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HOLTEC INTERNATIONAL

HI-STORM 100 CASK SYSTEM

SAFETY EVALUATION REPORT

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NUCLEAR REGULATORY COMMISSION

Docket No. _____ Official Exh. No. 138

In the matter of PFS

Staff _____ IDENTIFIED ✓

Applicant _____ RECEIVED ✓

Intervenor ✓ _____ REJECTED _____

Other _____ WITHDRAWN _____

DATE 6-25-02 Witness _____

Clerk Amp

and the overpack in the tipover event for the maximum centrifugal acceleration (when the overpack is essentially horizontal and the MPC is only restrained longitudinally by steel on stainless steel friction). Due to the finite distance of MPC travel necessary for it to impact the overpack lid, any such impact would not be concurrent with maximum deceleration due to ground impact. Therefore, the tensile load to the lid restraining studs would not occur at the time of maximum shear in those studs.

As a result of the above considerations, the staff concludes that the scope of the SAR tipover analysis is acceptable.

Accidental Drop

The SAR structural analysis of accidental drops of an overpack with a full MPC is in Appendix 3.M. This analysis determines factors of safety for the overpack structural components in the load path associated with an 11 inch vertical drop onto the reference pad. Appendix 3.A provides the determination of the maximum height (11 inches) that the overpack and MPC within the overpack may be dropped with overpack longitudinal axis vertical without imposing more than 45g deceleration on the MPC. This drop height is used as a limiting condition of use for the height that the overpack with MPC may be above a receiving surface. Summary minimum factors of safety are shown in SAR Tables 3.4.5 and 3.4.9.

The analyses of the overpack structural elements in the SAR determine that the factors of safety of the most critically loaded elements would be above 1.0, and that any deformation would not impose loads on the MPC or impair ready retrievability of the stored materials.

The staff review determined that the analytical approaches, computations, results, and acceptance criteria are acceptable. The assumptions relating to the receiving surface (used for both drop and tipover) are acceptable. The pad is the reference pad used for the HI-STAR 100 Cask System SAR. This pad is identical to that described in UCRL-ID-126295. The factors of safety determined are considered to include the lowest factors of safety associated with tipover of the overpack.

The SAR drop analysis does not include examination of a corner drop or drop with the overpack longitudinal axis horizontal. The analyses also do not include the stresses in all of the welds or all of the component members of the overpack body or lid weldments.

A corner drop with the center of gravity over the point of impact is considered to be most likely to cause local permanent distortion of the overpack. A drop from the maximum design drop height of 11 inches would, however, result in greater penetration of the receiving surface, reducing the maximum decelerations experienced by the MPC. The effects of subsequent overturning would be within the effects determined for the non-mechanistic tipover event. Any simultaneous deformation of the overpack would further reduce the deceleration. Any significant permanent deformation of the overpack at the point of impact would be readily observable following the event. The restraint of 11 inches vertical height for overpack handling should preclude a situation in which the full overpack were raised sufficiently to permit a corner drop with c.g. vertically over a tangent to the base plate edge.

adequate for certification and licensing at those sites where it is shown that handling of the overpack will not be greater than 11 inches and that the receiving surface hardness does not exceed that analyzed in the SAR.

Under this postulated accident, all stresses remain within allowable values, thereby assuring that the confinement boundary remains in tact.

11.2.4 HI-STORM 100 Storage Overpack Tipover

11.2.4.1 Cause of Tipover

Although analyses have shown that the overpack will not tip over as a result of severe natural phenomena, such as earthquakes and tornadoes, a tipover analysis is required as a bounding design event to demonstrate the defense-in-depth of the design.

11.2.4.2 Consequences of Tipover Accidents

The tipover is described in Section 3.4.10 of the SAR. Analyses included a structural analysis of the tipover event, the determination of maximum accelerations that may be experienced, an analysis of the integrity of the overpack lid during the event, and an analysis of the studs securing the lid to the overpack. Staff review of the structural analyses are in Section 3 of this SER. The maximum acceleration of the MPC inside the overpack was shown to be 43.2 g as a result of the tipover event. This acceleration is bounded by the 45 g acceleration for which the MPC has been designed and analyzed. The structural analyses of tipover in the SAR concluded that the overpack would maintain safety, that the factors of safety of the most critically loaded elements would be above 1.0, and that deformations of the overpack would not impose loads on the MPC or impair retrievability following a tipover event. The staff review determined that the analytical approaches, computations, results, and acceptance criteria are acceptable.

11.2.5 Burial Under Debris

11.2.5.1 Cause of Burial

Natural phenomena that could lead to burial of the cask under man-made or earthen material.

11.2.5.2 Consequences of Burial

The applicant analyzed the effects of a postulated accident in which the cask is buried under debris which would act as an additional thermal resistance to heat removal from the cask surface as well as 100% blockage of all air inlets. This scenario satisfies the requirement of NUREG-1536 to perform an adiabatic heatup calculation. The thermal effect of debris was modeled as adiabatic insulation on the overpack along with complete air inlet blockage. The results of this analysis show that the short-term cladding temperature limit would not be reached until more than 100 hours. As in the case of the 100% air inlet blockage accident, the concrete short-term limit of 350°F would be expected to be reached at approximately 33 hours. This accident analysis demonstrates that the 24 hour surveillance interval for the cask air inlets is