP197 packaging. This SAR describes the design features and presents the safety analyses, which demonstrate that the NUHOMS<sup>®</sup>-MP197 complies with applicable requirements of 10 CFR 71 [1]. The format and content of this SAR follow the guidelines of Regulatory Guide 7.9 [2].

The NUHOMS<sup>®</sup>-MP197 packaging consists of the NUHOMS<sup>®</sup>-MP197 Transport Cask, which is utilized for the off-site transportation of NUHOMS<sup>®</sup>-61BT Dry Shielded Canisters (DSCs) in accordance with 10CFR71 [1]. The packaging is intended to be shipped as exclusive use. The Transport Index for nuclear criticality control for the packaging is determined to be zero (0) in accordance with 10 CFR 71.59. See Chapter 6.

Transnuclear, Inc. has a NRC approved quality assurance program (Docket Number 71-0250) which satisfies the requirements of 10 CFR 71 Subpart H.

## 1.2 PACKAGE DESCRIPTION

### 1.2.1 Packaging

The NUHOMS<sup>®</sup>-MP197 packaging will be used to transport 61 intact standard Boiling Water Reactor (BWR) fuel assemblies with or without fuel channels, contained in a single NUHOMS<sup>®</sup>-61BT DSC. The NUHOMS<sup>®</sup>-MP197 packaging is designed for a maximum heat load of 15.9 kW or 260 W/assembly. The fuel that may be transported in the NUHOMS<sup>®</sup>-MP197 packaging is presented in Section 1.2.3.

The NUHOMS<sup>®</sup>-MP197 packaging consists of the following components:

- A NUHOMS<sup>®</sup>-61BT Dry Shielded Canister (DSC) consisting of a cylindrical shell, top and bottom shield plugs, inner and outer bottom closure plates, and inner and outer top cover plates. After loading, the DSC is vacuum dried and back-filled with an inert gas.
- A fuel basket assembly, located inside the DSC, which locates and supports the fuel assemblies, transfers heat to the DSC wall, and provides neutron absorption to satisfy nuclear criticality requirements. A basket hold down ring is installed on top of the basket, after fuel loading, to prevent axial motion of the basket within the canister.
- A NUHOMS<sup>®</sup>-MP197 transport cask consisting of a containment boundary, structural shell, gamma shielding material, and solid neutron shield. The containment boundary consists of a cylindrical shell, bottom end (closure) plate with a ram access penetration, top end forging ring, bottom and top cover plates (lids) with associated seals and bolts, and vent and drain port closure bolts and seals. The transport cask cavity also contains an inert gas atmosphere.
- Sets of removable upper and lower trunnions, bolted to the outer shell of the cask that provide support, lifting, and rotation capability for the NUHOMS<sup>®</sup>-MP197 cask.
- Impact limiters consisting of balsa and redwood, encased in stainless steel shells, are attached to each end of the NUHOMS<sup>®</sup>-MP197 cask during shipment. A thermal shield is provided between the bottom impact limiter and the cask to minimize heat transfer to the bottom limiter. Each impact limiter is held in place by twelve (12) attachment bolts.

A personnel barrier is mounted to the transport frame to prevent unauthorized access to the cask body. The overall dimensions of the NUHOMS<sup>®</sup>-MP197 packaging are 281.25 inches long and 122.00 inches in diameter with both impact limiters installed. The transport cask body is 208.00 inches long and 82.00 inches in diameter. The cask diameter including the radial neutron shield is 91.50 inches. The cask cavity is 197 inches long and 68.00 inches in diameter. Detailed design drawings for the NUHOMS<sup>®</sup>-MP197 packaging are provided in Appendix 1.4. The materials used to fabricate the packaging are shown in the Parts List on Drawing 1093-71-3. Where more than one material has been specified for a component, the most limiting properties are used in the analyses in the subsequent chapters of this SAR.

The maximum gross weight of the loaded package is 132.5 tons including a maximum payload of 21.5 tons. Table 1-1 summarizes the dimensions and weights of the NUHOMS<sup>®</sup>-MP197 packaging components. Trunnions, attached to the cask body, are provided for lifting and handling operations, including rotation of the packaging between the horizontal and vertical orientations. The NUHOMS<sup>®</sup>-MP197 packaging is transported in the horizontal orientation, on a specially designed shipping frame, with the lid end facing the direction of travel.

During normal operating conditions the maximum pressure within the DSC is 1.67 atm (9.8 psig). Within the cask body the maximum normal operating pressure is 1.37 atm (5.4 psig). A cask cavity and canister cavity pressure of 50 psig is conservatively used for the purposes of structural analyses. The spent fuel payload is shipped dry in a helium atmosphere. Both the transport cask cavity and the DSC cavity are filled with helium. The heat generated by the spent fuel assemblies is rejected to the surrounding air by convection and radiation. No forced cooling or cooling fins are required.

The following sections provide a physical and functional description of each major component. Detail drawings showing dimensions of significance to the safety analyses, welding and NDE information, as well as a complete materials list are provided in Appendix 1.4. Reference to these drawings is made in the following physical description sections, and in general, throughout this SAR. Fabrication of the NUHOMS<sup>®</sup>-MP197 packaging is performed in accordance with these drawings.

#### 1.2.1.1 NUHOMS<sup>®</sup>-61BT DSC

A Dry Shielded Canister (DSC) consists of a cylindrical shell, top and bottom shield plugs, inner and outer bottom closure plates, and inner and outer top cover plates. The overall length and the outer diameter of the DSC is 199.67 inches and 67.25 inches respectively. The DSC assembly and details are shown in drawings 1093-71-13 through 1093-71-18. The shell assembly is a high integrity stainless steel (SA-240 Type 304) welded pressure vessel that provides containment of radioactive materials, encapsulates the fuel in an inert atmosphere (the canister is back-filled with Helium before being seal welded closed), and provides biological shielding (in axial direction). The DSC has double redundant seal welds that join the shell and the top and bottom cover plate assemblies to seal the canister. The bottom end assembly welds are made during fabrication of the DSC. The top end closure welds are made after fuel loading. Both top plug penetrations (siphon and vent ports) are redundantly sealed after the DSC drying operations are complete.

The canister is designed to contain the fuel basket and fuel assemblies, and is completely supported by the transport cask. Under normal transport conditions, the canister rests on four transfer support rails, attached to the inside surface of the transport cask.

### 1.2.1.2 Fuel Basket

The basket structure is designed, fabricated and inspected in accordance with ASME B&PV Code Subsection NG [3]. Exceptions to the code are provided in Section 2.11. The overall length and outer diameter of the basket, including the hold down ring, is 178.5 inches and 66.00 inches respectively. The details of the NUHOMS<sup>®</sup>-61BT Fuel Basket are shown in drawings 1093-71-10 through -12. The NUHOMS<sup>®</sup>-61BT basket is designed to accommodate 61 intact standard BWR fuel assemblies with or without fuel channels. The basket structure consists of a welded assembly of stainless steel tubes (fuel compartments) separated by poison plates and surrounded by larger stainless steel boxes and support rails.

The basket structure is open at each end. Therefore, longitudinal fuel assembly loads are applied directly on the canister/cask body and not on the fuel basket structure. The fuel assemblies are laterally supported by the stainless steel structural boxes. The basket is laterally supported by the basket rails and the canister shell. The stainless steel basket rails are oriented parallel to the axis of the canister, and are attached to the periphery of the basket to provide support, and to establish and maintain basket orientation.

A shear key, welded to the inner wall of the DSC, mates with a notch in one of the basket support rails to prevent the basket from rotating during normal operations. Also, a hold down ring is installed above the basket, after fuel loading is complete, to prevent the basket from moving axially during transport.

The poison plates are constructed from borated aluminum, an aluminum/B<sub>4</sub>C metal matrix composite, or Boral<sup>®</sup>, and provide a heat conduction path from the fuel assemblies to the canister wall, as well as the necessary criticality control.

### 1.2.1.3

### NUHOMS®-MP197 Transport Cask

The cask is fabricated primarily of stainless steel. Non-stainless steel members include the cast lead shielding between the containment boundary inner shell and the structural shell, the o-ring seals, the borated polyester resin neutron shield material and the carbon steel closure bolts. Socket headed cap screws (bolts) are used to secure the top closure lid to the cask body and the RAM access closure plate to the bottom of the cask. The body of the cask consists of a 1.25 inch, 68 inch inside diameter stainless steel inner (containment) shell and a 2.5-inch thick, 82.00 inch outside diameter stainless steel structural shell which sandwich the 3.25 inch thick cast lead shielding material.

The overall external dimensions of the cask are 208.00 inches long and 91.5 inches outer diameter. The weight of the cask body (excluding the lid and lid bolts, which weighs approximately 5,610 pounds) is approximately 143,000 pounds, including 9,960 pounds of neutron shield material and roughly 60,000 pounds of cast lead. The following components comprise the NUHOMS®-MP197 Transport Cask.

#### A. Containment Vessel

The cask containment boundary consists of the inner shell, a 6.50 inch thick bottom plate with a 23.88 inch diameter, 2.5 inch thick RAM access closure, a top closure flange, a 4.50 inch thick top closure lid with closure bolts, vent and drain port closures and bolts, and double O-ring seals for each of the penetrations. A 68 inch diameter, 197 inch long cavity is provided.

The containment vessel prevents leakage of radioactive material from the cask cavity. It also maintains an inert atmosphere (helium) in the cask cavity. Helium assists in heat removal and provides a non-reactive environment to protect fuel assemblies against fuel cladding degradation. To preclude air in-leakage, the cask cavity is pressurized with helium to above atmospheric pressure.

The inner containment shell is SA-240, Type XM-19, and the bottom, and top flange materials are SA-182, Type FXM19. The top closure lid is constructed from SA-705, Type 630, H1100. The NUHOMS®-MP197 packaging containment vessel is designed, fabricated, examined and tested in accordance with the requirements of Subsection NB [4] of the ASME Code to the maximum practical extent. In addition, the design meets the requirements of Subsection WB of the ASME Section III, Division 3 [5] and Regulatory Guides 7.6 [6] and 7.8 [7]. Exceptions to the ASME Code are discussed in Section 2.11 of Chapter 2. The construction of the containment boundary is shown in drawings 1093-71-2, 3 and 4 provided in Appendix 1.4. The design of the containment boundary is discussed in Chapter 2 and the fabrication requirements (including examination and testing) of the containment boundary are discussed in Chapter 4.

## B. Gamma and Radial Neutron Shielding

The lead and steel shells of the transport cask provide shielding between the fuel and the exterior surface of the package for the attenuation of gamma radiation (Drawings 1093-71-2, -3 and -4).

Neutron shielding is provided by a borated polyester resin compound surrounding the outer shell. The resin compound is cast into long, slender aluminum containers. The containers are constructed from 6063-T5 aluminum. The total thickness of the resin and aluminum is 4.50 inches. The array of resin-filled containers is enclosed within a smooth 3/16 inch thick outer steel shell (SA-240, Type 304). In addition to serving as resin containers, the aluminum provides a conduction path, from the cask body to the neutron shield shell, for heat transfer.

The resin material is an unsaturated polyester cross-linked with styrene, with about 50% weight mineral and fiberglass reinforcement. The components are polyester resin, styrene monomer, alpha methyl styrene, aluminum oxide, zinc borate, and chopped fiberglass which produce the elemental resin composition shown below.

Element	% Weight
H	5.05
B	1.05
C	35.13
Al	14.93
O + Zn (balance)	43.84

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

The structural analysis of the NUHOMS<sup>®</sup>-MP197 cask body is presented in Chapter 2.

### 1.2.1.4 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 of the cask. These trunnion sockets are attached to the structural shell. Two types of trunnions are provided for the NUHOMS<sup>®</sup>-MP197 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 top (lifting) set of trunnions could be either type depending on site and transfer operation requirements. The bottom set of trunnions are the double shoulder type. The trunnions are fabricated and tested in accordance with ANSI N14.6 [9]. During transport, four trunnion plugs, containing neutron shielding material, will be 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.

### 1.2.1.5 Impact Limiters

The front and rear impact limiters, shown in TN Drawings 1093-71-1, -8, and -9, absorb energy during impact events by crushing balsa and redwood. The top and bottom impact limiters are identical. Each has an outside diameter of 122 inches and a height of 60.75 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, and provide wood confinement during impact. The metal structure locates, supports, confines, and protects the wood energy absorption material. The external surfaces of the impact limiter shells are painted.

The impact limiters are attached to the NUHOMS<sup>®</sup>-MP197 cask by twelve (12) attachment bolts. The attachment bolts are designed to keep the impact limiters attached to the cask body during all normal 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 two 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. During transportation, the impact limiter hoist rings are removed.

An aluminum thermal shield is added to the bottom impact limiter to reduce the impact limiter wood temperature. The details of the thermal shield are included in TN drawing 1093-71-9.

The functional description as well as the performance analysis of the impact limiters is provided in Appendix 2.10.8. The description and results of the impact limiter dynamic testing program are provided in Appendix 2.10.9.

### 1.2.2 Operational Features

The NUHOMS<sup>®</sup>-MP197 package is not considered to be operationally complex and is designed to be compatible with spent fuel pool loading/unloading methods. All operational features are readily apparent from inspection of the General Arrangement Drawings provided in Section 1.4. The sequential steps to be followed for cask loading, testing, and unloading operations are provided in Chapter 7.

### 1.2.3 Contents of Packaging

The contents of the NUHOMS<sup>®</sup>-MP197 packaging are limited to the following.

- Fuel parameters

The NUHOMS<sup>®</sup>-61BT DSC is designed to store 61 intact standard Boiling Water Reactor (BWR) fuel assemblies with or without fuel channels. Nominal channel thicknesses up to 0.120 inches thick are acceptable for transport.

Partial fuel assemblies (spent fuel assemblies from which fuel rods are missing) shall not be classified as intact fuel assemblies unless dummy fuel rods are used to displace an amount of water equal to that displaced by the original rod(s).

Permissible fuel assembly types are listed below.

<b>GE Type</b>	<b>Designation</b>	<b># of Fueled Rods</b>	<b>Uranium Content (MTU/assembly)</b>
7x7	2A	49	0.1977
7x7	2, 2B	49	0.1977
7x7	3, 3A, 3B	49	0.1896
8x8	4, 4A, 4B	63	0.1880
8x8	5, 6, 6B, 7, 7B	62	0.1876
8x8	8, 8B	62	0.1885
8x8	8, 8B, 9, 9B, 10	60	0.1824
9x9	11,13	74	0.1757
10x10	12	92	0.1857

Fuel characteristics are provided in the following table.

<b>BWR Fuel Assembly Design Characteristics<sup>(1) (3)</sup></b>							
<b>Transnuclear, ID</b>	<b>7 × 7- 49/0</b>	<b>8 × 8- 63/1</b>	<b>8 × 8- 62/2</b>	<b>8 × 8 - 60/4</b>	<b>8 × 8- 60/1</b>	<b>9 × 9- 74/2</b>	<b>10×10- 92/2</b>
<b>GE Designations</b>	GE2 GE3	GE4	GE-5 GE-Pres GE-Barrier GE8 Type I	GE8 Type II	GE9 GE10	GE11 GE13	GE12
<b>Max Length (in)</b>	176.2	176.2	176.2	176.2	176.2	176.2	176.2
<b>Max Width (in) (excluding channels)</b>	5.44	5.44	5.44	5.44	5.44	5.44	5.44
<b>Channel Internal Width (in)</b>	5.278	5.278	5.278	5.278	5.278	5.278	5.278
<b>Maximum MTU/assembly<sup>(2)</sup></b>	0.1977	0.1880	0.1856	0.1825	0.1834	0.1766	0.1867

(1) Any fuel channel thickness from 0.065 to 0.120 inch is acceptable on any of the fuel designs.

(2) The maximum MTU/assembly is calculated based on the theoretical density. The calculated value is higher than the actual.

(3) Maximum fuel assembly weight with channel is 705 lb.

Provided all the requirements listed in this section are met, the bounding fuel characteristics for the intact fuel assemblies are:

<b>Intact BWR Fuel Assembly Characteristics</b>	
<b>Physical Parameters:</b>	
Fuel Design:	7x7, 8x8, 9x9, or 10x10 BWR fuel assemblies manufactured by General Electric or equivalent reload fuel
Cladding Material:	Zircaloy
Fuel Damage:	Cladding damage in excess of pinhole leaks or hairline cracks is not authorized to be stored as "Intact BWR Fuel".
Channels:	Fuel may be stored with or without fuel channels
<b>Radiological Parameters<sup>1</sup>:</b>	
<b>Group 1:</b>	
Maximum Burnup:	27,000 MWd/MTU
Minimum Cooling Time:	6-years
Maximum Initial Enrichment:	See Poison Material Design Requirements Table
Minimum Initial Bundle Average Enrichment:	2.0 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	260 W/assembly
<b>Group 2:</b>	
Maximum Burnup:	35,000 MWd/MTU
Minimum Cooling Time:	12-years
Maximum Initial Enrichment:	See Poison Material Design Requirements Table
Minimum Initial Bundle Average Enrichment:	2.65 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	260 W/assembly
<b>Group 3:</b>	
Maximum Burnup:	37,200 MWd/MTU
Minimum Cooling Time:	12-years
Maximum Initial Enrichment:	See Poison Material Design Requirements Table
Minimum Initial Bundle Average Enrichment:	3.38 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	260 W/assembly
<b>Group 4:</b>	
Maximum Burnup:	40,000 MWd/MTU
Minimum Cooling Time:	15-years
Maximum Initial Enrichment:	See Poison Material Design Requirements Table
Minimum Initial Bundle Average Enrichment:	3.4 wt. % U-235
Maximum Initial Uranium Content:	198 kg/assembly
Maximum Decay Heat:	260 W/assembly

<sup>1</sup> Fuel assemblies fully complying with any of the following sets of parameters are suitable for transport in the NUHOMS®-MP197/61BT DSC. Each set of parameters needs to be fully evaluated to demonstrate compliance with the requirements of 10CFR71.

- The maximum weight of the BWR fuel assemblies shall not exceed 43,000 lb., or 705 lb. per fuel assembly
- The total decay heat of the cavity contents shall not exceed 15.9 kW or 260 W/assembly.
- Measured external radiation levels shall not exceed the requirements of 10 CFR 71.47.  
Measured surface contamination levels shall not exceed the requirements of 10 CFR 71.87(i).

Chapter 5 provides the shielding analysis. Chapter 6 covers the criticality safety of the NUHOMS<sup>®</sup>-MP197 and its contents, listing material densities, moderator ratios, and geometric configurations.

### BWR Fuel Assembly Poison Material Design Requirements

*Borated aluminum, Boralyn<sup>®</sup>, Metamic<sup>®</sup>, or equivalent metal matrix composites*

NUHOMS <sup>®</sup> - 61BT DSC Type	Maximum Lattice Average Enrichment <sup>(1)</sup> (wt% U-235)	Minimum B-10 Areal Density in Poison Plates (g/cm <sup>2</sup> )	% Credit of B10 used in Criticality Calculation	Poison Material Coupon Testing
A	3.7	0.021	90	Neutron Transmission plus Radiography
B	4.1	0.032	90	Neutron Transmission plus Radiography
C	4.4	0.040	90	Neutron Transmission plus Radiography

*Boral<sup>®</sup>*

NUHOMS <sup>®</sup> - 61BT DSC Type	Maximum Lattice Average Enrichment <sup>(1)</sup> (wt% U-235)	Minimum B-10 Areal Density in Poison Plates (g/cm <sup>2</sup> )	% Credit of B10 used in Criticality Calculation
A	3.7	0.025	75
B	4.1	0.038	75
C	4.4	0.048	75

<sup>(1)</sup> Maximum pin enrichment is 5% U235 in all cases.

### 1.3 REFERENCES

1. 10 CFR 71, Packaging and Transportation of Radioactive Material.
2. USNRC Regulatory Guide 7.9, "Standard Format and Content of Part 71 Applications for Approval of Packaging for Radioactive Material", Rev. 2, May 1986.
3. American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code, Section III, Subsection NG, 1998 with 1999 Addenda.
4. American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code, Section III, Subsection NB, 1998 with 1999 Addenda.
5. American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code, Section III, Division 3, Subsection WB, 1998 with 1999 Addenda.
6. USNRC Regulatory Guide 7.6, "Design Criteria for the Structural Analysis of Shipping Cask Containment Vessel", Rev. 1, March 1978.
7. USNRC Regulatory Guide 7.8, "Load Combinations for the Structural Analysis of Shipping Cask", Rev. 1, March 1989.
8. American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code, Section III, Subsection NF, 1998 with 1999 Addenda.
9. American National Standards Institute, ANSI N14.6, American National Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds or More for Nuclear Materials, 1993.

#### 1.4 APPENDIX – NUHOMS®-MP197 PACKAGING DRAWINGS

The following Transnuclear drawings are enclosed:

Drawing No	Title
1093-71-1	NUHOMS®-MP197 Packaging, Transport Configuration
1093-71-2	NUHOMS®-MP197 Packaging, General Arrangement, Parts List
1093-71-3	NUHOMS®-MP197 Packaging, General Arrangement
1093-71-4	NUHOMS®-MP197 Packaging, Cask Body Assembly
1093-71-5	NUHOMS®-MP197 Packaging, Cask Body Details
1093-71-6	NUHOMS®-MP197 Packaging, Cask Body Details
1093-71-7	NUHOMS®-MP197 Packaging, Lid Assembly & Details
1093-71-8	NUHOMS®-MP197 Packaging, Impact Limiter Assembly
1093-71-9	NUHOMS®-MP197 Packaging, Impact Limiter Details
1093-71-10	NUHOMS®-61B Transportable Canister, for BWR Fuel Basket Assembly
1093-71-11	NUHOMS®-61B Transportable Canister, for BWR Fuel Basket Details
1093-71-12	NUHOMS®-61B Transportable Canister, for BWR Fuel Basket Details
1093-71-13	NUHOMS®-61B Transportable Canister, for BWR Fuel General Assembly
1093-71-14	NUHOMS®-61B Transportable Canister, for BWR Fuel General Assembly
1093-71-15	NUHOMS®-61B Transportable Canister, for BWR Fuel Shell Assembly
1093-71-16	NUHOMS®-61B Transportable Canister, for BWR Fuel Shell Assembly
1093-71-17	NUHOMS®-61B Transportable Canister, for BWR Fuel Canister Details
1093-71-18	NUHOMS®-61B Transportable Canister, for BWR Fuel Canister Details
1093-71-20	NUHOMS®-MP197 Packaging, Regulatory Plate
1093-71-21	NUHOMS®-MP197 Packaging, on Transport Skid
1093-71-22	NUHOMS®-MP197 Packaging, ASME Code Compliance and Exceptions

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. <small>HAWTHORNE, N.Y.</small>						
PROJ. <i>PS</i>	<i>5/1/01</i>							
Q/A/WRS	<i>5/1/01</i>	NUHOMS <sup>®</sup> -MP197 PACKAGING TRANSPORT CONFIGURATION						
N/T								
MECH. DES. <i>JC</i>	<i>5/1/01</i>	NONE   B   1093-71-1   <i>SAR</i> SCALE   SIZE   DWG. NO.   REV.						
CHK'D. BY <i>PS</i>	<i>5/1/01</i>							
DWN. BY. <i>FTM</i>	<i>27 APR. 01</i>							

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED  
INFORMATION

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y.						
PS	4/1/01							
PROJ.		NUHOMS <sup>®</sup> -MP197 PACKAGING GENERAL ARRANGEMENT						
Q/A/NRS	5/1/01							
N/T		SAR						
JL	5/1/01							
MECH. DES.		NONE    B    1093-71-2    0 SCALE    SIZE    DWG. NO.    REV.						
PS	5/1/01							
CHK'D. BY		27 APR. 01						
QTB								
DWN. BY								

PARTS LIST					
SAFETY DESIGNATION	ITEM NO.	NO. REQ'D	NOMENCLATURE	DESCRIPTION	MAT'L.
	1	EA.	TRANSPORT CASK ASSEMBLY		
SR	2	1	INNER SHELL	DWG. 1093-71-4	SA-240 TYPE 304
SR	3	A/R	GAMMA SHIELD	DWG. 1093-71-4	ASTM B-29
SR	4	1	OUTER SHELL	DWG. 1093-71-4	SA-240 TYPE 304
SR	5	1	BOTTOM	DWG. 1093-71-4	SA-240 TYPE 304
SR	6	A/R	NEUTRON SHIELD	DWG. 1093-71-5	SA-240 TYPE 304
SR	7	1	SHIELD SHELL	DWG. 1093-71-4	SA-240 TYPE 304
SR	8	60	NEUTRON SHIELD BOX	DWG. 1093-71-5	6063-T5 ALUM
SR	9	12	SHIELD SHELL END CAP (SHORT)	DWG. 1093-71-4	SA-240 TYPE 304
SR	10	8	SHIELD SHELL END CAP (LONG)	DWG. 1093-71-4	SA-240 TYPE 304
SR	11	16	IMP. LMR. ATTACH. BLOCK	DWG. 1093-71-5	SA-240 TYPE 304
SR	12	1	CASK BODY FLANGE	DWG. 1093-71-4	SA-182 FXM19
SR	13	48	LID BOLT THD. INSERT	HELICOIL #185-24CN-2500	304 SST
SR	14	4	DOUBLE SHOULDER TRUNNION	DWG. 1093-71-4	SA-182 F304
SR	15	48	TRUNNION BOLT	1/2"-7UNC x 1" LG. SOCKET HD. CAP SCREW	SA-240 TYPE 304
SR	16	2	TRUNNION ATTACH. BLOCK (FR)	DWG. 1093-71-5	SA-182 F304
SR	17	48	TRUNNION BOLT THD. INSERT	HELICOIL #185-20CN-2500	304 SST
SR	18	24	IMP. LMR. ATTACH. W/SHIM	DWG. 1093-71-4	304 SST
SR	19	24	IMP. LMR. ATTACH. BOLT	DWG. 1093-71-8	SA-240 TYPE 304
NSR	19A	24	IMP. LMR. ATTACH. WASHER	DWG. 1093-71-8	304 SST
SR	20	1	LID	DWG. 1093-71-7	SA-240 TYPE 304
SR	21	48	LID BOLT	DWG. 1093-71-7	SA-240 TYPE 304
NSR	22	48	LID BOLT WASHER	DWG. 1093-71-7	304 SST
SR	23	2	IMPACT LIMITER ASSEMBLY	DWG. 1093-71-8	
SR	23A	2	OUTER SHELL (1/4" PLATE)	DWG. 1093-71-8	SA-240 TYPE 304
SR	23B	2	INNER SHELL (1/4" PLATE)	DWG. 1093-71-8	SA-240 TYPE 304
SR	23C	2	OUTER COVER (1/4" PLATE)	DWG. 1093-71-8	SA-240 TYPE 304
SR	23D	2	INNER COVER (1/4" PLATE)	DWG. 1093-71-8	SA-240 TYPE 304
SR	23E	24	OUTER COVER SEGMENT (1/4" PL)	DWG. 1093-71-8	SA-240 TYPE 304
SR	23F	24	GUSSET (3/16" PLATE)	DWG. 1093-71-8	SA-240 TYPE 304
SR	23G	2	INNER RING (1/4" PLATE)	DWG. 1093-71-8	SA-240 TYPE 304
SR	23H	2	COVER (1/4" PLATE)	DWG. 1093-71-8	SA-240 TYPE 304
SR	23I	A/R	BALSA	DWG. 1093-71-8	NOTE 4
SR	23J	A/R	REDWOOD	DWG. 1093-71-8	NOTE 4
NSR	23K	14	FUSIBLE PLUG	DWG. 1093-71-8	RILSAN BHN68
NSR	23L	14	FUSIBLE PLUG BOSS	DWG. 1093-71-8	304 SST
NSR	23M	14	FUSIBLE PLUG O-RING	PARKER 3-906	FLUOROCARBON
NSR	23N	4	HOIST RING	JERGENS # 23429	FORGED STEEL
NSR	23P	4	HOIST RING REINFORCEMENT BLOCK	DWG. 1093-71-9	304 SST
NSR	23R	4	SUPPORT ANGLE	DWG. 1093-71-8	304 SST
NSR	23S	4	SUPPORT ANGLE PAD	DWG. 1093-71-8	304 SST
SR	23T	24	OUTER BOLT TUNNEL	DWG. 1093-71-8	SA-312 TYPE 304
SR	23U	24	TUNNEL SHELF	DWG. 1093-71-8	SA-240 TYPE 304
SR	23V	24	INNER BOLT TUNNEL	DWG. 1093-71-8	SA-312 TYPE 304
NSR	23W	16	BOLTING BOSS	DWG. 1093-71-9	304 SST
SR	24	1	LID O-RING (INNER)	67.79" I.D. x 275" WIDE	FLUOROCARBON
SR	25	1	LID O-RING (OUTER)	68.94" I.D. x 275" WIDE	FLUOROCARBON
SR	26	1	PAD PLATE	DWG. 1093-71-5	SA-240 TYPE 304
SR	27	2	TIE BAR	DWG. 1093-71-5	TYPE 304-19
SR	28	2	BEARING BLOCK	DWG. 1093-71-5	TYPE 304-19
SR	29	4	THD. INSERT	HELICOIL # 1185-8CN-1000	304 SST
SR	30	1	KEY PLUG COVER	DWG. 1093-71-5	SA-240 TYPE 304
SR	30A	1	KEY PLUG WELDMENT	DWG. 1093-71-5	SA-240 TYPE 304
SR	31	A/R	NEUTRON SHIELD	DWG. 1093-71-5	SA-240 TYPE 304
SR	32	4	KEY COVER BOLT	1/2"-13UNC x 1" LG. FLAT HD. SCREW	SA-240 TYPE 304
SR	33	1	RAM CLOSURE PLATE	DWG. 1093-71-6	TYPE 304-19
SR	34	12	RAM CLOSURE BOLT	1/2"-13UNC x 4" LG. SOCKET HD. CAP SCREW	SA-240 TYPE 304
NSR	35	12	WASHER	DWG. 1093-71-6	304 SST
SR	36	1	O-RING	PARKER 2-468	FLUOROCARBON
SR	37	1	O-RING	PARKER 2-463	FLUOROCARBON
SR	38	4	THD. INSERT	DWG. 1093-71-6	304 SST
SR	39	4	VENT/DRAIN/TEST PORT PLUG	DWG. 1093-71-6	SA-240 TYPE 304
SR	40	4	HEX HD. CAP SCREW	3/4"-10UNC x 1.75" LG.	NOTE 5
SR	41	4	O-RING	PARKER 2-226	FLUOROCARBON
SR	42	4	O-RING	PARKER 3-910	FLUOROCARBON
SR	43	12	RAM CLOSURE THD. INSERT	HELICOIL #1185-16CN-2500	304 SST
SR	44	4	HEX HD. CAP SCREW	1/4"-7UNC x 1" LG.	SA-240 TYPE 304
SR	45	4	TRUNNION REPLACEMENT PLUG	DWG. 1093-71-4	304 SST
	46		BASKET ASSEMBLY	DWG. 1093-71-10	
SR	46A	16	FUEL COMPARTMENT (1/2" STK)	DWG. 1093-71-11	SA-240 TYPE 304
SR	46B	4	FUEL COMPARTMENT WRAP	DWG. 1093-71-11	SA-240 TYPE 304

PARTS LIST					
SAFETY DESIGNATION	ITEM NO.	NO. REQ'D	NOMENCLATURE	DESCRIPTION	MAT'L.
SR	46C	45	FUEL COMPARTMENT (1/2" STK)	DWG. 1093-71-11	SA-240 TYPE 304
SR	46D	5	FUEL COMPARTMENT WRAP	DWG. 1093-71-11	SA-240 TYPE 304
SR	46E	2	POISON PLATE	DWG. 1093-71-11	NOTE 3
SR	46F	2	POISON PLATE	DWG. 1093-71-11	NOTE 3
SR	46G	10	POISON PLATE	DWG. 1093-71-11	NOTE 3
SR	46H	8	POISON PLATE	DWG. 1093-71-11	NOTE 3
SR	46I	4	POISON PLATE	DWG. 1093-71-11	NOTE 3
SR	46J	4	POISON PLATE	DWG. 1093-71-11	NOTE 3
SR	46K	4	SHIM PLATE	DWG. 1093-71-11	NOTE 6
SR	46L	8	SHIM PLATE	DWG. 1093-71-11	NOTE 6
SR	46M	8	BASKET RAIL (TYPE 1)	DWG. 1093-71-12	TYPE 304
SR	46N	4	BASKET RAIL (TYPE 2)	DWG. 1093-71-12	TYPE 304
SR	46P	224	WELD STUD	.50"-13UNC	SA-479-304
SR	46R	224	FLAT WASHER	.50" I.D.	304 SST
SR	46S	224	HEX NUT	.50"-13UNC	304 SST
SR	46T	128	BASKET PLATE INSERT	DWG. 1093-71-11	TYPE 304
SR	46U	8	SHIM PLATE	DWG. 1093-71-11	NOTE 6
SR	46V	30	POISON PLATE	DWG. 1093-71-11	NOTE 3
	47		BASKET HOLDDOWN RING	DWG. 1093-71-12	
SR	47A	2	BASKET HOLDDOWN PLATE	DWG. 1093-71-12	SA-240 TYPE 304
SR	47B	8	BASKET HOLDDOWN PLATE	DWG. 1093-71-12	SA-240 TYPE 304
SR	47C	4	BASKET HOLDDOWN PLATE	DWG. 1093-71-12	SA-240 TYPE 304
SR	47D	4	BASKET HOLDDOWN PLATE	DWG. 1093-71-12	SA-240 TYPE 304
SR	47E	2	BASKET HOLDDOWN PLATE	DWG. 1093-71-12	SA-240 TYPE 304
SR	47F	4	SPACER PAD	DWG. 1093-71-12	SA-240 TYPE 304
SR	47G	8	BASKET HOLDDOWN PLATE	DWG. 1093-71-12	SA-240 TYPE 304
SR	47H	4	BASKET HOLDDOWN PLATE	DWG. 1093-71-12	SA-240 TYPE 304
SR	47I	4	BASKET HOLDDOWN PLATE	DWG. 1093-71-12	SA-240 TYPE 304
SR	47J	4	ALIGNMENT LEG	DWG. 1093-71-12	TYPE 304
	47K		DELETED		
	47L		DELETED		
	47M		DELETED		
NSR	48	4	TRUNNION O-RING	PARKER 2-393	FLUOROCARBON
NSR	49	48	TRUNNION BOLT SEAL CAP	DWG. 1093-71-4	UNAS 8211 IN 304
NSR	50	48	TRUNNION BOLT SEAL CAP O-RING	PARKER 2-039	FLUOROCARBON
SR	51	2	TRUNNION ATTACH. BLOCK (GR)	DWG. 1093-71-5	SA-182 F304
NSR	52	4	SPACER WASHER	DWG. 1093-71-6	304 SST
SR	53	16	TRUNNION PLUG BOLT	1/2"-7UNC x 3" LG. SOCKET HD. CAP SCREW	SA-240 TYPE 304
NSR	54	2	LID ALIGNMENT PIN	DWG. 1093-71-4	A-479-316
NSR	55	4	SLIDE RAIL	DWG. 1093-71-4	SA-240 TYPE 304
	56		CANISTER ASSEMBLY	DWG. 1093-71-13	
SR	56A	1	CANISTER SHELL	DWG. 1093-71-15	SA-240 TYPE 304
SR	56B	1	BOTTOM SHIELD PLUG	DWG. 1093-71-15	A-36
SR	56C	1	INNER BOTTOM COVER	DWG. 1093-71-15	SA-240 TYPE 304
SR	56D	1	OUTER BOTTOM COVER	DWG. 1093-71-15	SA-240 TYPE 304
SR	56E	1	GRAPPLE RING SUPPORT	DWG. 1093-71-15	SA-240 TYPE 304
SR	56F	1	GRAPPLE RING	DWG. 1093-71-15	SA-240 TYPE 304
SR	56G	1	TOP SHIELD PLUG	DWG. 1093-71-18	A-36
SR	56H	1	INNER TOP COVER PLATE	DWG. 1093-71-17	SA-240 TYPE 304
SR	56I	1	OUTER TOP COVER PLATE	DWG. 1093-71-17	SA-240 TYPE 304
SR	56J	2	SIPHON/VENT PORT COVER PLATE	DWG. 1093-71-18	SA-240 TYPE 304
SR	56K	1	SIPHON/VENT BLOCK	DWG. 1093-71-18	SA-240 TYPE 304
NSR	56L	1	SIPHON TUBING	3/4" O.D. x .049" WALL	SA-312 SST
NSR	56M	1	MALE CONNECTOR	SYNLOCK SS-1210-1-B	316 SST
NSR	56N	1	ALIGNMENT KEY	DWG. 1093-71-15	SA-240 TYPE 304
SR	56P	1	SUPPORT RING SEGMENT	DWG. 1093-71-17	SA-240 TYPE 304
NSR	56R	2	QUICK CONNECT COUPLING	SYNLOCK SS-1210-1-B	316 SST
SR	56S	4	CANISTER LIFTING LUG	DWG. 1093-71-17	SA-240 TYPE 304
	56T		DELETED		
SR	57	16	TRUNNION PLUG BOLT	1/2"-7UNC x 2 1/2" LG. FLAT HD. SCREW	SA-240 TYPE 304
NSR	58	1	THERMAL SHIELD	DWG. 1093-71-9	ALUMINUM
NSR	59	16	HEX HD. CAP SCREW	3/8"-16UNC x .50" LG.	SA-240 TYPE 304
SR	60	1	VENT PORT PLUG	DWG. 1093-71-18	TYPE 304
	61		DELETED		
NSR	62	1	REGULATORY PLATE	DWG. 1093-71-20	SST
SR	63	2	SINGLE SHOULDER TRUNNION	DWG. 1093-71-5	SA-182 F304
NSR	64	AR	SECURITY WIRE	DWG. 1093-71-2	304 SST
NSR	65	1	LEAD DISC	DWG. 1093-71-2	LEAD
NSR	66	1	HEX PLUG	3/8"-18NPT	SST

NOTES:

- 1) NO. REQ'D. IS FOR 1 COMPLETE CASK I.E. 1 CASK BODY, 2 IMPACT LIMITERS (1 SET)
- 2) WHERE SPECIFIC ITEMS ARE SPECIFIED (I.E. PARKER O-RING, HELICOIL THD. INSERTS) EQUIVALENT SUBSTITUTES ARE ACCEPTABLE.
- 3) ENRICHED BORON ALUM ALLOY OR BORON CARBIDE/ ALUMINUM METAL MATRIX COMPOSITE OR BORAL®

BASKET TYPE	MAX. LATTICE ENRICHMENT (WT % U-235)	BORON-ALUM. ALLOY OR BORALYN® OR METAMIC® MIN. B10 CONTENT (g/cm²)	BORAL® MIN. B10 CONTENT (g/cm²)
A	3.7	.021	.025
B	4.1	.032	.036
C	4.4	.040	.046

POISON PLATES MAY BE COMPOSED ENTIRELY OF BORATED MATERIAL, OR MAY BE A THINNER BORATED SHEET PAIRED WITH AN ALUMINUM SHEET TO ACHIEVE THE REQUIRED THICKNESS OF .31" NOMINAL.

- 4) FOR BALSA AND REDWOOD PROPERTIES SEE DWG. 1093-71-8.
- 5) FOR BOLT MATERIAL AND MACHINING DETAIL SEE DWG. 1093-71-6.
- 6) MATERIAL: 6061-T651 ALUMINUM OR EQUIVALENT.
- 7) OPTIONAL TRUNNION TO BE USED FOR SINGLE FAILURE PROOF LIFTING.
- 8) TORQUE REQUIREMENTS:  
LID BOLTS: 1,440-1,510 FT. LBS.  
TRUNNION BOLTS: 520-540 FT. LBS.  
IMPACT LIMITER ATTACHMENT BOLTS: 140-160 FT. LBS.  
RAM CLOSURE PLATE BOLTS: 100-125 FT. LBS.  
VENT/DRAIN/TEST PORT BOLTS: 60-70 FT. LBS.  
AT ASSEMBLY APPLY NUCLEAR GRADE NEOLUBE OR EQUIVALENT TO ABOVE BOLTS.
- 9) DRAWINGS 1093-71-2 THRU -21 ARE IN ACCORDANCE WITH ASME Y14.5M (1994) & ANSI/AWS 2.4-98.
- 10) FOR APPLICABLE ASME CODE SEE DWG. 1093-71-22.
- 11) FOR OPERATIONS PROCEDURES SEE CHAPTER 7.
- 12) MAXIMUM WEIGHT OF PACKAGE: 132.5 TONS  
MAXIMUM WEIGHT OF CONTENTS (FUEL ASSEMBLIES): 21.5 TONS  
MAXIMUM WEIGHT OF SECONDARY PACKAGING (THERMAL SHIELD, IMPACT LIMITERS & ATTACHMENTS): 13.9 TONS
- 13) "FLUOROCARBON" PER AMS-R-83485.
- 14) MATERIAL MAY ALSO BE SA-182 FXM19.
- 15) MATERIAL MAY ALSO BE SA-182, F304.
- 16) .12' x 4.00' x 195.00'.

NO.	DATE	REVISIONS	DWN.	CHK'D	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	<p style="text-align: center;">TRANSNUCLEAR, INC. HAYTHORNE, N.Y.</p> <p style="text-align: center;">NUHOMS®-MP197 PACKAGING GENERAL ARRANGEMENT PARTS LIST</p>						
PS	9/16/01							
B/A WRS	9/16/01							
N/T								
MECH. DES.	5/1/01							
CHK'D. BY	PS	5/1/01						SAR
DWN. BY	GTD	2/27/01						
NONE	B	1093-71-3						0
SCALE	SIZE	DWG. NO.						REV.

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED  
INFORMATION

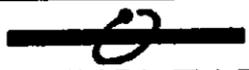
NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. <small>HAWTHORNE, N.Y.</small>  NUHOMS <sup>®</sup> -MP197 PACKAGING CASK BODY ASSEMBLY						
PROJ.	PS 5/1/01							
Q/A	WRS 5/1/01							
N/T								
MECH. DES.	JL 5/1/01							
CHK'D. BY	PS 5/4/01							SAR
DWN. BY	GTB 27 APR. 01	NONE	B	1093-71-4	0			
		SCALE	SIZE	DWG. NO.	REV.			

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y. NUHOMS <sup>®</sup> -MP197 PACKAGING CASK BODY DETAILS						
PROJ.	PS 5/4/01							
Q/A	WRS 5/1/01							
N/T								
MECH. DES.	JL 5/1/01							
CHK'D. BY	PS 5/1/01							SAR
DWN. BY	PTD 27 APR. 01	NONE	B	1093-71-5	0			
		SCALE	SIZE	DWG. NO.	REV.			

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y. NUHOMS <sup>®</sup> -MP197 PACKAGING CASK BODY DETAILS						
PROJ.	5/1/01							
Q/A WKS	5/1/01							
N/T								
MECH. DES.	5/1/01							
CHK'D. BY	5/1/01							SAR
DWN. BY.	27 APR. 01	NONE	B	1093-71-6				0
		SCALE	SIZE	DWG. NO.				REV.

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

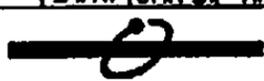
NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 <b>TRANSNUCLEAR, INC.</b> HAWTHORNE, N.Y.						
PROJ. <i>PS</i>	<i>5/1/01</i>							
Q/A <i>WRS</i>	<i>5/1/01</i>							
N/T								
MECH. DES. <i>X</i>	<i>5/1/01</i>							
CHK'D. BY <i>PS</i>	<i>5/1/01</i>	NUHOMS <sup>®</sup> -MP197 PACKAGING LID ASSEMBLY & DETAILS						
DWN. BY. <i>QTD</i>	<i>27 APR. 01</i>	NONE	B	1093-71-7	SAR		0	REV.
		SCALE	SIZE	DWG. NO.				

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y.						
PS	5/1/01							
PROJ.		NUHOMS <sup>®</sup> -MP197 PACKAGING IMPACT LIMITER ASSEMBLY						
Q/A	WRS 5/1/01							
N/T		SAR						
MECH. DES.	SC 5/1/01							
CHK'D. BY	PS 5/9/01	NONE B 1093-71-8 SCALE SIZE DWG. NO.						
DWN. BY	QTD 27 APR. 01							
		0 REV.						

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

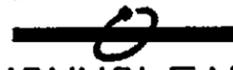
NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y.						
PRD. <i>PS</i>	<i>5/1/01</i>							
Q/A <i>WRS</i>	<i>5/1/01</i>							
N/T								
MECH. DES. <i>JC</i>	<i>5/1/01</i>							
CHK'D. BY <i>PS</i>	<i>5/1/01</i>	NUHOMS <sup>®</sup> -MP197 PACKAGING IMPACT LIMITER DETAILS						
DWN. BY <i>FTD</i>	<i>27 APR. 01</i>	NONE	B	1093-71-9	SAR		0	REV.
		SCALE	SIZE	DWG. NO.				

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS		DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y. NUHOMS®-61BT TRANSPORTABLE CANISTER FOR BWR FUEL BASKET ASSEMBLY					
PROD.	PS	5/4/01						
Q/A	WRS	5/1/01						
N/T								
MECH. DES.	JC	5/1/01						
CHK'D. BY	PS	5/1/01	SAR					
DWN. BY	QTB	27 APR. 01						
			SCALE	SIZE	DWG. NO.	REV.		

**FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION**

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	<div style="text-align: center;">   <b>TRANSNUCLEAR, INC.</b>  <small>HAWTHORNE, N.Y.</small>  <b>NUHOMS<sup>®</sup>-61BT TRANSPORTABLE CANISTER            FOR BWR FUEL            BASKET DETAILS</b> </div>						
PROJ. <i>PS</i>	<i>5/1/01</i>							
Q/A <i>WKS</i>	<i>5/1/01</i>							
N/T								
MECH. DES. <i>JC</i>	<i>5/1/01</i>							
CHK'D. BY <i>PS</i>	<i>5/1/01</i>	<b>SAR</b>						
DWN. BY <i>9TH</i>	<i>27 APR. 01</i>	NONE	B	1093-71-11	0			
		SCALE	SIZE	DWG. NO.	REV.			

**FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION**

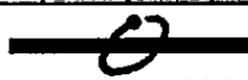
NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y. NUHOMS®-61BT TRANSPORTABLE CANISTER FOR BWR FUEL BASKET DETAILS						
PROJ.	PS 5/1/01							
Q/A	WRS 5/1/01							
N/T								
MECH. DES.	JL 5/4/01							
CHK'D. BY	PS 5/1/01							SAR
DWN. BY.	QTB 27 APR. 01	NONE	B	1093-71-12				0
		SCALE	SIZE	DWG. NO.				REV.

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

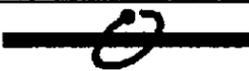
NO.	DATE	REVISIONS	DWN.	CHK'D.	ME.	N/T	Q/A	PROJ.
APPROVALS	DATE	<div style="text-align: center;">   <b>TRANSNUCLEAR, INC.</b>  <small>HAWTHORNE, N.Y.</small>  <b>NUHOMS®-61BT TRANSPORTABLE CANISTER FOR BWR FUEL GENERAL ASSEMBLY</b> </div>						
PROJ.	5/4/01							
Q/A	WRS 5/1/01							
N/T								
MECH. ENG.	JC 5/1/01							
CHK'D. BY	PS 5/1/01							SAR
DWN. BY.	GTB 27 APR. 01	NONE SCALE	B SIZE	1093-71-13 DWG. NO.		0 REV.		

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NEL	DATE	REVISIONS	DVN.	CHK'D.	ME.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAYTHORNE, N.Y. NUHOMS <sup>®</sup> -61BT TRANSPORTABLE CANISTER FOR BWR FUEL GENERAL ASSEMBLY						
PS PROJ.	5/1/01							
Q/A WRS	5/1/01							
N/T								
MECH. ENG. JL	5/1/01							
CHK'D. BY PS	5/1/01							SAR
DVN. BY. JTD	27 APR. 01	NONE SCALE	B SIZE	1093-71-14 DWG. NO.				0 REV.

**FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION**

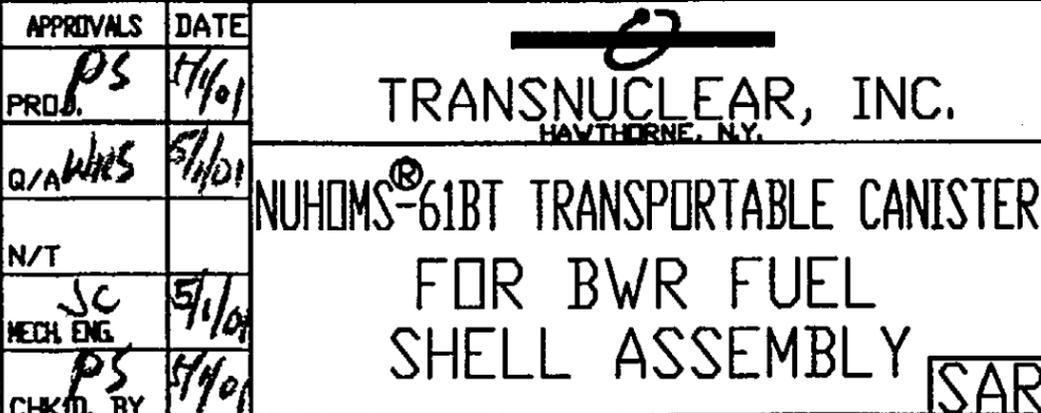
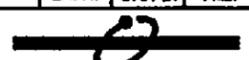
NO.	DATE	REVISIONS	DVN.	CHK'D.	M.E.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y. NUHOMS <sup>®</sup> -61BT TRANSPORTABLE CANISTER FOR BWR FUEL SHELL ASSEMBLY						
PROD.	PS 4/4/01							
Q/A	WRS 5/1/01							
N/T								
MECH. ENG.	SC 5/1/01							
CHK'D. BY	PS 4/4/01							SAR
DVN. BY.	QTY 27 APR. 01	NONE SCALE	B SIZE	1093-71-15 DWG. NO.				0 REV.

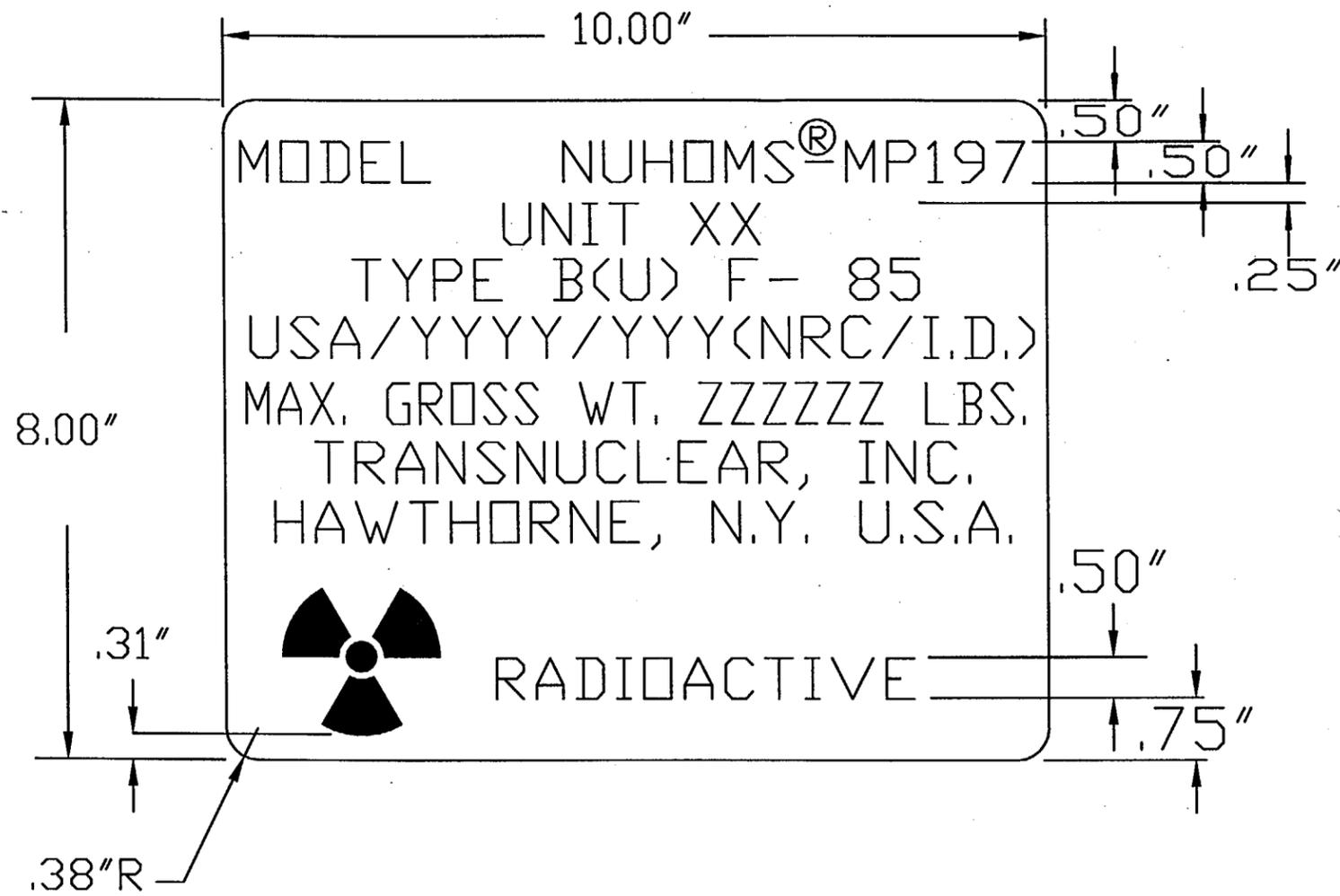
FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NEL	DATE	REVISIONS	DWN	CHK'D	ME.	N/T	Q/A	PROJ.
APPROVALS	DATE	 TRANSNUCLEAR, INC. HAWTHORNE, N.Y. NUHOMS <sup>®</sup> -61BT TRANSPORTABLE CANISTER FOR BWR FUEL SHELL ASSEMBLY						
PROJ. <i>PS</i>	<i>5/1/01</i>							
Q/A <i>WRS</i>	<i>5/1/01</i>							
N/T								
MECH. ENG. <i>JC</i>	<i>5/4/01</i>							
CHK'D. BY <i>PS</i>	<i>5/4/01</i>							<i>SAR</i>
DWN. BY. <i>QTB</i>	<i>27 APR. 01</i>	NONE SCALE	B SIZE	1093-71-16 DWG. NO.		0 REV.		

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.E.	N/T	Q/A	PROJ.
APPROVALS	DATE	<div style="text-align: center;">   <b>TRANSNUCLEAR, INC.</b>  <small>HAWTHORNE, N.Y.</small>  <b>NUHOMS<sup>®</sup>-61BT TRANSPORTABLE CANISTER</b>  <b>FOR BWR FUEL</b>  <b>CANISTER DETAILS</b> </div>						
PRJ.	5/1/01							
Q/A	WRS 5/1/01							
N/T								
MECH. ENG.	JC 5/1/01							
CHK'D. BY	PS 5/1/01							SAR
DWN. BY.	9TB 27 APR. 01	NONE	B	1093-71-17	0			
		SCALE	SIZE	DWG. NO.	REV.			





NOTES:

- 1) FOR ATTACHMENT SEE DWG. 1093-71-21.
- 2) MATERIAL: SST, .048" THICK.
- 3) TOLERANCE, UNLESS OTHERWISE SPECIFIED: +/- .12"
- 4) LETTERS & SYMBOLS TO BE STAMPED OR ENGRAVED THEN PAINTED WITH BLACK PAINT.
- 5) "XX" SIGNIFIES CASK NUMBER, INSERT APPROPRIATE SEQUENTIAL NUMBER STARTING WITH 01, 02, 03, ... ETC.
- 6) "YYYY/YYY" SIGNIFIES NRC I.D.
- 7) "ZZZZZZZ" SIGNIFIES CASK WEIGHT.

NO.	DATE	REVISIONS	DWN.	CHK'D.	H.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	 <b>TRANSNUCLEAR, INC.</b> <small>HAWTHORNE, N.Y.</small> <b>NUHOMS®-MP197 PACKAGING</b> <b>REGULATORY PLATE</b>						
PS	5/1/01							
WRS	5/1/01							
JC	5/1/01							
PS	5/1/01							
SCALE	SIZE	DWG. NO.	REV.					
HALF	B	1093-71-20	0					

**FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION**

NO.	DATE	REVISIONS	DWN.	CHK'D.	M.D.	N/T	Q/A	PROJ.
APPROVALS	DATE	<div style="text-align: center;">   <b>TRANSNUCLEAR, INC.</b>  <small>HAWTHORNE, N.Y.</small>  <b>NUHOMS<sup>®</sup>-MP197 PACKAGING</b>  <b>ON TRANSPORT SKID</b> </div>						
PROJ.	5/1/01							
Q/A	5/1/01							
N/T								
MECH. DES.	5/1/01							
CHK'D. BY	5/1/01							SAR
DWN. BY	27 APR. 01	NONE	B	1093-71-21				0
		SCALE	SIZE	DWG. NO.				REV.

The cask containment boundary and the canister shell, the inner top cover plate, the inner bottom cover plate, the siphon vent block, and the siphon/vent port cover plates of the DSC are designed, fabricated and inspected in accordance with the ASME Code Subsections NB to the maximum practical extent. The basket is designed, fabricated and inspected in accordance with ASME Code Subsection NG to the maximum practical extent. Other cask components (such as the shield shell and neutron shielding) and canister components (such as outer bottom cover, top and bottom shield plugs) are not governed by the ASME Code.

**ASME Code Exceptions for the NUHOMS-MP197 Transport Cask Containment Boundary**

ASME Code Section/Article	Code Requirement	Exception, Justification & Compensatory Measures
NCA	All	Not compliant with NCA
NB-1100	Requirements for Code Stamping of Components	The NUHOMS-MP197 Transport Cask containment boundary is designed & fabricated in accordance with the ASME Code, Section III, Subsection NB to the maximum extent practical. However, Code Stamping is not required. As Code Stamping is not required, the fabricator is not required to hold an ASME "N" or "NPT" stamp, or to be ASME Certified.
NB-1131	The design specification shall define the boundary of a component to which other components are attached.	A code design specification is not prepared for the NUHOMS-MP197 Transport Cask. A TN design criteria document is prepared in accordance with TN's QA program.
NB-2130	Material must be supplied by ASME approved material suppliers	Material is certified to meet all ASME Code criteria but is not eligible for certification or Code Stamping if a non-ASME fabricator is used. As the fabricator is not required to be ASME certified, material certification to NB-2130 is not possible. Material tractability & certification are maintained in accordance with TN's NRC approved QA program.
NB-4121	Material Certification by Certificate Holder	
NB-7000	Overpressure Protection	No overpressure protection is provided for the NUHOMS-MP197 Transport Cask. The function of the NUHOMS-MP197 Transport Cask is to contain radioactive materials under normal, off-normal, and hypothetical accident conditions postulated to occur during transportation. The NUHOMS-MP197 Transport Cask is designed to withstand the maximum internal pressure considering 100% fuel rod failure at maximum accident temperature. The NUHOMS-MP197 Transport Cask is pressure tested in accordance with the requirements of 10CFR71 and TN's approved QA program.
NB-8000	Requirements for nameplates, stamping & reports per NCA-8000	The NUHOMS-MP197 Transport Cask nameplates provide the information required by 10CFR71 and 49CFR173 as appropriate. Code stamping is not required for the NUHOMS-MP197 Transport Cask. QA Data packages are prepared in accordance with the requirements of 10CFR71 and TN's approved QA program.

**ASME Code Exceptions for the NUHOMS-61BT Canister**

ASME Code Section/Article	Code Requirement	Exception, Justification & Compensatory Measures
NCA	All	Not compliant with NCA
NB-1100	Requirements for Code Stamping of Components	The canister shell, the inner top cover plate, the inner bottom cover plate, the siphon vent block, and the siphon/vent port cover plates of the DSC are designed & fabricated in accordance with the ASME Code, Section III, Subsection NB to the maximum extent practical. However, Code Stamping is not required. As Code Stamping is not required, the fabricator is not required to hold an ASME "N" or "NPT" stamp, or to be ASME Certified.
NB-2130	Material must be supplied by ASME approved material suppliers	Material is certified to meet all ASME Code criteria, but is not eligible for certification or Code Stamping if a non-ASME fabricator is used. As the fabricator is not required to be ASME certified, material certification to NB-2130 is not possible. Material traceability & certification are maintained in accordance with TN's NRC approved QA program.
NB-4121	Material Certification by Certificate Holder	
NB-4243 and NB-5230	Category C weld joints in vessels and similar weld joints in other components shall be full penetration joints. These welds shall be examined by UT or RT and either PT or MT	The joint between the top outer and inner cover plates and the shell are design and fabricated per ASME Code Case N-595-1. The welds are partial penetration welds and the root and final layer are PT examined.
NB-6100 and 6200	All completed pressure retaining systems shall be pressure tested	The vent and siphon block is also not pressure tested due to the manufacturing sequence. The siphon block weld is helium leak tested when fuel is loaded and then covered with the outer top closure plate. Meets ASME code per code case N-591-1.
NB-7000	Overpressure Protection	No overpressure protection is provided for the NUHOMS-61BT DSC. The function of the NUHOMS-61BT DSC is to contain radioactive materials under normal, off-normal, and hypothetical accident conditions postulated to occur during transportation. The NUHOMS-61BT DSC is designed to withstand the maximum internal pressure considering 100% fuel rod failure at maximum accident temperature. The NUHOMS-61BT DSC is pressure tested in accordance with the requirements of 10CFR71 and TN's approved QA program.
NB-8000	Requirements for nameplates, stamping & reports per NCA-8000	The NUHOMS-61BT DSC nameplates provide the information required by 10CFR71, 49CFR173, and 10CFR72 as appropriate. Code stamping is not required for the NUHOMS-61BT DSC. QA Data packages are prepared in accordance with the requirements of 10CFR71, 10CFR72, and TN's approved QA program.

**ASME Code Exceptions for the NUHOMS-61BT DSC Fuel Basket**

ASME Code Section/Article	Code Requirement	Exception, Justification & Compensatory Measures
NG-1100	Requirement for Code Stamping of Components	The NUHOMS-61BT DSC baskets are designed & fabricated in accordance with the ASME Code, Section III, Subsection NG to the maximum extent practical as described in the SAR, but Code Stamping is not required. As Code Stamping is not required, the fabricator is not required to hold an ASME N or NPT stamp or be ASME Certified.
NG-2000	Use of ASME Material	Material is certified to meet all ASME Code criteria but is not eligible for certification or Code Stamping if a non-ASME fabricator is used. As the fabricator is not required to be ASME certified, material certification to NG-2130 is not possible. Material tractability & certification are maintained in accordance with TN's NRC approved QA program. The poison material and aluminum plates are not used for structural analysis, but to provide criticality control and heat transfer. They are not ASME Code Class I materials.
NCA	All	Not compliant with NCA as no code stamp is used.

NO.	DATE	REVISIONS	DWN	CHK'D	ME.	D/A	PRD.
APPROVAL DATE							
PS 4/10							
NRS 5/10							
JL 5/10							
PS 5/10							
STP 27 APR 01							
NONE		B	1093-71-22				
SCALE	SIZE	DWG. NO.	REV.				

TRANSNUCLEAR, INC.  
HAUTBOURG, N.Y.  
NUHOMS-MP197 PACKAGING  
ASME CODE COMPLIANCE  
AND EXCEPTIONS SAR

**Table 1-1  
Nominal Dimensions and Weights of the NUHOMS<sup>®</sup>-61B Packaging**

<b>Nominal Dimensions (in.)</b>	
NUHOMS <sup>®</sup> -MP197 packaging overall length with impact limiters and thermal shield	281.25
NUHOMS <sup>®</sup> -MP197 packaging overall length without impact limiters and thermal shield	208.00
NUHOMS <sup>®</sup> -MP197 cask impact limiter outside diameter	122.00
NUHOMS <sup>®</sup> -MP197 cask outside diameter (w/o impact limiters and thermal shield)	91.50
NUHOMS <sup>®</sup> -MP197 cask cavity inner diameter	68.00
NUHOMS <sup>®</sup> -MP197 cask cavity length	197.00
NUHOMS <sup>®</sup> -MP197 cask inner containment shell radial thickness	1.25
NUHOMS <sup>®</sup> -MP197 cask lead gamma shield radial thickness	3.25
NUHOMS <sup>®</sup> -MP197 cask body outer shell	2.50
NUHOMS <sup>®</sup> -MP197 cask closure lid thickness	4.50
NUHOMS <sup>®</sup> -MP197 cask bottom thickness	6.50
NUHOMS <sup>®</sup> -MP197 cask resin and aluminum box thickness	4.50
NUHOMS <sup>®</sup> -61BT DSC overall length (does not include grapple ring at bottom)	195.9
NUHOMS <sup>®</sup> -61BT DSC outer diameter	67.25
NUHOMS <sup>®</sup> -61BT DSC cavity length	179.50
NUHOMS <sup>®</sup> -61BT DSC cavity inner diameter	66.25
Overall NUHOMS <sup>®</sup> -61BT DSC fuel basket length (with hold down ring)	178.5
NUHOMS <sup>®</sup> -61BT DSC fuel basket outer diameter	66.00
<b>Nominal Weights (lb.×1000)</b>	
Weight of fuel assemblies	43.0
Loaded weight of NUHOMS <sup>®</sup> -MP197 Packaging without impact limiters	237.23
Weight of impact limiters, thermal shield, and attachments.	27.87
Total loaded weight of NUHOMS-MP197 <sup>®</sup> Packaging (without transport skid)	265.1

Notes to Figure 1-1

A. Some details exaggerated for clarity.

B. Components are listed below:

- 1 Impact Limiter
- 2 Canister
- 3 Fuel Basket
- 4 Hold Down Ring
- 5 Transport Cask Lid
- 6 Transport Cask Inner Shell
- 7 Transport Cask Gamma (Lead) Shield
- 8 Transport Cask Outer Shell
- 9 Transport Cask Neutron (Resin) Shield
- 10 Transport Cask Shield Shell
- 11 Transport Cask Bottom Closure
- 12 Transport Cask Bearing Block
- 13 Impact Limiter Attachment Bolt
- 14 Thermal Shield
- 15 Trunnion

**Figure 1-1**

**General Arrangement  
NUHOMS-MP197 Packaging**

**FIGURE WITHHELD AS SENSITIVE  
UNCLASSIFIED INFORMATION**