

(1) **Heavy loads**

WSRC-TR-93-581, "Savannah River Site Human Error Data Base Development for Nonreactor Nuclear Facilities," H.C. Benhardt, et al., Westinghouse Savannah River Company, February 28, 1994.

Data presented in terms of "a lift" which is defined as "lift, move and set down."

Generic assessment was 1.5×10^{-4} per operation-hour, high and low estimates are a factor of 10, assume "a lift" (operation) takes one hour:

Standard load	1.5×10^{-5} /operation, EF=10
Typical load	1.5×10^{-4} /operation, EF=10
Unusual load	1.5×10^{-3} /operation, EF=10

(2) **Aircraft crash**

DOE-STD-3014-96, "Accident Analysis for Aircraft Crash into Hazardous Facilities," U.S. Department of Energy, October 1996.

Spent fuel pool surface (80ftx40ft) $\sim 2 \times 10^{-4}$ square miles

(Will need to consider PWR and BWR differences, pool location)

Crashes per square mile per year (minimum, U.S. average, maximum):

General aviation	1×10^{-7}	2×10^{-4}	3×10^{-3}
Air carrier	7×10^{-8}	4×10^{-7}	2×10^{-6}
Air taxis	4×10^{-7}	1×10^{-6}	8×10^{-6}
Large military	6×10^{-8}	2×10^{-7}	7×10^{-7}
Small military	4×10^{-8}	4×10^{-6}	6×10^{-8}
Total:	7×10^{-7}	2×10^{-4}	3×10^{-3}

(3) **Tornado (Winds)**

(A) DOE-STD-1020-94, "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities," Change Notice #1, U.S. Department of Energy, January 1996.

(B) NUREG/CR-5042, "Evaluation of External Hazards to Nuclear Power Plants in the United States," C.Y. Kimura and R.J. Budnitz, U.S. Nuclear Regulatory Commission, December 1987.

(C) NOAA, <http://www.nssl.noaa.gov>

(Will need to consider PWR and BWR differences, pool location)

Average number of tornados per 10,000 square miles (1950 to 1995)

All	Oklahoma	7.5	Texas	4.7	Florida	8.4	Illinois	4.7
F2-F5	Oklahoma	2.4	Texas	1.1	Florida	1.2	Illinois	1.5

(4) Human error (considering data from WSRC-TR-93-581.

MATERIAL REQUIRED TO SUPPORT RISK ASSESSMENT - HEAVY LOADS AREA ONLY(1) **Heavy loads -**(A) **Spent fuel cask handling**

- (1) weight of cask, which risk group - standard, typical, unusual
- (2) number of lifts
- (3) period of vulnerability (time at risk to total time of movement)

(B) **Other heavy loads**

- (1) NUREG-0612 list samples of other heavy loads, which risk group - standard, typical, unusual
- (2) Are there others associated with decommissioning
 - (i) weight, size that would cause pool failure
 - (ii) number of lifts

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(iii) period of vulnerability (time at risk to total time of movement