72-1004

TRANSNUCLEAR
AN AREVA COMPANY

September 23, 2004
NUH03-04-117

Mr. L. Raynard Wharton
Spent Fuel Project Office, NMSS
U. S. Nuclear Regulatory Commission
11555 Rockville Pike M/S O13-D-13
Rockville, MD 20852

Subject: Submittal of Revision 1 of Application for Amendment No. 9 to the NUHOMS® Certificate of Compliance No. 1004 (TAC NO. L23732).

References:
1. Revision 1 of Application for Amendment No. 8 to the NUHOMS® Certificate of Compliance (CoC), No. 1004, (TAC NO. L23653).
2. Supplement to Revision 1 of Application for Amendment No. 8 to the NUHOMS® Certificate of Compliance (CoC), No. 1004, (TAC NO. L23653).

Dear Mr. Wharton:

Transnuclear, Inc. (TN) herewith submits Revision 1 of our application for Amendment No. 9 to the NUHOMS® CoC No. 1004.

Per our earlier discussion with you, the specific changes to Technical Specifications 1.2.10 and 1.2.13 which were withdrawn per Reference 2 are being reflected in this supplement. Also included herewith are pages of the Technical Specifications which were revised in References 1 and 2 to reflect the existing configuration of the Specifications being amended in this application.

Finally, Table 1-1g of proposed Technical Specifications 1.2.1 is revised to reflect the alternate poison plate configurations for each 32PT DSC basket type and to be consistent with SAR Table M.6-1.

Please replace the affected pages of Revision 0 of this application with the changed pages included herewith.

Should you or your staff require additional information to support review of this application, please do not hesitate to contact me at 510-744-6053 or Mr. Jayant Bondre at 510-744-6043.

Sincerely,

UBChopra

U. B. Chopra

Licensing Manager

NMSS01

Docket 72-1004

Enclosures:

1. Ten Copies of Replacement Pages of Revision 1 of Amendment No. 9 to the NUHOMS® Certificate of Compliance (CoC), No. 1004.

ATTACHMENT A

Description, Justification, and Evaluation of Amendment 9 Changes

ATTACHMENT A

DESCRIPTION, JUSTIFICATION AND EVALUATION OF AMENDMENT CHANGES

1.0 INTRODUCTION

The purpose of this application for Amendment No. 9 to CoC 1004 is:

- To expand the NUHOMS®–32PT DSC Fuel Specification and Fuel Qualification Tables (FQTs), previously approved per CoC 1004 Amendment No. 5, to include reconstituted fuel assemblies and assemblies with low initial enrichment levels (between 1.1 and 2.0 wt % U-235).

- To revise the 32PT DSC Fuel Specification Table 1-1g to show the minimum soluble boron loading concentration required as a function of the fuel initial enrichment for the CE 14x14, WE 14x14, and CE 15x15 Class PWR fuel assemblies. Also, revise Fuel Specification 1.2.15a to be consistent with this change.

- To add CE 14x14, WE 14x14, WE 15x15, and WE 17x17 Class PWR fuel assemblies to the authorized contents of the NUHOMS®–24PHB DSC, that was previously approved per CoC 1004 Amendment No. 6.

This application provides the supporting shielding analysis and criticality analyses for the above listed changes. Thermal, structural, and confinement analyses for the 32PT DSC and 24PHB DSC are not affected by these changes.

This section of the application provides (1) a brief description of the changes, (2) justification for the changes, and (3) a safety evaluation for these changes.

Revision 1 of this application requests changes to Tech Specifications 1.2.2 (Table 1-1g), 1.2.10 and 1.2.13.

2.0 BRIEF DESCRIPTION OF THE CHANGE

2.1 Significant Changes to the Technical Specifications Relative to NUHOMS® CoC 1004, *Amendment* 8

Attachment B of this submittal includes a mark-up of the affected Technical Specifications. The changes listed below are relative to CoC 1004 Amendments 8 which is currently under NRC review:

- For the 32PT DSC, revise Fuel Qualification Tables 1-2d, 1-2e, 1-2f, 1-2g and 1-2h to include fuel assemblies with low enrichment levels and provide cooling times for regions depicted as "Not Analyzed" in these specific Tables. Also, revise these Tables to indicate cooling time requirements for reconstituted fuel assemblies.

- For the 32PT DSC, revise Fuel Specification Table 1-1e to include reconstituted fuel assemblies. Also, revise Table 1-1f to clarify that CE 15x15 fuel assemblies with stainless steel plugging clusters are acceptable.

- For the 32PT DSC, revise Fuel Specification Table 1-1g to include variable soluble boron loading as a function of initial enrichment for CE 14x14, CE 15x15 and WE 14x14 assembly class. *Table 1-1g is revised to reflect the alternate poison plate configurations for each 32PT DSC basket type.*

- For the 32PT DSC, revise "Limit/Specification" section of Specification 1.2.15a to delete 2500 ppm and add reference to Table 1-1g.

- For the 24PHB DSC, revise Table 1-1i to include storage of WE 17x17, WE 15x15, CE 14x14 and WE 14x14 PWR assembly class to the 24PHB DSC.

In addition, TN requests changes to Technical Specifications *as described below* which provide clarification and consistency to the contents of *these* Technical Specifications without altering the *currently specified limits or the supporting bases* of the Specifications.

- Revise *the title and Limit/Specification of Specification 1.2.10 to replace the words "Outside the Spent Fuel Building" with "for all transfer operations". In addition, add a definition of the term "Transfer Operations" in the Basis section. There is no change to the currently specified 80" TC/DSC handling height limit which is based on a TC/DSC drop accident analysis as stated in the Basis section and presented in FSAR section 8.2.5. Addition of a definition of "Transfer Operations" provides clarity to the applicability of this Specification.*

- *Revise Specification 1.2.13 to delete Limits 1, 2, 3, and 4. Instead, add a new Limit to say "No lifts or handling or transfer of a loaded TC/DSC is permissible at DSC basket temperatures below 0°F". This change removes the 80" lifting/handling limit from this Specification, since this handling height limit for transfer operations is controlled by Specification 1.2.10 as discussed above. Hence, with this change, Specification 1.2.13 limits the operation of a Loaded TC/DSC in a low temperature environment, while Specification 1.2.10 controls the Handling Height of a Loaded TC/DSC.*

  Accordingly, the terms "Heights" or "and Height" are deleted from the Specification. The Bases section is also revised to delete the bases for the 80" drop height limit.

  The phrase "and Location" is also deleted from the title of the Specification. The Applicability section is revised to delete the distinction between the locations where 10 CFR Part 50 or Part 72 requirements are applicable, since the requirements of Part 72 apply to both outside and inside the spent fuel building (once the loaded TC/DSC is placed on the transfer trailer).

The Action statement of this Specification is revised to correct an editorial error (the term "available" is replaced with the term "unavailable".

Besides adding clarity, the proposed revision of this Specification is a betterment change and is more restrictive. This change results in a deletion of the previously allowed option of limited TC/DSC handling operations at temperatures between -20°F and 0°F. There is no change to the low temperature limit or the bases for this limit as currently specified in the Bases section.

- Revise Technical Specification 1.2.12 to provide clarification to the intent of the Action Statement a.

2.2 Changes to Updated NUHOMS® FSAR, Revision *8*

Attachments C-1 and C-2 of this submittal include revised and new pages for the Updated FSAR Appendices M and N, respectively. These updated pages are prepared in a format consistent with the Standard Review Plan for Dry Cask Storage (NUREG 1536).

Attachments C-1 and C-2 provide a complete supporting evaluation of the changes to the NUHOMS®-32PT and 24PHB System requested under this application.

3.0 JUSTIFICATION OF CHANGE

Nuclear Management Company (NMC) and Dominion Nuclear Connecticut (DNC) have contracted with TN to use the NUHOMS®-32PT system to store fuel assemblies with the revised parameters as described in this application at their Palisades and Millstone Nuclear Plants, respectively. Similarly, Progress Energy (PE) is considering an option to use 24PHB DSC to store fuel with these revised parameters at their Robinson Nuclear Plant.

To support the needs of NMC, DNC, and PE, TN requests that the staff assign appropriate priority for review of this application which is consistent with a February 2005 effective date for the amended CoC.

4.0 EVALUATION OF CHANGE

TN has evaluated the NUHOMS®-32PT and NUHOMS®-24PHB systems for structural, thermal, shielding and criticality adequacy and has concluded that the storage of PWR fuel with the revised parameters in the NUHOMS®-32PT and additional fuel types in the NUHOMS®-24PHB Systems have no significant effect on safety. This evaluation is documented in the updated Appendices M and N of the FSAR (Attachments C-1 and C-2, respectively).

ATTACHMENT B

Suggested Changes to Technical Specifications of CoC 1004 Amendment No. 8

(Changes proposed by CoC Amendment 8 have been included as current configuration.)

The NUHOMS®-32PT is designed for unirradiated fuel with an initial fuel enrichment of up to 5.0 wt. % U-235 as shown in Table 1-1g, taking credit for Poison Rod Assemblies (PRAs), poison plates, and soluble boron in the DSC cavity water during loading operations. The required PRA locations are per Figures 1-5, or 1-6 or 1-7. *A 32PT DSC basket may contain 0, 4, 8 or 16 PRAs and is designated a Type A, Type B, Type C or Type D basket, respectively. Each basket type is designed with up to three alternate configurations depending on the configuration of poison plates provided (16, 20 or 24) as shown in Table 1-1g.* Table 1-1h specifies the minimum B10 content for poison plates. Specification 1.2.15a defines the requirements for boron concentration in the DSC cavity water for the NUHOMS®-32PT design only.

The NUHOMS®-24PHB is designed for unirradiated fuel with an assembly average initial enrichment of less than or equal to 4.5 wt. % U-235 as shown in Table 1-1i, taking credit for soluble boron in the DSC cavity water during loading operations. Specification 1.2.15b defines the requirements for boron concentration in the DSC cavity water for the NUHOMS®-24PHB design only.

The NUHOMS®-24PTH is designed for unirradiated fuel with an assembly average initial enrichment of less than or equal to 5.0 wt. % U-235, as shown in Table 1-1l, taking credit for soluble boron in the DSC cavity water during loading operations and the boron content in the poison plates of the DSC basket, as shown in Table 1-1p for intact fuel and Table 1-1q for damaged fuel. The 24PTH DSC basket is designated as Type 1, if it is provided with aluminum inserts and Type 2 if it does not contain the aluminum inserts. Each basket type is designed with three alternate configurations, based on the boron content in the poison plates, as listed in Table 1-1r. The specification for the Metal Matrix Composite (MMC) for the 24PTH poison plates is provided in Table 1-1s. Specification 1.2.15c defines the requirements for boron concentration in the DSC cavity water as a function of the DSC basket type for the various fuel classes authorized for storage in the 24PTH DSC for the NUHOMS®-24PTH design only.

The thermal design criterion of the fuel to be stored is that the total maximum heat generation rate per assembly and BPRA or Control Components be such that the fuel cladding temperature is maintained within established limits during normal and off-normal conditions. For the NUHOMS®-24P, 52B and 61BT systems, fuel cladding temperature limits were established based on methodology in PNL-6189 and PNL-4835. For the NUHOMS®-32PT, 24PHB and 24PTH systems, fuel cladding limits are based on ISG-11, Rev. 2 (Reference 3).

The radiological design criterion is that fuel stored in the NUHOMS® system must not increase the average calculated HSM or transfer cask surface dose rates beyond those calculated for the 24P, 24PHB, 52B, 61BT, or 32PT canister full of design basis fuel assemblies with or without BPRAs. The design value average HSM and cask surface dose rates for the 24P and 52B canisters were calculated to be 48.6 mrem/hr and 591.8 mrem/hr respectively based on storing twenty four (24) Babcock and Wilcox 15x15 PWR assemblies (without BPRAs) with 4.0 wt. % U-235 initial enrichment, irradiated to 40,000 MWd/MTU, and having a post irradiation time of five years. To account for BPRAs, the fuel assembly cooling required times are increased to maintain the above dose rate limits.

Table 1-1g
Initial Enrichment, Required Number of PRAs *and Minimum Soluble Boron Loading* (NUHOMS®-32PT DSC)

Assembly Class and Type	*Soluble Boron Loading (ppm)*	*No PRAs (Type A) Poison Plate Configuration*			*4 PRAs (Type B) Poison Plate Configuration*		*8 PRAs (Type C) Poison Plate Configuration*		*16 PRAs (Type D) Poison Plate Configuration*	
		16	*20*	*24*	*20*	*24*	*20*	*24*	*20*	*24*
WE 17x17 Fuel Assembly[1] *Westinghouse 17x17 LOPAR/Standard* *Westinghouse 17x17 OFA/Vantage 5,+*[2]	*2500*	*3.40*	*3.40*	*3.40*	*4.00*	*4.00*	*4.50*	*4.50*	*5.00*	*5.00*
B&W 15x15 Mark B Fuel Assembly[1]	*2500*	*3.30*	*3.30*	*3.30*	*3.90*	*3.90*	NE	NE	*5.00*	*5.00*
WE 15x15 Fuel Assembly *Westinghouse 15x15 Standard/ZC* *Exxon/ANF 15x15 WE*	*2500*	*3.40*	*3.40*	*3.40*	*4.00*	*4.00*	*4.60*	*4.60*	*5.00*	*5.00*
CE 14x14 Fuel Assembly *CE 14x14 Standard/Generic* *CE 14x14 Fort Calhoun*	*1800*	*3.35*	*3.40*	*3.50*	*3.90*	*4.00*	*4.35*	*4.35*	*NE*	*NE*
	2000	*3.50*	*3.60*	*3.70*	*4.10*	*4.20*	*4.55*	*4.55*	*NE*	*NE*
	2100	*3.60*	*3.65*	*3.80*	*4.20*	*4.30*	*4.70*	*4.70*	*NE*	*NE*
	2200	*3.70*	*3.75*	*3.90*	*4.30*	*4.40*	*4.80*	*4.80*	*NE*	*NE*
	2300	*3.75*	*3.85*	*4.00*	*4.40*	*4.50*	*4.90*	*4.90*	*NE*	*NE*
	2400	*3.80*	*3.90*	*4.05*	*4.50*	*4.60*	*5.00*	*5.00*	*NE*	*NE*
	2500	*3.90*	*4.05*	*4.15*	*4.55*	*4.70*	-	-	*NE*	*NE*
WE 14x14 Fuel Assembly *Westinghouse 14x14 ZCA/ZCB* *Westinghouse 14x14 OFA* *Exxon/ANF 14x14 WE*	*1800*	*3.55*	*3.65*	*3.75*	*4.25*	*4.40*	*NE*	*NE*	*NE*	*NE*
	2000	*3.75*	*3.85*	*3.90*	*4.50*	*4.60*	*NE*	*NE*	*NE*	*NE*
	2100	*3.80*	*3.95*	*4.00*	*4.60*	*4.75*	*NE*	*NE*	*NE*	*NE*
	2200	*3.90*	*4.00*	*4.10*	*4.70*	*4.85*	*NE*	*NE*	*NE*	*NE*
	2300	*4.00*	*4.10*	*4.20*	*4.85*	*5.00*	*NE*	*NE*	*NE*	*NE*
	2400	*4.10*	*4.20*	*4.30*	*4.95*	-	*NE*	*NE*	*NE*	*NE*
	2500	*4.15*	*4.25*	*4.40*	*5.00*	-	*NE*	*NE*	*NE*	*NE*
CE 15x15 Fuel Assembly *CE 15x15 Palisades* *Exxon/ANF 15x15 CE*	*1800*	*3.00*	*3.15*	*3.15*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2000	*3.15*	*3.30*	*3.30*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2100	*3.20*	*3.35*	*3.40*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2200	*3.30*	*3.45*	*3.50*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2300	*3.35*	*3.50*	*3.55*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2400	*3.40*	*3.60*	*3.60*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2500	*3.50*	*3.65*	*3.70*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*

NOTES:
(1) With or without BPRAs. *BPRAs shall not be stored in basket location where a PRA is required.*
(2) *Includes all Vantage versions (5, +, ++, etc.)*
NE = Not Evaluated

Table 1-1r
B10 Specification for the NUHOMS®-24PTH Poison Plates

NUHOMS®-24PTH DSC Basket Type[(1)]	Minimum B10 Aerial Density, gm/cm^2	
	Natural or Enriched Boron Aluminum Alloy / Metal Matric Composite (MMC)	Boral®
1A or 2A	.007	.009
1B or 2B	.015	.019
1C or 2C	.032	.040

(1) Basket Type 1 contains aluminum inserts in the R45 transition rails of the basket, Type 2 does not contain aluminum inserts.

Table 1-1s
Specification for the Metal Matrix Composite (MMC) for the NUHOMS®-24PTH Poison Plates

No.	Specification
1	The metal matrix composite shall consist of boron carbide powder in an aluminum alloy matrix.
2	The boron carbide content shall be limited to a maximum 40% by volume.
3	No more than 10 wt % of the boron carbide powder shall be larger than 60 microns.
4	The product shall be at least 98% of theoretical density.
5	The composite final product form shall have the tensile properties: • Minimum yield strength, 0.2% offset: 1.5 ksi • Minimum ultimate strength: 5.0 ksi • Minimum elongation in 2 inches: 1%

1.2.2 DSC Vacuum Pressure During Drying

Limit/Specification:

Vacuum Pressure:	≤3 mm Hg
Time at Pressure:	≥30 minutes following evacuation
Number of Pump-Downs:	2

Applicability: This is applicable to all DSCs. The term "inner top cover" as used in this and other Technical Specifications means either the inner top cover plate or the top shield plug assembly.

Objective: To ensure a minimum water content.

Action: If the required vacuum pressure cannot be obtained:

1. Confirm that the vacuum drying system is properly installed.
2. Check and repair, or replace, the vacuum pump.
3. Check and repair the system as necessary.
4. Check and repair the seal weld between the inner top cover and the DSC shell.

Surveillance: No maintenance or tests are required during normal storage. Surveillance of the vacuum gauge is required during the vacuum drying operation.

Bases: A stable vacuum pressure of ≤3 mm Hg further ensures that all liquid water has evaporated in the DSC cavity, and that the resulting inventory of oxidizing gases in the DSC is well below the 0.25 volume %.

1.2.3 24P and 52B DSC Helium Backfill Pressure

Limit/Specifications:

Helium 2.5 psig ± 2.5 psig backfill pressure (stable for 30 minutes after filling).

Applicability: This specification is applicable to 24P and 52B DSCs only.

Objective: To ensure that: (1) the atmosphere surrounding the irradiated fuel is a non-oxidizing inert gas; (2) the atmosphere is favorable for the transfer of decay heat.

Action: If the required pressure cannot be obtained:

1. Confirm that the vacuum drying system and helium source are properly installed.
2. Check and repair or replace the pressure gauge.
3. Check and repair or replace the vacuum drying system.
4. Check and repair or replace the helium source.
5. Check and repair the seal weld between the inner top cover and the DSC shell.

If pressure exceeds the criterion, release a sufficient quantity of helium to lower the DSC cavity pressure.

Surveillance: No maintenance or tests are required during the normal storage. Surveillance of the pressure gauge is required during the helium backfilling operation.

Bases: The value of 2.5 psig was selected to ensure that the pressure within the DSC is within the design limits during any expected normal and off-normal operating conditions.

1.2.3a 61BT, 32PT, 24PHB and 24PTH DSC Helium Backfill Pressure

Limit/Specifications:

Helium 2.5 psig ± 1.0 psig backfill pressure (stable for 30 minutes after filling).

Applicability: This specification is applicable to 61BT, 32PT, 24PHB and 24PTH DSC only.

Objective: To ensure that: (1) the atmosphere surrounding the irradiated fuel is a non-oxidizing inert gas; (2) the atmosphere is favorable for the transfer of decay heat.

Action: If the required pressure cannot be obtained:

1. Confirm that the vacuum drying system and helium source are properly installed.
2. Check and repair or replace the pressure gauge.
3. Check and repair or replace the vacuum drying system.
4. Check and repair or replace the helium source.
5. Check and repair the seal weld between the inner top cover and the DSC shell.

If pressure exceeds the criterion, release a sufficient quantity of helium to lower the DSC cavity pressure.

Surveillance: No maintenance or tests are required during the normal storage. Surveillance of the pressure gauge is required during the helium backfilling operation.

Bases: The value of 2.5 psig was selected to ensure that the pressure within the DSC is within the design limits during any expected normal and off-normal operating conditions.

1.2.4 24P and 52B DSC Helium Leak Rate of Inner Seal Weld

Limit/Specification:

$\leq$1.0 x 10^{-4} atm · cubic centimeters per second (atm · cm^3/s) at the highest DSC limiting pressure.

Applicability: This specification is applicable to the inner top cover seal weld of the 24P and 52B DSCs only.

Objective:

1. To limit the total radioactive gases normally released by each canister to negligible levels. Should fission gases escape the fuel cladding, they will remain confined by the DSC confinement boundary.

2. To retain helium cover gases within the DSC and prevent oxygen from entering the DSC. The helium improves the heat dissipation characteristics of the DSC and prevents any oxidation of fuel cladding.

Action: If the leak rate test of the inner seal weld exceeds 1.0x10^{-4} (atm · cm^3/s):

1. Check and repair the DSC drain and fill port fittings for leaks.

2. Check and repair the inner seal weld.

3. Check and repair the inner top cover plate for any surface indications resulting in leakage.

Surveillance: After the welding operation has been completed, perform a leak test with a helium leak detection device.

Bases: If the DSC leaked at the maximum acceptable rate of 1.0x10^{-4} atm · cm^3/s for a period of 20 years, about 63,100 cc of helium would escape from the DSC. This is about 1% of the 6.3 x 10^6 cm^3 of helium initially introduced in the DSC. This amount of leakage would have a negligible effect on the inert environment of the DSC cavity. (Reference: American National Standards Institute, ANSI N14.5-1987, For Radioactive Materials—Leakage Tests on Packages for Shipment," Appendix B3).

1.2.4a 61BT, 32PT, 24PHB and 24PTH DSC Helium Leak Rate of Inner Seal Weld

Limit/Specification:

$\leq 1.0 \times 10^{-7}$ reference cubic centimeters per second (cc/s).

Applicability: This specification is applicable to the inner top cover seal weld of 61BT, 32PT 24PHB and 24PTH DSC only.

Objective:

1. To demonstrate that the top cover to be "leak tight", as defined in "American National Standard for Leakage Tests on Packages for Shipment of Radioactive Materials," ANSI N14.5 – 1997.
2. To retain helium cover gases within the DSC and prevent oxygen from entering the DSC. The helium improves the heat dissipation characteristics of the DSC and prevents any oxidation of fuel cladding.

Action: If the leak rate test of the inner seal weld exceeds 1.0×10^{-7} reference cc/s:

1. Check and repair the inner seal weld.
2. Check and repair the inner top cover for any surface indications resulting in leakage.

Surveillance: After the welding operation has been completed, perform a leak test with a helium leak detection device.

Bases: The61BT, 32PT, 24PHB and 24PTH DSC will maintain an inert atmosphere around the fuel and radiological consequences will be negligible, since it is designed and tested to be leak tight.

1.2.10 *TC/DSC* Handling Height *for All Transfer Operations*

Limit/Specification:	1. The loaded TC/DSC shall not be handled at a height greater than 80 inches *for all transfer operations.* 2. In the event of a drop of a loaded TC/DSC from a height greater than 15 inches: (a) fuel in the DSC shall be returned to the reactor spent fuel pool; (b) the DSC shall be removed from service and evaluated for further use; and (c) the TC shall be inspected for damage and evaluated for further use.
Applicability:	The specification applies to handling the TC, loaded with the DSC, on route to, and at, the storage pad.
Objective:	1. To preclude a loaded TC/DSC drop from a height greater than 80 inches. 2. To maintain spent fuel integrity, according to the spent fuel specification for storage, continued confinement integrity, and DSC functional capability, after a tip-over or drop of a loaded DSC from a height greater than 15 inches.
Surveillance:	In the event of a loaded TC/DSC drop accident, the system will be returned to the reactor fuel handling building, where, after the fuel has been returned to the spent fuel pool, the DSC and TC will be inspected and *evaluated* for future use.
Basis:	*Transfer Operations include all activities from the time a loaded TC/DSC is disconnected from a crane until the DSC is in storage inside the HSM.* The NRC evaluation of the TC/DSC drop analysis concurred that drops up to 80 inches, of the DSC inside the TC, can be sustained without breaching the confinement boundary, preventing removal of spent fuel assemblies, or causing a criticality accident. This specification ensures that handling height limits will not be exceeded in transit to, or at the storage pad. Acceptable damage may occur to the TC, DSC, and the fuel stored in the DSC, for drops of height greater than 15 inches. The specification requiring inspection of the DSC and fuel following a drop of 15 inches or greater ensures that the spent fuel will continue to meet the requirements for storage, the DSC will continue to provide confinement, and the TC will continue to provide its design functions of DSC transfer and shielding.

1.2.13 TC/DSC Lifting/*Handling* as a Function of Low Temperature

Limit/Specification: *No lifts or handling or transfer of a loaded TC/DSC is permissible at DSC basket temperatures below 0°F.*

Applicability: These temperature limits apply to lifting and transfer of all loaded TC/DSCs inside and outside the spent fuel pool building.

Objective: The low temperature limits are imposed to ensure that brittle fracture of the ferritic steels, used in the TC trunnions and shell and in the DSC basket, does not occur during transfer operations.

Action: Confirm the basket temperature before transfer of the TC. If calculation or measurement of this value is *un*available, then the ambient temperature may conservatively be used.

Surveillance: The ambient temperature shall be measured before transfer of the TC/DSC.

Bases: The basis for the low temperature limits is ANSI N14.6-1986 paragraph 4.2.6 which requires at least 40°F higher service temperature than nil ductility transition (NDT) temperature for the TC. In the case of the standardized TC, the test temperature is -40°F; therefore, although the NDT temperature is not determined, the material will have the required 40°F margin if the ambient temperature is 0°F or higher. This assumes the material service temperature is equal to the ambient temperature.

The basis for the low temperature limit for the DSC is NUREG/CR-1815.

1.2.16 Provision of TC Seismic Restraint Inside the Spent Fuel Pool Building as a Function of Horizontal Acceleration and Loaded Cask Weight

Limit/Specification:

Seismic restraints shall be provided to prevent overturning of a loaded TC during a seismic event if a certificate holder determines that the horizontal acceleration is 0.40 g or greater. The determination of horizontal acceleration acting at the center of gravity (CG) of the loaded TC must be based on a peak horizontal ground acceleration at the site, but shall not exceed 0.25 g.

Applicability:	This condition applies to all TCs which are subject to horizontal accelerations of 0.40 g or greater.
Objective:	To prevent overturning of a loaded TC inside the spent fuel pool building.
Action:	Determine what the horizontal acceleration is for the TC.
Surveillance:	Determine need for TC restraint before any operations inside the spent fuel pool building.
Bases:	Calculation of overturning and restoring moments.

compartment grid assembly and transfer mechanical loads to the DSC shell. They also provide the thermal conduction path from the basket assembly to the canister shell wall, making it efficient in rejecting heat from its payload. This method of construction forms a robust structure of compartment assemblies which provides for storage of 32 fuel assemblies. The nominal clear dimension of each fuel compartment opening is 8.7 in. x 8.7 in., which provides clearance around the fuel assemblies.

During dry storage of the spent fuel in the NUHOMS®-32PT system, no active systems are required for the removal and dissipation of the decay heat from the fuel. The NUHOMS®-32PT DSC is designed to transfer the decay heat from the fuel to the basket, from the basket to the canister body and ultimately to the ambient via the HSM or TC.

Each canister is identified by a Mark Number as follows: WWW32PT-XXX-YYY-ZZZ, where: XXX is the canister type designation (S100/L100/S125/L125), YYY is the basket type designation, *while* WWW and ZZZ are designated by TN. Each canister is also marked with the patent number. *The basket type designation, YYY, consists of a letter (A, B, C, or D to designate 0, 4, 8 or 16 PRAs) and 2 numerals (16, 20 or 24 to designate the configuration of poison plates).*

M.1.2.2 Operational Features

M.1.2.2.1 General Features

The NUHOMS®-32PT DSCs are designed to safely store 32 intact standard PWR fuel assemblies with or without BPRAs. The NUHOMS®-32PT DSC is designed to maintain the fuel cladding temperature below allowable limits during storage, short-term accident conditions, short-term off-normal conditions and fuel transfer operations.

The criticality control features of the NUHOMS®-32PT DSC are designed to maintain the neutron multiplication factor k-effective less than the upper subcritical limit equal to 0.95 minus benchmarking bias and modeling bias under all conditions.

M.1.2.2.2 Sequence of Operations

The sequence of operations to be performed in loading fuel into the NUHOMS®-32PT DSCs is presented in Chapter M.8.

M.1.2.2.3 Identification of Subjects for Safety and Reliability Analysis

M.1.2.2.3.1 Criticality Prevention

Criticality is controlled by geometry, soluble boron in spent fuel pool and by utilizing fixed neutron poison material in the fuel basket. If required, depending on fuel assembly design and initial enrichment, Poison Rod Assemblies (PRAs), as shown in Figure M.1-2 are also used for criticality control. The 32PT basket may contain 0, 4, 8 or 16 PRAs and is called a Type A, Type B, Type C, or Type D, respectively. These features are only necessary during the loading and unloading operations that occur in the loading pool (underwater). However, the PRAs are left in place following the completion of the DSC draining and drying operations which are discussed in M.8.1.3. During storage, with the DSC cavity dry and sealed from the environment, criticality

Table M.2-3
Initial Enrichment, Required Number of PRAs *and Minimum Soluble Boron Loading*
(NUHOMS®-32PT DSC)

Assembly Class and Type	*Soluble Boron Loading (ppm)*	*No PRAs (Type A)*			*4 PRAs (Type B)*		*8 PRAs (Type C)*		*16 PRAs (Type D)*	
		Poison Plate Configuration			*Poison Plate Configuration*		*Poison Plate Configuration*		*Poison Plate Configuration*	
		16	*20*	*24*	*20*	*24*	*20*	*24*	*20*	*24*
WE 17x17 Fuel Assembly[(1)] *Westinghouse 17x17 LOPAR/Standard* *Westinghouse 17x17 OFA/Vantage 5,+*[(2)]	*2500*	*3.40*	*3.40*	*3.40*	*4.00*	*4.00*	*4.50*	*4.50*	*5.00*	*5.00*
B&W 15x15 Mark B Fuel Assembly[(1)]	*2500*	*3.30*	*3.30*	*3.30*	*3.90*	*3.90*	*NE*	*NE*	*5.00*	*5.00*
WE 15x15 Fuel Assembly *Westinghouse 15x15 Standard/ZC* *Exxon/ANF 15x15 WE*	*2500*	*3.40*	*3.40*	*3.40*	*4.00*	*4.00*	*4.60*	*4.60*	*5.00*	*5.00*
CE 14x14 Fuel Assembly *CE 14x14 Standard/Generic* *CE 14x14 Fort Calhoun*	*1800*	*3.35*	*3.40*	*3.50*	*3.90*	*4.00*	*4.35*	*4.35*	*NE*	*NE*
	2000	*3.50*	*3.60*	*3.70*	*4.10*	*4.20*	*4.55*	*4.55*	*NE*	*NE*
	2100	*3.60*	*3.65*	*3.80*	*4.20*	*4.30*	*4.70*	*4.70*	*NE*	*NE*
	2200	*3.70*	*3.75*	*3.90*	*4.30*	*4.40*	*4.80*	*4.80*	*NE*	*NE*
	2300	*3.75*	*3.85*	*4.00*	*4.40*	*4.50*	*4.90*	*4.90*	*NE*	*NE*
	2400	*3.80*	*3.90*	*4.05*	*4.50*	*4.60*	*5.00*	*5.00*	*NE*	*NE*
	2500	*3.90*	*4.05*	*4.15*	*4.55*	*4.70*	-	-	*NE*	*NE*
WE 14x14 Fuel Assembly *Westinghouse 14x14 ZCA/ZCB* *Westinghouse 14x14 OFA* *Exxon/ANF 14x14 WE*	*1800*	*3.55*	*3.65*	*3.75*	*4.25*	*4.40*	*NE*	*NE*	*NE*	*NE*
	2000	*3.75*	*3.85*	*3.90*	*4.50*	*4.60*	*NE*	*NE*	*NE*	*NE*
	2100	*3.80*	*3.95*	*4.00*	*4.60*	*4.75*	*NE*	*NE*	*NE*	*NE*
	2200	*3.90*	*4.00*	*4.10*	*4.70*	*4.85*	*NE*	*NE*	*NE*	*NE*
	2300	*4.00*	*4.10*	*4.20*	*4.85*	*5.00*	*NE*	*NE*	*NE*	*NE*
	2400	*4.10*	*4.20*	*4.30*	*4.95*	-	*NE*	*NE*	*NE*	*NE*
	2500	*4.15*	*4.25*	*4.40*	*5.00*	-	*NE*	*NE*	*NE*	*NE*
CE 15x15 Fuel Assembly *CE 15x15 Palisades* *Exxon/ANF 15x15 CE*	*1800*	*3.00*	*3.15*	*3.15*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2000	*3.15*	*3.30*	*3.30*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2100	*3.20*	*3.35*	*3.40*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2200	*3.30*	*3.45*	*3.50*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2300	*3.35*	*3.50*	*3.55*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2400	*3.40*	*3.60*	*3.60*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*
	2500	*3.50*	*3.65*	*3.70*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*

NOTES:

(1) With or without BPRAs. *BPRAs shall not be stored in basket location where a PRA is required.*

(2) *Includes all Vantage versions (5, +, ++, etc.).*

NE – Not Evaluated

ATTACHMENT C-1

Updated FSAR Revision *8* Changed Pages

Revisions indicated relative to Updated FSAR, Revision *8*. Listed below are the affected FSAR Appendix M pages:

- *M.1-4*
- M.2-3
- M.2-13 thru M.2-15
- M.2-17 thru M.2-21
- M.5-1 thru M.5-2
- M.5-4 thru M.5-8
- M.5-8a thru M.5-58c (New)
- M.5-89a (New)
- M.5-90 thru M.5-99
- M.5-99a thru M.5-99g (New)
- M.6-2
- M.6-4
- M.6-4a (New)
- M.6-8 thru M.6-9
- M.6-10a (New)
- M.6-11
- M.6-11a (New)
- M.6-12
- M.6-30
- M.6-32
- M.6-34
- M.6-42 thru M.6-46
- M.6-46a (New)
- M.6-47 thru M.6-48
- M.6-48a thru M.6.48d (New)
- M.6-49
- M.6-49a thru M.6-49c (New)
- M.6-50
- M.6-56a thru M.6-56nn (New)

ATTACHMENT C-2

Updated FSAR Revision *8* Changed Pages

Revisions indicated relative to Updated FSAR, Revision *8*. Listed below are the affected FSAR Appendix N pages:

- Page N.2-2
- Page N.2-2a (New)
- Page N.2-7
- Page N.2-9
- Page N.5-1
- Page N.5-1a (New)
- Page N.6-1 thru N.6-3
- Page N.6-5
- Page N.6-6
- Page N.6-27
- Page N.6-39a thru N.6-39i (New)
- Page N.6-40
- Page N.6-46 thru N.6-49 (New)