SENSITIVE

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Spent Fuel Project Office, NMSS
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Subject: Summary Report of 72.48 Evaluations Implemented in NUHOMS® FSAR, Revision 6

Reference: Final Safety Analysis Report (FSAR) for the Standardized NUHOMS® Horizontal Modular Storage System For Irradiated Nuclear Fuel, Revision 6.

Attention: Document Control Desk:

Transnuclear Inc. (TN) herewith submits the subject bi-annual report per the requirement of 10CFR 72.48(d)(2). This report provides a brief description of the changes, tests and experiments to the NUHOMS® system implemented from March 31, 2000 through October 31, 2001 (scope cut-off date for Reference 1).

Most of these changes were implemented under the provisions of Condition 9 of CoC 1004, Amendment 2 until this Condition was deleted with the issuance of CoC 1004, Amendment 3, effective September 12, 2001.

Changes listed in the subject report have been grouped together according to the following three categories: Dry Shielded Canister (DSC), Horizontal Storage Module (HSM), Transfer Cask (TC). For clarity of presentation, the contents of the subject report have been arranged such that each change description is followed by a summary of the safety evaluation for that specific change.

TN has also included a summary of those Safety Evaluations performed during the period March 31, 2000 to October 31, 2001 that address fabrication and installation Nonconformances of the NUHOMS® components.

All of the changes listed in the subject report were evaluated and determined not to require an amendment to the CoC.

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

NMSS01

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Sincerely,

UBChopra

U. B. Chopra

Licensing Manager

Docket 72-1004

Attachment: Summary Report of 72.48 Evaluations Performed for the NUHOMS® System for the Period 3/31/2000 through 10/31/2001 (Reference FSAR, Revision 6).

cc: File: NUH003.12003, Duplicate Storage
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REPORT OF 72.48 EVALUATIONS (CONDITION 9 of CofC 1004) PERFORMED FOR THE NUHOMS® SYSTEM FOR THE PERIOD 3/31/00 TO 10/31/01 (REFERENCE FSAR REVISION 6)

DSC CHANGES

SE 72-1023

This Safety Evaluation (SE) addresses the addition of a new Dry Shielded Canister (DSC) designated as the 24PT2 DSC to the NUHOMS® system. The NUHOMS® -24PT2 series consists of the 24PT2S and 24PT2L DSCs. The 24PT2S DSC is a transportable DSC with a cavity length identical to the standardized NUHOMS® -24P DSC and is designed to store 24 PWR fuel assemblies without Burnable Poison Rod Assemblies or BPRAs. The 24PT2L DSC has a cavity length identical to the long cavity 24P DSC and is designed to store 24 PWR fuel assemblies with or without BPRAs. The 24PT2S/24PT2L DSCs have been analyzed to demonstrate that they can handle the payload requirements specified in Specification 1.2.1 of NUHOMS® CoC 1004 (PWR Fuel with or without Burnable Poison Rod Assemblies or BPRAs), while meeting the requirements of 10CFR 72.236.

The 24PT2 DSC utilizes a NUHOMS® Transfer Cask (TC) for transfer operations and the NUHOMS® Horizontal Storage Module (HSM) for storage, with no changes to the HSM or TC as described in CoC 1004.

The 24PT2S & L are based upon the original FO and FC DSCs respectively which have been previously certified by the NRC for transportation of spent fuel in the NUHOMS® MP 187 Package (CoC 9255). The NRC has also licensed the use of these canisters for storage of spent fuel at Rancho Seco ISFSI (Materials License No. SNM-2510).

The NUHOMS®-24PT2S and 24PT2L DSC shell assemblies are similar to the existing DSCs; however the basket assembly has the following design improvements required for transportation:

- Increased number of spacer discs (26 for the 24PT2 versus 8 for the 24P),
- Spacer disc thickness changed to 1.25" from 2.00" thick for the 24P,
- Spacer disc material changed to SA 533 Grade B, Class 1 instead of SA 516 Grade 70 to accommodate the higher basket temperatures. The spacer discs are coated with electroless nickel versus thermal sprayed aluminum,
- The support rod assemblies design consist of pre-tensioned 2" diameter high strength stainless steel rods and 3" diameter spacer sleeves versus welded rod to spacer disc design in the 24P,
- The support rods are high strength stainless steel (SA 564 TP 630, H1100 versus SA 479, XM-19 for the 24P), and
- Guide sleeves and oversleeves that support borated neutron absorber sheets (no neutron absorber used in 24P).

A detailed comparison of the weight of the 24PT2S DSC relative to the Standard 24P DSC components from FSAR Table 8.1-4 (and a similar comparison for the 24PT2L DSC v/s Standard long cavity 24P DSC from FSAR Table H-1) was made. The effects of these weight differences are addressed in the 24PT2S/24PT2L calculations supporting this SE.

Thermal Evaluation:

A new thermal analysis evaluates the specific 24PT2S DSC basket geometry using the same methodology as the standard 24P-DSC thermal evaluation for storage (DSC within the HSM), loading, closure and transfer operations (DSC within the TC). This reanalysis used a design basis heat load of 1 kW per fuel assembly in the 24PT2S-DSC and calculated 24PT2S-DSC basket internals and fuel cladding temperatures for the normal, off-normal and accident conditions described in the FSAR.

The calculated maximum fuel cladding temperatures for the 24PT2S DSC (normal, off-normal and accident cases) remain below the cladding temperature limits defined in the NUHOMS FSAR and the SER.

The 24PT2S-DSC contains Boral™ as a neutron poison material. Although no credit is taken for its presence in the criticality evaluation, the Boral™ temperatures are below the material temperature limits.

Since the amount of heat rejected from the DSC to the HSM and transfer cask and ultimately to the atmosphere remains at 24 kW (same as the standardized 24P DSC), the DSC shell, HSM concrete and transfer cask temperature distributions are not affected and remain the same as is currently shown in the NUHOMS FSAR. Hence, inclusion of the 24PT2S-DSC in the standard NUHOMS CoC has no affect on the thermal analysis done previously for the standard NUHOMS 24P DSC support structure, transfer cask or the HSM.

The thermal evaluation performed for the 24PT2S DSC described above bounds the evaluation for the 24PT2L DSC, since the control component heat load is conservatively considered in the 24PT2S DSC heat loads described above. Also, the increased cavity length provides a greater surface area for the dissipation of heat, and the calculated temperatures for the 24PT2L DSC are bounded by those reported for the 24PT2S DSC.

Although the calculated pressures for the 24PT2S and 24PT2L DSC are slightly higher than the 24P Standard DSC pressures shown in FSAR Table 8.1-6, they remain bounded by the 10.0 psig design pressure value for the normal conditions for the standard 24P DSC. The off-normal pressure remains within an allowable range per the ASME Code as discussed in NB-3223(a). Similarly, the calculated values for the Level D accident operating Condition remain bounded by the design values for the standard 24P DSC of 60 psig.

Structural Evaluation:

The structural evaluations for the 24PT2S/24PT2L DSC address the following parameters:

- 24PT2S/24PT2L DSC basket assembly configuration changes relative to the 24P DSC basket,

- Increased vertical and horizontal deadweight loads due to the increased weight of the 24PT2S/24PT2L basket assembly,

- Different 24PT2S/24PT2L basket temperatures (relative to the FO/FC design) due to the higher heat load of 24 kW for the –24P and 24PT2S/24PT2L versus 13.5 kW for the FO/FC DSC, and

- Increased vertical and side drop loads, seismic loads, and handling loads due to increased basket weight. The 24PT2S/24PT2L is evaluated against the same criteria as the 24P (75g for end/side drops, 0.25g horizontal/0.17g vertical seismic, and handling/transfer g-levels) for these load increases, per FSAR Table 3.2-1.

The 24PT2S/24PT2L shell assemblies are evaluated vis-a-vis the 24P standard and long cavity shell assembly designs to demonstrate compliance with the criteria in the FSAR. Similarly, the 24PT2S and 24PT2L DSCs basket components are evaluated to demonstrate compliance against the structural design criteria specified in the FSAR, Section 3.2.5.2.

The 24PT2S/24PT2L support rod assembly design is different (pretensioned rod/spacer sleeve system in the 24PT2 versus a welded rod-to-spacer in the -24P), thus, the qualification of the support rod assembly follows the methodology employed for the Standardized NUHOMS® –52B which uses pretensioned rod/sleeves. The spacer disc is analyzed using ANSYS finite element models similar to those used for the –24P.

The results of the structural evaluations show that the calculated stresses for the 24PT2 DSC basket components (support rods and spacer sleeves, spacer discs, guide sleeves) meet the FSAR design criteria specified in section 3.2.5.2 for the –24P, and therefore these designs can be incorporated in the FSAR.

Confinement Barriers and Systems Evaluation:

The design features of the 24PT2S/24PT2L DSCs required for confinement are identical to the standard 24P DSC and thus there is no change in the confinement integrity documented in the NUHOMS FSAR.

Criticality Evaluation:

One important difference between the two sets of canister designs is the fixed poison sheets (Boral™) in the 24PT2S/24PT2L DSCs. No credit is taken in the criticality calculations for the fixed poison (Boral™). The poison plates are modeled as pure aluminum. This is very conservative, however it ensures that only canister geometry and soluble boron are credited in the criticality analysis consistent with the licensing basis for the standard 24P and the long cavity 24P DSC designs.

The results of the analysis show that the 24PT2S/24PT2L are qualified for storage in the NUHOMS® system because the DSCs are less reactive than the standardized DSC used for the NUHOMS® system criticality analysis.

Shielding Evaluation:

The 24PT2S and 24PT2L DSC shell assembly designs are identical from a shielding point of view. The 24PT2S and 24PT2L baskets include internal design features that result in increased shielding as compared to the standard 24P and the long cavity 24P DSC designs. This increased shielding is in the form of additional, albeit thinner spacer discs, poison material and the stainless steel wrappers. Therefore, the shielding analysis presented in the FSAR for the standard 24P and long cavity 24P bound the 24PT2S and 24PT2L canister designs.

Operations/Maintenance/Mechanical Evaluation:

The loading/unloading procedures for the 24PT2S/24PT2L DSC are identical to that provided in Chapter 5 of the FSAR for the standard 24P DSC and the long cavity DSC. The addition of the 24PT2S and 24PT2L DSCs to the NUHOMS® system has no adverse impact on external interfaces with the OS197 transfer cask, transfer equipment or the HSM.

The materials for the 24PT2S/24PT2L have been evaluated for hydrogen generation during fuel loading, as required by IEB 96-04. Hydrogen monitoring as discussed in the FSAR for 24P DSC will also be employed for the 24PT2S/24PT2L DSC.

Based on the justification provided above, it is concluded that 24PT2 DSC may be added to the NUHOMS® system without a CoC Amendment.

SE 72-1150

This Safety Evaluation addresses the following changes to the Standard 52B DSC drawings implemented by ECNs 99-0530 and 99-0532:

1. The end detail of the rod and sleeve assembly is revised to allow the ends of the support rod to be slightly recessed.

2. The use of a thread locking material is added to the small screws that restrain the neutron absorber plates.

3. The end sleeve of the rod and sleeve configuration (top and bottom) is revised to allow these end sleeves to be made up of two pieces, and the lengths of the sleeve pieces may be varied to obtain the necessary spacer disk spacing. The location tolerances of the spacer disk are unchanged. Also a requirement for mating the 2 pieces is added to ensure necessary load transfer, and the orientation of the anti-rotation pin is specified to allow potential future removal.

4. A flag note is added to the weld callout for the support bar to the top spacer disk to allow for substitute weld configuration and weld prep details. No change to materials is permitted. Also the use of MT to examine the carbon steel to carbon steel weldment (support bar to top spacer disk) is added.

Evaluation of Change 1:

The change to the end of the rod and sleeve to allow a small recess will not alter the structural performance of the basket. The analysis assumes that only the sleeve takes any compressive loading during vertical deadweight or a drop. Thus there will be no change to the stresses reported for vertical loadings.

The change does not alter the thermal performance, the dose rates or the criticality results reported in the FSAR. The external interfaces with the transfer cask, transfer equipment and HSM are unchanged.

Evaluation of Change 2:

The use of a thread locking material is added to the small screws that restrain the neutron absorber plates. The purpose of the thread locking material is to prevent loosening during shipping of the empty DSC from the fabricator to the utility. There is no requirement for the threads to be locked to sustain any of the load cases described in the FSAR.

This change does not affect the thermal, shielding or criticality performance of the DSC, as the analyzed design is unchanged.

The type of material specified has excellent chemical resistance and should pose no problem considering the non-borated BWR fuel pool environment, and the fact that the DSC will be immersed for only a short time, typically less than 24 hours.

Evaluation of Change 3:

The change to the ends of the rod and sleeve to allow a 2-part assembly will not adversely impact the structural performance of the basket. The analysis assumes that only the sleeve takes any compressive loading during vertical deadweight or a drop. Thus there will be no change to the stresses reported in FSAR for vertical loadings given that the two sections have similar cross sections.

The modification does not affect the thermal, shielding, and criticality analysis of the DSC as reported in the FSAR.

Evaluation of Change 4:

The substitute weld is required to have strength that is equivalent to the original. The weld material remains the same and the support bar and the spacer disk are unchanged. The weld maintains the stresses within ASME Code allowable values.

The modification does not affect the thermal, shielding, and criticality analysis of the DSC as reported in the FSAR. The external interfaces with the transfer cask, transfer equipment and HSM are unchanged.

Based on the justification provided above, it is concluded that the changes may be implemented without a CoC Amendment.

SE 72-1218

ECN 99-0590 implements the addition of an optional lifting lug configuration to 52B DSC Basket-Shell Assembly that is NUREG-0612 compliant for vertical lifts of an empty DSC. This change does not affect any component analyzed in other calculations because weld sizes and plate thicknesses in the 52B DSC either increase or remain unchanged.

The new lifting lug configuration will not alter the structural performance of the loaded DSC since the lug is only used in transporting an empty DSC. Additionally, the new lug configuration does not change the DSC shell thickness nor the support ring thickness. The analysis demonstrates that this lug configuration will provide more structural capacity than the current configuration for transporting the empty DSC. This is because NUREG-0612 stress criteria are more stringent than the ASME stress requirements. The revised lug configuration has no significant weight increase.

The new lifting lug configuration does not alter the thermal, shielding, or criticality analysis of the DSC as reported in the FSAR. The external interfaces with the transfer cask, transfer equipment and HSM are unchanged.

Based on the justification provided above, it is concluded that the change may be implemented without a CoC Amendment.

SE 72-1280

ECN-99-0633 limits the interfacing internal dimension of the oversleeve and the corresponding external dimension of the guidesleeve components in the "C"-shaped configuration for the 24P DSC. It also specifies a weld reinforcement of 0.03" for the welding.

To ensure that there is no interference, the design is changed to limit the maximum guide sleeve outside dimension to 9.17" and require that the guide sleeve and over sleeve installation be such that the C-Section welds are not be in the same azimuth. The over sleeve inside dimension is also revised to preclude interference with the guidesleeve.

The limitations on guidesleeve/oversleeve width and orientation ensure that binding does not occur. The analysis confirms that no additional stresses are induced as a result of thermal growth.

There is no change to the thermal or shielding analysis of the DSC. The new width limitations for the guidesleeve and oversleeve inside dimension do not impact the criticality analysis since they are within the currently specified guidesleeve/oversleeve tolerances. The effect of guidesleeve thickness variation has been analyzed and an increase in guidesleeve thickness from 16 gauge to 12 gauge thickness, results in a decrease in reactivity on the order of .3%. Therefore, the slight increase in guidesleeve/oversleeve thickness in the area of the weld reinforcement will result in a negligible decrease in reactivity.

There is no change to the mechanical performance of the DSC since this change does not change the operational testing required for the DSC (fuel assembly gauge testing).

SE 72-1426

This Safety Evaluation addresses changes to the top and bottom shield plugs of the Long-Cavity PWR DSC as implemented in ECN-00-0725 and ECN-00-0743. These changes enhance fabricability of the shield plug assemblies. In addition, an alternate option for a different physical configuration of the radial and center stiffeners, curved instead of straight, is provided to address concerns relative to potential radiation streaming.

The revised structural analysis documents the acceptability of this design change with respect to all the applicable load cases for structural evaluation. The calculated stress results remain below allowable.

The revised shielding analysis concludes that the calculated local dose rates due to streaming and gap effects are reduced due to the curvature of the new rib design. The additional steel used in the curved rib design results in a slightly higher (about 10%) dose rate at one foot away from the shield plug versus the straight rib design. The effect of these changes are insignificant relative to HSM and offsite dose rates.

The effect of a composite lead shield plug, with steel stiffeners, is bounded by the previous thermal analyses. The change has no effect on criticality. There are no mechanical interface impacts as the external configuration of the shield plugs is unchanged.

SE 72-1493

ECN-00-0770 increases the maximum length of the DSC shell from 186.29 inches to 186.55 inches to allow flexibility in fabrication of the long cavity PWR DSCs, relative to meeting the DSC top and bottom shield plug thickness, shell recess and DSC shell length requirements. An additional modification to the HSM design to accommodate the longer DSC has been evaluated separately.

The change to the canister length does not involve a change to the DSC cavity dimension. The bottom and top end geometries are unchanged including the component thicknesses, weld sizes and weld details. This increase in DSC length increases the DSC weight by an insignificant 9.3 lbs and thus does not impact any structural analyses, which use the weight calculation results.

With an increase in length of 0.26", the shell stability of the canister is potentially impacted. The analysis considered both the finite and infinite length calculations and demonstrated that the results are essentially unchanged.

The operational handling stresses are not adversely impacted as the friction loads are unchanged and their application over an increased length will result in decreased stresses. The stresses from DSC binding are unchanged as the added length will reduce the potential angle of binding and thus reduce load.

Since there is no change to the DSC internal cavity, or the fuel specification, there is no change to the DSC internal volume and the resulting internal gas pressurization. Thus, there is no change to the internal pressure load cases. The heat load is not altered; hence the thermal analysis is not affected.

This modification does not involve any other changes to DSC shell or basket material or component thicknesses. Therefore, there is no change to the shielding analysis or criticality analysis results reported in the FSAR.

The analysis evaluated DSC/Transfer Cask interference due to thermal growth of the hotter DSC to confirm that an adequate clearance gap remains between the DSC ends and the cask cavity under all conditions. This evaluation considers ambient temperature cases of 100°F, 0°F and –40°F for the two transfer cask configurations described in the FSAR. No changes are needed in the OS197 transfer cask cavity dimensions. The standard transfer cask, if built using a carbon steel structural shell, and the short cavity dimension, must have an additional cavity of 0.26" minimum to ensure that adequate gap exists between the DSC and the cask inner.

The increase in the maximum length of the Long Cavity 24P DSC has been shown to be acceptable with no significant change to the FSAR analysis results.

SE 72-1513

ECN-00-0782 enhances DSC fabrication flexibility by allowing alternate materials as listed below:

- Add alternative materials for fabrication of Siphon and Vent Blocks (ASME SA-182, Grade F304N & ASME SA-479, Type 304); applies to Standard & Long-Cavity PWR and BWR DSCs to allow DSC fabricator flexibility in material section for the blocks.

- Add alternative materials for fabrication of Siphon and Vent Block Cover Plates (ASME SA-479, Type 304); applies to Standard & Long-Cavity PWR and BWR DSCs to allow DSC fabricator flexibility in material section.

- Long Cavity PWR Shell Assembly drawing, allow the BSPA Inner Ring Plate to be fabricated from pipe section or rolled ring, similar to fabrication methods allowed for the Grapple Ring Support.

- Add alternative materials for fabrication of Support Ring (ASME SA-479, Type 304); applies to Standard & Long-Cavity PWR and BWR DSCs to allow DSC fabricator flexibility in material section for the support ring. Also specifies maximum edge dimension.

All materials remain 304 stainless steel. The material properties (Sy, Su, density, and thermal expansion) are unchanged. Therefore the stresses and margins (ASME Code allowables) are not adversely impacted. There is no change to the weight of the DSC or the TC.

The change to allow the fabricator to use an alternate method of fabrication of the BSPA Inner Ring Plate has no effect on structural calculations since the alternate material (pipe section) for this component has the same mechanical properties as the listed plate.

There is no change to the internal cavity, or the fuel specification, and thus there is no change to the DSC internal volume and the resulting internal gas pressurization. There is no affect on the thermal, shielding or criticality results reported in the FSAR.

SE 72-1544

CARs 00.039 and 00.063 identified deficiencies associated with the NUHOMS® Long Cavity Dry Shielded Canister (DSC) shield plug structural calculations.

These changes result in a revision to FSAR Tables H-3, H-4 and H-5 (associated with revisions to the Long Cavity DSC shield plug structural analysis calculations) and a revision to FSAR Table 8.2-7 (associated with the revision to the 24P "Short" Cavity DSC shell structural analysis). All of the reported stress values remain below the allowable values.

The structural analysis revisions do not result in any physical changes to the Long Cavity DSC shield plugs or the NUHOMS® 24P "Short" Cavity DSC shell and all of the acceptance criteria for the DSC shield plugs (allowable stress intensities) and DSC shell remain satisfied. Because the changes resulted in no modifications to the DSC designs, the structural response, thermal performance, shielding capabilities, criticality control and mechanical performance remain compliant with all requirements. Therefore, there is no effect on safety.

SE 72-1549

Calculation NUH004.0236 was revised to remove the superceded evaluation of the NUHOMS®-24P DSC guide sleeves, oversleeves and associated welds, since the appropriate revised evaluation of these components is now documented in Calculation NUH004.0240, Rev. 2. SE 72-1549 addresses this revision and its impact on the FSAR analysis.

These changes result in updated FSAR Tables 8.2-7 and 8.2-15 and associated text in FSAR Section 8.2.5.2.A(iv). Some of the stress values are higher than previously reported but are less than the allowable values.

The structural analysis revisions do not result in any physical changes to the NUHOMS®-24P DSC guide sleeves and all of the acceptance criteria for the guide sleeves (allowable stress intensities) remain satisfied. Because the changes resulted in no modifications to the DSC design, the structural response, thermal performance, shielding capabilities, criticality control and mechanical performance remain compliant with all requirements. Therefore, there is no effect on safety.

SE 72-1559

ECN-00-0806 enhances DSC fabrication flexibility by allowing alternate materials as described below:

- Add alternative materials for fabrication of Siphon and Vent Blocks (ASME SA-182, Grade F304); applies to Standard & Long-Cavity PWR and BWR DSCs to allow DSC fabricator flexibility in material section for the blocks.

- The alternate Siphon Tube (NITS component) material is added at the request of a new DSC fabricator to allow flexibility of material selection for the tubing. The only major difference between the existing ASTM A249 (welded) material and the new alternative ASTM A213 (seamless) material is the method of tube fabrication.

- Add alternative materials for fabrication of DSC Basket-Shell Assembly's Key (ASME SA-479, Type 304); applies to Standard & Long-Cavity PWR and BWR DSCs to allow DSC fabricator flexibility in material section.

The structural evaluation is not adversely impacted due to adding an alternative material for the fabrication of the Siphon and Vent Blocks, Siphon Tubing and Key. There is no change in the DSC or Transfer Cask weight. The material properties (Sy, Su, density, and thermal expansion) are unchanged. The operational handling loads and all other loadings are also unchanged. Therefore the stresses and margins (ASME Code allowables) are not adversely impacted.

There is no change to the thermal, shielding and criticality analysis results as reported in the FSAR.

SE 72-1589

CAR 00.077, Rev. 1 documents errors in an existing thermal calculation. Specifically, an incorrect heat transfer correlation was used in the calculation to model convection heat transfer from the DSC surface (cylindrical geometry) to the bulk air for all the cases analyzed for the 24P and 52B DSCs. In addition, for the -40°F ambient storage case in the HSM, a heat load of 19.2 kW was used in the analysis of the 24P DSC instead of the licensed 24 kW. SE 72-1589 determines the impact of corrective actions performed to address the deficiencies noted in the referenced CAR.

Maximum temperatures presented in Revision 5 of the NUHOMS® Final Safety Analysis Report (FSAR) for the DSC shell are affected. The HSM temperatures reported in Revision 5 of the FSAR are not significantly affected by the changes. DSC revised stress values are less than those reported in Sections 8.1 and 8.2 of Revision 5 of the NUHOMS® FSAR. DSC support structure revised stresses are also below allowables. The calculated fuel cladding temperatures reported in the FSAR Table 8.1-26 and Table 8.1-27 are also not affected by this change.

Thermal Evaluation (HSM, 24P and 52B DSCs)

The HSM concrete, heat shield, support structure, and DSC shell temperatures are recalculated using the correct heat transfer correlation. The impact of the revised temperatures on the structural analysis for the HSM concrete, DSC support structure, DSC shell assembly, and DSC basket were investigated through revisions to various NUHOMS® calculations. The reanalysis does not result in any modification to the physical configuration of the Cask components. The revised DSC temperatures are provided in Tables 8.1-24, 8.1-25 8.1-26, and 8.1-27 of the FSAR.

The HSM concrete temperatures are essentially unchanged due to the thermal reanalysis performed to resolve CAR 00.077.

For determination of the fuel cladding temperatures during storage, the controlling case is the 70°F ambient case for normal condition and the HSM blocked vent condition for the accident scenario. Relatively minor increases in the 24P and 52B DSC shell temperatures will not affect the calculated fuel cladding temperature.

Structural Evaluation (HSM, 24P and 52B)

Using the revised temperature distribution, thermal stress analysis is performed. The revised temperatures are generally higher; however the thermal gradients are generally smaller. As documented in the calculation, the 24P DSC shell assembly thermal stresses and the corresponding load combinations stress results are enveloped by the values in the existing analysis. This is due to reduced thermal gradients and some stress redistribution due to the higher temperatures. Conservatively, the maximum temperatures were used to determine stress allowables. Based on the evaluation performed, the stress values reported in the FSAR are bounding and no changes are required.

Since the temperature differences between the revised and existing results for the 52B are smaller that the 24P, and the evaluation for the 24P concluded that the existing results are bounding, no specific evaluation is performed for the 52B and the existing results are judged to be adequate.

For structural analysis of the basket, the temperature gradient across the basket components is less. Also, the maximum temperatures of the basket components are still bounding. Therefore, it is concluded that there is no impact on the basket structural analysis due to the changes described in CAR 00.077 Rev. 1.

HSM Evaluation

The thermal reanalysis calculated revised concrete temperatures for the HSM for ambient normal and off normal conditions. In general, the revised temperature distributions are very similar to the existing ones as reported in the FSAR. Also, the thermal gradients are generally smaller. Temperature profiles for blocked vent accident conditions are not changed.

The revised maximum HSM concrete component temperature for the normal thermal condition is 200°F versus 201°F in the existing analysis. For the off-normal thermal condition, the maximum temperature for all the concrete components in the original analysis is 241°F versus 239°F in the revised analysis. Therefore, the revised temperatures do not affect the qualification of the HSM concrete components.

The HSM steel support, welds and miscellaneous components, the maximum normal condition temperature is 280°F versus 268°F in the original analysis. For the off-normal condition the maximum temperature is 301°F versus 292°F in the original analysis. The effect of the increase in temperatures on stresses has been evaluated. The increased stresses meet interaction ratios/stress allowables in the FSAR. The accident HSM accident temperatures are not affected by this change. The revised stress evaluations affect FSAR Tables 8.1-14, Table 8.2-19 and Table 8.2-20.

Shielding and Criticality Evaluation

The thermal analysis has no impact on the shielding or criticality analysis.

HSM CHANGES

SE 72-1434

SE 72-1434 evaluates the following changes to the HSM design configuration:

- Cask Docking Surface: The steel cask docking ring embedment is eliminated and the recessed cask docking flange is formed in concrete during casting of the base unit. The recessed flange and door dimensions are based on the larger MP-187 Cask diameter, to provide flexibility to allow the use of MP-187 or the OS-197 Cask.

- DSC Support Rail Extension Anchorage: A baseplate is added under the rail extension plate, which is bolted and grouted to the front opening, thereby eliminating field welding.

- DSC Axial Retainer: A drop-in tube steel is used as a post to axially restrain the DSC, analogous to a removable parking bollard. Less door clamps are required since the door is no longer in the load path for axial restraint of the DSC. Four door clamps are bolted to threaded embedments around the formed opening.

All of the changes described above are evaluated and shown to be structurally qualified. The evaluations conclude that the changes are acceptable and do not exceed the allowable stress conditions previously determined.

The use of the OS197 cask docking with a flanged opening sized for the larger diameter MP187 Cask results in approximately 2 1/8" of less concrete radially around the cask during DSC transfer operations. However, this condition is bounded by the analyzed case of the DSC fully inserted into the HSM without the cask providing shielding and without the HSM door installed.

The revised DSC axial retainer provides the same safety function of axially restraining the DSC during seismic events and the change is shown to be acceptable.

There is no change to the shielding or thermal performance of the HSM and criticality is not altered since the changes do not affect the DSC. Hence, the changes may be implemented without a COC Amendment.

SE 72-1616

This safety evaluation addresses a set of changes to the standardized HSMs to enhance the shielding capacity of the HSMs. The revised modules are designated as HSM Model 102, to distinguish them from the original modules, designated as HSM Model 80. The optional set of changes include:

- The standardized design composite door with steel liners on all faces is replaced by a reinforced concrete shield door (with steel liner on the inside only) which is 24.5 inches thick. The door is square at the front of the wall and circular on the inside. A 0.5 inch thick steel liner is provided on the inside surface of the door.

- A 1 1/2" thick concrete layer around the perimeter of each air vent (on the side walls) is replaced with steel plates.

All of the changes described above are evaluated and shown to be structurally qualified. The analysis concludes that the changes are acceptable and do not exceed the allowable stress conditions previously determined. The revised door and its attachments to the front wall remain structurally qualified for the worst case tornado generated wind and missile impact loads. The vent liners do reduce the volume of concrete, however the change in section properties of the HSM is insignificant to the overall structural integrity of the HSM.

The thermal performance of the HSM and criticality is not altered since the changes do not affect the vent flow areas inside the HSM. The reduced volume of air between the DSC and door does not affect the thermal analyses since the analyses does not take credit nor rely on air flow within this cavity (see FSAR Section 8.1.3).

The subject changes have no adverse impact on the features, function or performance of the DSC or the HSM. The structural, thermal and shielding performances of the HSMs are not adversely affected by the changes and the changes may be implemented without a CoC Amendment.

TRANSFER CASK (TC) CHANGES:

SE 72-1545

ECN 00-0796 deletes the bottom support ring holes that are primarily used for the attachment of a nonintegral ram. The elimination of these holes will also eliminate the localized stress concentrations due to the holes. The presence or absence of the subject holes has a minimal impact on the overall structural response of the cask, since there is negligible change in the weight and stiffness of the cask. The various loading on the cask (seismic, wind, drop) and the corresponding stresses and deformations are essentially unchanged. Therefore, there is no impact on the safety function of the cask due to the elimination of the holes in the bottom support ring.

ECN 00-0796 also revises the description of "Chemical Lead" to "Chemical-Copper Lead" to reflect the new grade name that is used in the 1992 revision of ASTM Specification B29 for the corresponding lead. The composition of the "Chemical-Copper Lead" in the 1992 edition for Specification B29 encompasses the "Chemical Lead" from an earlier revision of the standard. Both the "Chemical Lead" and the "Chemical-Copper Lead" have a 99.90 weight percent lead content. The differences in the two codes essentially reflect a re-categorization of the various grades of lead. There is no impact on the shielding capability of cask, and consequently there is no impact on the safety function of the cask.

SE 72-1601

ECN-01-0837 implements the following changes to the OS197 Transfer Cask (TC):

1. The TC trunnion inner plate is relocated towards the outboard side, so that the necessary lead thickness will be achieved by placing lead only on one side of the inner plate to enhance the fabricability of the trunnion assemblies.

2. An optional continuous weld is allowed for the welding of the rails to the TC to eliminate potential of the rail being out of tolerance due to stitch welding, avoid crud traps and enhance fabricability.

3. The effective throat for the groove weld between the TC upper trunnion and the upper trunnion sleeve is increased from 1-3/8" to 1-1/2" in order to increase the stress margin on the weld. As a result of the increase in weld size, the upper trunnion overlay size had to be increased. In addition, the weld filler material is revised and optional weld filler materials are added to the cask fabrication specification.

4. Increase TC upper trunnion wall thickness by reducing the inboard inner diameter from 9.0" to 8.0".

5. Revise the minimum thickness requirement of the Cask Inner Liner from 0.38" to 0.45"

The fabricability and enhancement changes described above (Changes 1 and 2) do not alter the design basis, function & operations of for the TC and do not require any changes to the structural, shielding, criticality, thermal and weight analysis. Therefore, there are no adverse effects on the safety shielding, criticality, thermal and mechanical performance of the cask.

The design changes described above (Changes 3, 4, and 5) increase the lifting load capacity of the upper trunnions. Since the payload is not increased, these changes add an additional margin to the transfer cask upper trunnion structural response reported in FSAR Chapter 8.0. The allowance for alternate filler metals for the upper trunnion to shell weld have been analyzed and shown to be acceptable.

Note: The modified OS197 TC configuration described here was added to the FSAR drawings only and the scope of this SE is specifically limited to the drawing configuration change only. The impact of the addition of this modified OS197 cask (designated as OS197H) on the safety analysis reported in the FSAR is presented elsewhere in this Report under SE 72-1610.

SE 72-1608

ECN-01-0845 revises Transfer Cask main assembly drawing to allow for the addition of two additional weld filler metals for the weld of the Upper Trunnion Cover Plate to Upper Trunnion.

The addition of the two additional weld filler material for the weld between the upper trunnion cover plate and the upper trunnion does not alter the design basis, function & operations for the transfer cask and does not require any changes to the structural, shielding, criticality, thermal and weight analysis. This weld is not a structural weld and not addressed in any structural analysis. Therefore, there are no adverse effects on the shielding, criticality, thermal and mechanical performance of the cask as reported in the FSAR.

Therefore, there are no effects on the safety function of the transfer cask.

SE 72-1610

This SE evaluates the reanalysis performed for the required design changes to the OS197 transfer cask to create the modified transfer cask, designated as OS197H, have been described elsewhere in this Report under SE 72-1601. The reanalysis demonstrates that the maximum on-the-hook weight capacity of the OS197H cask is 250,000 lbs (OS197 was originally qualified for 200,000 lbs), and the maximum payload weight is 116,000 lbs (OS197 was originally qualified for 80,000 lbs).

In addition, the reanalysis documents that with no design changes to the OS197 Cask, the maximum on-the-hook weight capacity of the cask is increased from 200,000 to 208,500 lbs, and the maximum payload weight is increased from 80,000 to 90,000 lbs.

The license basis fuel parameters such as decay heat load, fuel assembly weight, number of stored fuel assemblies, and source terms are not changed. Therefore, the thermal, shielding, and criticality control properties are not affected.

The stresses in the OS197H transfer cask are evaluated primarily by scaling the results of the existing OS197 structural calculations using appropriate scale factors. The analyses performed in the existing OS 197 calculations used linear/elastic methods, thus linear scaling of the results is appropriate.

Calculated stresses in the OS197H and OS197 casks are less than applicable allowable stresses. The design modifications to the OS197 that created the OS197H did not introduce any new loadings or interfaces that could cause an interference problem. The structural analysis results as reported in the FSAR for the transfer cask (OS197 and OS197H) have been updated accordingly.

SE 72-1642

ECN-01-0863 & 01-0864 implement the following clarification and fabricability enhancement changes to the OS197 Transfer Cask:

The washers associated with ½" diameter cap screws (category NITS item) for the transfer cask bottom cover plate and with the 1 – ¾" diameter bolts (category B item) for the top cover plate are listed as separate part numbers. Also, an option is provided to allow cadmium plating of the carbon steel tapered pins (category NITS item) to minimize corrosion or fabricate the pins from stainless steel.

These changes do not alter the design basis, function & operations for the transfer cask and do not require any changes to the structural, shielding, criticality, thermal, and weight analysis.

NONCONFORMANCES FOR NUHOMS COMPONENTS

SE 72-1458 (TN NCR 00.084)

This Safety Evaluation addresses a nonconformance identified during the fabrication of the Top Shield Plugs for two 52B DSC's. The nonconformance was that some of the four threaded holes accepted a no-go gauge. The repair consists of enlarging the tapped holes and installing ¾-10 Helicoils. The same thread size (¾-10) and minimum thread length will be maintained to accommodate the existing lifting hardware. This minor change does not in any way affect the canister configuration since the holes are only used for placing the shield plug. While not a design basis change to the FSAR, it is not explicitly in compliance with the detail shown in the FSAR and thus is evaluated in this Safety Evaluation.

Structural: The detail of the lift holes was specifically described in the FSAR drawing. The hole location is unchanged and therefore the angle of the lift cables, and the cable loads, will be unchanged. A Helicoil is a high strength steel (stainless steel) thread insert that develops the full strength of a threaded hole.

Thermal/Shielding/Criticality/Mechanical: The use of Helicoils in the shield plug does not significantly alter the thermal, shielding, criticality, or mechanical performance of the DSC.

SE 72-1459 (TN NCR 00.081)

This Safety Evaluation addresses a nonconformance identified during the fabrication of a Top Shield Plug for a 52B DSC. The nonconformance was that the top shield plug-to-DSC shell gap was larger than the design requirement. The disposition for this condition is to build up the edge of the plug with a band of weld metal that will decrease the gaps to acceptable limits. The disposition is "Repair."

Structural: The use of weld build up at the top of the plug, combined with the reduction in the bottom chamfer, does not adversely impact the structural analysis as the shield plug will still rest in all conditions fully on the support ring.

The stress ratios for the Level D load case (drop load) remain below ASME Code allowables.

The impact of the weld buildup is to shift the load application point on the support ring inward and increase the cantilever, and thus the imposed moments into the DSC shell. The impact of this increased moment on local DSC shell stresses is evaluated using manual calculations. Resultant stress ratios in the shell remain below ASME Code allowables.

Thermal/Criticality/Mechanical: The weld buildup and increased gap below the buildup do not impact the thermal, criticality, or mechanical analysis.

Shielding: A conservative shielding evaluation of the increased gap tolerance between the shield plug and DSC shell was performed. This shielding evaluation assumes the maximum gap deviation is all around the shell's circumference. The localized dose rate change at the gap location was calculated and ratioed to reflect the gap/plug area. General dose rates are changed by less than 10%, and are not significant.

SE 72-1462 (TN NCR 00.085)

This Safety Evaluation addresses a nonconformance identified during the performance testing of a 52B DSC. The nonconformance is the measured fillet weld size of 0.31" on the support ring-to-shell top side exceeds the maximum drawing requirement of 0.25". The purpose of the maximum weld size requirement is to avoid potential interference of the shield plug with this weldment. The disposition is "use-as-is."

The purpose of the maximum weld size requirement is to avoid potential interference of the shield plug with this weldment. It was demonstrated that sufficient clearance for the ring-to-shell weldment, assuming a zero side gap, is available. This plug and shell did not exhibit an interference, as demonstrated by the fact that the shield plug was lowered successfully.

The slight increase in the weldment size does not adversely impact the structural analysis. The increased weld size will result in lower stress ratios due to the increased weld throat. The other ring to the shell, and vent/siphon block weldments are unchanged.

There is no adverse impact on the criticality analysis since the support ring is outside the active fuel region. There is no adverse impact on the thermal or shielding analyses since the support ring is not modeled in the thermal or shielding analyses. There are no mechanical interface impacts as the external configuration of the DSC is unchanged.

SE 72-1468 (TN NCR 00.090)

This Safety Evaluation addresses a nonconformance identified during the performance testing inspection of a 52B DSC. The nonconformance was that the stamping of the grapple ring S/N and Patent No. used interrupted dot die stamps. In addition the top shield plug was also stamped interrupted dot die stamps. The TN design requirements are that stamping be performed with low stress stamps. The disposition of the NCR is to "use-as-is."

The TN FSAR and procurement drawings specify the stamping of the grapple ring and the three top cover plates, and specify the use of low stress stamps. This applies to the Grapple Ring, Outer Top Cover Plate, Inner Top Cover Plate, and the Top Shield Plug.

Grapple Ring: The intent of this general requirement to use low stress stamps is to minimize the impact of the stamping on the pressure boundary components, the inner and outer top cover plates. The grapple ring plate is a non-pressure boundary component. The very localized discontinuity caused by the stamping (dot die stamps) will not be a significant adverse impact upon the structural capacity of the plug. Thermal, shielding, and criticality are, given the very minor impact of stamping and the ductile stainless material, not adversely impacted.

Top Shield Plug: The intent of this general requirement to use low stress stamps is to minimize the impact of the stamping on the thinner pressure boundary components, the inner and outer top cover plates. The top shield plug, on the other hand, is a non-pressure boundary component and is very thick (8.00" nominal). The use of dot die stamps on the top shield plug, and multiple stamping, will not adversely impact the structural capacity of the plug. Thermal, shielding, and criticality are, given the very minor impact of stamping and the massive plug, not adversely impacted. There are no mechanical interface impacts as the external configuration of the DSC is unchanged.

SE 72-1480 (TN NCR 00.107)

This Safety Evaluation addresses nonconformances identified during final performance testing of a 24P DSC. The nonconformances were cylindricity, canister length, recess of outer cover plate, and shield plug thickness (overthick). The disposition of these nonconformances is "Use-as-is".

Cylindricity

The DSC shell has one small area that was outside the tolerance, a maximum of 0.013". This single out-of-tolerance was determined to have no adverse impact on the Transfer Cask and HSM interface. The other measured data demonstrated that sufficient clearance was present. No disciplines (structural, thermal, shielding, or criticality) were impacted.

Canister length out-of-tolerance & Recess of Outer Top Cover Plate

The minimum recess of the outer top cover plate was measured below the TN drawing minimum requirement of .12". In addition the canister length measured more than the maximum length specified by the procurement drawing. The disposition of these two nonconformances is "Use-as-is" based on the following discussion.

The reduction in the recess of the outer top cover plate does not impact the design basis analysis. The condition of a flush outer top cover was the original design configuration of the 24P and 52B DSC's. The design was changed to provide operational benefits by adding a minimum recess of the outer top cover. A recess less than the design value, but greater or equal to 0.00", will not impact the structural analysis. There is no adverse impact upon the thermal analysis as the attachment weld is not relied upon for heat transfer, and the change (reduction) in air gap between the outer cover plate and the transfer cask will increase the heat transfer. There is no adverse impact on shielding or criticality as the recess is well outside the active fuel region, is not made until the DSC is drained, and the thickness of the closure plates remains within tolerance.

The canister length is limited so that the DSC will have allowance to expand thermally inside the Transfer Cask and will be able to fit axially inside the Transfer Cask. This evaluation utilized the actual length of the canister, the amount of outer top cover plate recess, and an assumed increase in canister length due to inner and outer top cover plate welding. The evaluation was made against the bounding Transfer Cask design, using bounding temperatures. It determined that there is adequate gap between the DSC and the cask inner cavity for thermal growth during the worst case, -40 F and 0 F ambient conditions with the design basis heat load of 24 kW. Given the small increase in length of the empty DSC there is no adverse impact on structural, thermal, criticality, or shielding. The increased DSC length will also not impact HSM loading and storage since a 3/8" gap is available between the DSC and the seismic restraint/DSC rail stop.

Shield Plug Thickness

The shield plug was measured at 0.03" more than the design maximum. This will provide a small amount of additional shielding and no significant adverse impact on structural, thermal, or criticality.

SE 72-1510 (TN NCR 00.134)

This Safety Evaluation addresses a nonconformance for the Basket Assembly of a 24P DSC. The nonconformance is that during fabrication of a 24P DSC basket assembly, one support rod was cut to a length 1 inch shorter than the nominal required length. The repair involves reattaching the cut portion of the rod using a partial penetration weld. The disposition of the nonconformance is "Repair. This repair will produce a rod of the correct length. There is no change to the other critical dimensions of the DSC basket, e.g. there is no change to the dimensions or tolerances of the support rods or spacer disk location, nor is the DSC internal cavity length dimension or tolerance changed.

Structural: The repair was evaluated in a TN calculation and demonstrated that structural adequacy was maintained by reattaching the cut portion to the remaining rod with a partial penetration weld of E309 weld filler metal or greater strength. The repaired geometry was evaluated for all applicable loadings, primarily the top and bottom end drops. The stresses in the rod and the attaching weld are less than the applicable ASME Code allowable.

Thermal/Shielding/Criticality/Mechanical: The repair of the support rod does not involve a change to either the internal cavity dimension/tolerance of the DSC, or thickness of the end components. Therefore there is no change to the thermal, shielding, criticality, or mechanical results.

SE 72-1528 (TN NCR 00.186 & 00.190)

This safety evaluation address a nonconformance identified for HSM embedments. The nonconformance was that the electroplating method/process used to coat the embedment assemblies did not permit adequate flow of the plating solution within the sleeve nuts. As a result, some of the internal surfaces of the sleeve nuts may not be coated or fully coated. The disposition is to "Repair" the embedment assemblies to provide an equivalent level of corrosion protection.

The repaired embedment assemblies provide an equivalent level of corrosion protection. Generally, additional electroplating, hot-dip galvanizing, application of zinc-rich cold galvanizing compounds or any compatible combinations of these coatings are considered acceptable levels of corrosion protection.

The fit-up and function of the embedment assemblies are not affected. With the exception of the Cask Restraint Embedment Assemblies and embedments that may be exposed due to HSM array expansion, all of the embedment assemblies will be permanently filled with bolts (or studs) during installation of the DSC Support Structure and/or final HSM assembly at the ISFSI. Once connection to the embedment is complete, protection against corrosion on the sleeve nut interior is less significant since the mating bolt effectively seals the inner surface of the sleeve nut. The coating on the exterior surfaces of the embedment and the mating bolt provides sufficient galvanic protection for the connection. The internal threads of the Cask Restraint Embedment Assemblies receive a lubricant or grease that provides additional protection against corrosion. Therefore, there is no effect on the safety functions of the embedments due to the repair.

There is no adverse impact on the structural, shielding or thermal performance of the HSM and criticality is not altered since the change does not affect the DSC. Therefore, the change has no adverse impact on the features, function or performance of the HSM.

SE 72-1529 (TN NCR 00.188)

This Safety Evaluation addresses a nonconformance of the Canister Axial Retainer Assembly that is part of the HSM. The nonconformance is that as a result of lengthening the DSC, the existing axial restraints are ¼" long. The disposition is to "Repair" the Retainer Assembly by cutting ¼" from the length.

The modified Axial Retainer Assembly provides the same safety function of axially restraining the DSC during seismic events. The seismic load path is unchanged.

There is no change to the bolted connection of the axial retainer assembly to the HSM shielded door, which is the controlling design element in the axial retainer. Therefore the maximum tensile force on these bolts are maintained as described in the FSAR.

There is no change to the shielding or thermal performance of the HSM and criticality is not altered since the change does not affect the DSC.

The subject change has no adverse impact on the features, function or performance of the DSC or the HSM. The structural, thermal and shielding performances of the HSMs are not adversely affected by this change. The reduced length maintains the analyzed axial gap between the DSC and axial retainer/rail.

SE 72-1546 (TN NCR 00.202)

This Safety Evaluation addresses nonconformances on a top shield plug that was damaged during fabrication. Nonconformance No. 1) Portions of the four lift hole threads were damaged and, Nonconformance No. 2, there are several "dents in the bottom surface of the plug. The disposition of the nonconformance is "repair" to restore the TSPA to the design condition by using threaded inserts to restore the lift holes, and using repair by welding to restore the bottom plate thickness and surface.

The repair consists of enlarging the tapped holes and installing ¾-10 threaded inserts. The same thread size (¾-10) and minimum thread length will be maintained to accommodate the existing lifting hardware. This minor change does not adversely affect the canister configuration since the holes are only used for placing the shield plug. While not a design basis change to the FSAR, it is not explicitly in compliance with the detail shown in the FSAR and thus will be evaluated in this Safety Evaluation.

Structural: The detail of the lift holes was specifically described in the FSAR drawing. The hole location is unchanged and therefore the angle of the lift cables, and the cable loads, will be unchanged. A threaded insert is a carbon steel insert with both an external and internal thread. For the disposition of this NCR, ¾-10 threaded inserts will be used with the ASTM A36 steel of the plug assembly. An evaluation of the inserts, using conservative values for yield and ultimate strength, demonstrated sufficient margins to meet both ASME and NUREG-0612 criteria.

Thermal/Shielding/Criticality/Mechanical: The use of threaded inserts in the shield plug does not significantly alter the thermal, shielding, criticality, or mechanical performance of the DSC.

SE 72-1582 (TN NCR 01.014)

This Safety Evaluation addresses a nonconformance on the HSM installation. The nonconformance is that HSM base units and roofs for the double row array were placed without firm contact at their back-to-back surfaces. Such placement resulted in gaps exceeding the specified roof gap tolerance of 3/4". The widths of the gaps vary along the four rows, but generally do not exceed 1" to 1 1/4" (approximately). The nonconforming gaps may permit access into the HSM, so the "Repair" disposition will eliminate or reduce the gaps to within the specified tolerance.

Similar to the existing requirements for flashing birdscreen gaps that exceed 3/4", the back-to-back gaps between the roofs and adjacent gaps between the shield walls that exceed 3/4" are flashed closed or reduced so that the gaps do not exceed 3/4". The same material used for birdscreen flashing is used for the repair.

The repaired array has no adverse effect on the safety functions of the HSM and HSM array. The specified tolerance of 3/4" between the roofs was established only for the convenience of keeping the access to the module vents limited to 3/4". The repair covers or reduces the gaps to be within the specified tolerance.

There are no structural or thermal requirements for double row HSM arrays to have their back surfaces of the base units and roofs in contact. The structural qualification of the HSMs in the double row array does not rely on firm contact between the modules and there are no design load paths between the modules. The addition of flashing across the gaps on the roofs and across the gaps on the end shield walls does not interfere with any operational or safety functions of the HSMs. Similar to the birdscreens, the weight of the flashing and the installation of anchor bolt fasteners are inconsequential to the structural capacity of the modules. There is no adverse effect on the thermal performance of the HSMs.

There will be a slight dose rate increase due to gaps. This increase is estimated by first determining the dose increase at the increased gap. A weighted average is then determined for the entire HSM roof surface. The results are that the increase in the area weighted dose rate, considering the increased gaps, is less than 1%, and is therefore insignificant.

In conclusion, the structural, thermal and shielding performances of the HSMs are not adversely affected by this change. Criticality is not altered since the change does not affect the DSC. Therefore, the change has no adverse impact on the features, function or performance of the HSM.

SE 72-1598 (TN NCR 01.025)

This Safety Evaluation addresses a nonconformance on the HSM installation. The nonconformance is that two adjacent HSM base units and roofs have a spacing greater than the design tolerance. The nonconformance is that the width of the ventilation gaps between the modules is defined as 6" ± 3/4", while the gap between these two HSM's exceeds the maximum gap by approximately 1/8" at the top of the roofs and at the top of the base units. The deviation is small and occurs in less than 20" of the vertical height of the module. The disposition is "Use-as-is". The base of the modules are reasonably tight against the channels, but the modules tilt slightly apart which increases the gap size at the top of the base. Roof installation used available positional tolerances to minimize the resulting gap at the top of the roof.

Review of the HSM structural calculation indicates that variations in the gaps do not directly effect the structural safety of HSMs. The HSMs are not structurally connected to each other and do not rely on the presence of adjacent HSMs to perform their structural function.

Thermal and shielding calculations were specifically revised or created when the gap tolerance was defined. The thermal calculations found that the impact on the temperature distributions due to the ± 3/4" tolerance on the gap size is negligible and the various thermal analysis calculations were not affected. The as-built gap does not have an adverse thermal effect since an increase in gap size improves thermal performance. The shielding calculation conservatively used 1" instead of 3/4" and concluded that a gap tolerance of ± 1" will not have a significant impact on either site or offsite exposures. Criticality is not altered since the changes are outside the HSM.

The above change has no adverse impact on the features, function or performance of the HSM. The structural, thermal, shielding, and criticality performance of the HSMs are not adversely affected by the changes, and therefore the nonconformance is acceptable as is.

SE 72-1600 (TN NCR 01.029)

This Safety Evaluation addresses a nonconformance on the HSM Base Unit. The nonconformance is that the DSC support rail embedment is mislocated by ¼". That is, the design location of 9 1/4" ± 1/16" was measured (as-built) as 9 7/16", which exceeds the tolerance. The disposition is "Use-as-is".

The nonconforming embedment causes the axial position of the right rail assembly to be approximately 1/4" too far forward relative to the left rail assembly and the axial retainer. As a result, the two canister stop plates at the rear of the structure do not align. In addition, the canister support length, which is the distance from the canister stop plates to the drop-in tube steel axial retainer, is also slightly reduced due to the nonconformance.

A 1/4" spacer or shim shall be added to the left rail canister stop plate to bring the stop plates within reasonable alignment. The addition of the shim will help ensure adequate distribution of seismic and operational loads to the canister stop plates, as originally assumed in the design.

The as-built canister support length does not deviate from design requirements and therefore is acceptable.

The bolted connections for the DSC Support Structure have slotted holes that permit field adjustments during assembly, so the overall structural integrity is not affected by the nonconformance. That is, the connections were able to accommodate the axial shift in the right rail assembly without binding. All other aspects of the rail alignment and installation, including bolt tightening and baseplate grouting have been completed without difficulty.

The repaired canister stop plate has no adverse effect on the safety functions of the HSM and HSM array. There are no significant structural, shielding or thermal affects since the structure provides the nominal canister support length and axial restraint per design requirements.

In conclusion, the structural, thermal and shielding performances of the HSM are not adversely affected by this change. Criticality is not altered since the change does not affect the DSC. Therefore, the change has no adverse impact on the features, function or performance of the HSM.

SE 72-1630 (TN NCR 01.039)

This Safety Evaluation addresses a nonconformance of the neutron absorber plates of the 52B DSC. The nonconformance is that the width tolerance of the absorber plates exceeds the design tolerance. The FSAR evaluates and specifies Neutron Absorber Sheet Width as 6.30" +/- 0.04" whereas the as fabricated width tolerance is 0.04055" i.e., 0.00055" (0.001") over the specified.

Structural: The Neutron Absorber Sheets are designed such that they are not required to take any structural load. The potential impact of plus tolerance in width on the weight is a negligible increase of .0035 lbs (0.00055 x 162 x 0.139 x 0.2836). The negligible increase in width and length, because of increased tolerance, can be reworked by localized edge sanding/grinding to avoid any binding during insertion of Neutron Absorber Sheets into the basket before loading the fuel. Therefore no adverse impact.

Criticality: The deviation in the width of the Neutron Absorber Sheets does not alter the conclusion of the criticality analysis presented in the FSAR. As shown in FSAR, Fig. 3.3-15, as the Neutron Absorber Sheets width increases, the criticality factor k_{eff} decreases. Also the FSAR in Section 3.3.4.2.3 (F.5) states ".....Manufacturing nonconformances resulting in narrow regions on absorber sheets are acceptable without further analysis if the minimum width is no less than 6.0 inches." Therefore no adverse impact.

Thermal/Shielding/Mechanical: The nonconformance in the width of the Neutron Absorber Sheets does not significantly alter the thermal, shielding, or mechanical performance of the DSC

SE 72-1647 (TN NCR 01.069)

This Safety Evaluation addresses a nonconformance of the Basket Support Spacer Sleeves for the 52B DSC. The nonconformance is that the TN Fabrication specification and the FSAR require spacer sleeves' material to be ASME 564, Type 630, H1100. The as-procured material for these spacer sleeves is ASME 564, Type 630, H1150. The disposition is "Use-as-is".

The nonconformance does not alter the design basis, function & operations for the DSC and does not require any changes to the structural, shielding, criticality, thermal and weight analysis. The as-procured material meets the chemical and mechanical requirements of the ASME material classification as specified in the Fabrication Specification and the FSAR. The only difference is the Age Hardening temperature. The SE documents that the as-procured material meets the design requirements (H1100) for chemicals and mechanicals.

There are no adverse effects on the safety functions of the DSC such as: shielding, criticality, thermal and mechanical performance. There is no change to the design basis, function & operations of the DSC.

SE 72-1655 (TN NCR 01.074 & 01.076)

This Safety Evaluation addresses a nonconformance of the weld wire qualification for the NUHOMS General License DSC's and the Onsite Transfer Cask, OS197-1. The nonconformance is that that the stainless steel bare wire filler metals utilized for GMAW welding did not meet all the requirements of NB-2432. Specifically A-8 bare wire filler materials, which were used in the GMAW process, were not tested (chemically) in the as-deposited condition, but rather in the bare wire condition. This applies to one fabricator.

This evaluation demonstrates that there are no adverse impacts on safety for all disciplines as a result of the nonconformance. The results documented in the NCR's and summarized here demonstrate that the weldments made using these GMAW processes and weld filler metals are sound. There is no change to the critical dimensions of the DSC or TC, nor the fit, form and function of these components.

Structural: The structural evaluation of the DSC and Transfer Cask is not adversely impacted due to this nonconformance. The SE demonstrates that the weld filler metals used in the DSC and Transfer Cask fabrication, and the weld processes used, particularly the GMAW process, produced sound weldments. The operational handling loads and all other loadings are also unchanged. Therefore the stresses and margins (ASME Code allowables) are not adversely impacted.

The disposition approach had two elements; the first a demonstration by the use of in-situ testing that the TC and DSC weldments have sufficient delta ferrite and are thus sound, and the second a "worst-case" evaluation utilizing test specimens and destructive examination that assumes that these weldments have very low ferrite values, but still demonstrates that the weldments are sound and will perform the design function.
The service environment for the NUHOMS canister is such that the loss of all ferrite in the weld would, in the extreme case, produce a condition that approximates the stainless steel shell material and thereby produce no additional general or localized corrosion concern to the canister or TC.

Thermal/Shielding/Criticality/Mechanical: This nonconformance of weld filler metal testing does not involve a change to either the internal cavity dimension/tolerance of the DSC, or thickness of the end components, nor is the heat load or source term altered. The Transfer Cask is similarly unchanged. The nonconformance does not require any changes to the structural, shielding, criticality, thermal, and weight analysis. Therefore there is no change to the thermal, shielding, criticality, or mechanical results.