Heavy Load Drops

The working group investigated the frequency of dropping a heavy load in or near the spent fuel pool, and investigated potential damage to the pool from such a drop. Details of this evaluation can be found in Appendix 5. Based on discussions with structural engineers, the working group assumed that only spent fuel shipping casks had sufficient weight to catastrophically damage the pool if dropped. Other heavy loads are assumed to be treated using the guidelines presented in NUREG-0612, are of low likelihood to be moved over the spent fuel pool, or are of low likelihood to cause catastrophic damage to the pool if dropped.

For a non-single failure proof load handling system the likelihood of a load drop, or the drop frequency, was estimated from NUREG-0612 to be in the range of 2.0x10-5 to 1.2x10-3 per year, with a mean value of 3.4x10-4 per year. The number of lifts was based on the NEI estimate of 100 lifts per year. For a single failure proof load handling system (or a plant conforming to the NUREG-0612 guidelines), the range is estimated to be 5.5x10-6 to 3.4x10-5 per year, with a mean value of 9.6x10-6 per year, again for 100 lifts per year but using new data from Navy crane experiences. Once the load is dropped, the next question is whether the drop did significant damage to the spent fuel pool.

For the failure of the pool floor, it is assumed that the load physically travels near or over the pool between 5% and 25% of the total path lift length (the path lift length is the distance from the lift of the load to the placement of the load on the pool floor). It is also assumed that the critical path length (the load being high enough above the pool that a drop could cause damage to the structure) is between 10% and 15% of the length when the load is near or over the pool. The working group estimates a failure rate (the drop leading to a loss of inventory) in the 1.0x10-7 to 7.5x10-5 per year, with a mean value of 2.1x10-5 per year, for the non-single failure proof system and 2.8x10-8 to 2.1x10-6 per year, with a mean value of 2.0x10-7 per year for the single failure proof system (or a plant conforming to the NUREG-0612 guidelines).

For failure of the pool wall, the working group assumes one-in-ten events (0.1) will result in significant damage to the wall. For the non-single failure proof handling system, the mean value for the failure rate is 2.1x10-6 per year and for the single failure proof handling system the mean value for the failure rate is 2.1x10-8 per year (The value given in NUREG/CR-4982 for wall failure was 3.7x10-8 per year, for 204 lifts per year. For 100 lifts, the NUREG/CR-4982 value would be 1.5x10-8 per year.) These estimates are bounded by other more likely initiating events.