

(Revision 5)

Summary of Other Heavy Load Drop Studies

Heavy load drops were evaluated as part of Generic Safety Issue 82. In NUREG/CR-4982 ("Severe Accidents in Spent Fuel Pools in Support of Generic Safety Issue 82) the total human error rate associated with cask movement was estimated to be 6.0×10^{-4} incidents per lift. It was further assumed that only 1-in-100 human errors would result in a cask drop. It was also estimated that the cask was above the pool edge (wall) about 25% of the lift time. Based on two shipment per week with two lifts per shipment (208 lifts), the estimate for a load drop on the spent fuel pool wall was 3.1×10^{-4} per year. Damage to the pool wall sufficient to cause a loss-of-inventory was further estimated to have a 1-in-10 probability based on the evaluation presented in NUREG/CR-5176, "Seismic Failure and Cask Drop Analyses of the Spent Fuel Pools at Two Representative Nuclear Power Plants," LLNL, P.G. Prassinis, et al., January 1989. The height of the load above the pool wall is only about 8 to 10 inches. The estimate of a loss-of-inventory from a heavy load drop on the spent fuel pool wall was 3.1×10^{-5} per year (for a non-single failure proof handling system). Damage resulting from a load drop onto the spent fuel pool floor was not addressed as part of Generic Safety Issue 82. If the load is dropped from a high enough elevation, 30 to 40 feet above the spent fuel pool floor, it is likely that significant damage could occur resulting in a loss-of-inventory. Based on 100 lifts per year, the NUREG/CR-4982 evaluation would estimate the loss-of-inventory from a heavy load drop on the spent fuel pool wall to be about 1.5×10^{-5} per year (for a non-single-failure proof handling system).

In NUREG-1353, conformance with NUREG-0612 was estimated to reduce the probability of a load drop as presented in NUREG/CR-4982 by a factor of 1,000. Based on Table 2, the fault tree method indicated that the expected reduction was in the 10 to 100 range. For 100 lifts per year, the NUREG/CR-4982 evaluation would estimate the loss-of-inventory from a heavy load drop on the pool wall to be 1.5×10^{-8} per year. This value should be increased by a factor of 10 to account for a load drop 30 to 40 feet above the spent fuel pool floor (a drop onto the pool floor may likely cause sufficient damage to result in a loss-of-inventory), to 1.5×10^{-7} per year, for use for comparison to this current evaluation for a load drop on the pool floor. Based on the fault tree quantification (Table 2), the mean probability for the loss-of-inventory from a heavy load drop was estimated to be 2.0×10^{-7} per year for 100 lifts (for a single-failure proof handling system) for a drop on the spent fuel pool floor and 2.0×10^{-8} per year for a drop on the spent fuel pool wall.

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