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**DESIGN WIND SPEEDS FOR HIGH HAZARD, MODERATE
HAZARD, IMPORTANT/LOW HAZARD AND GENERAL USE
FACILITIES AT THE SAVANNAH RIVER SITE (U)**

by

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Nonreactor Safety Research
Savannah River Laboratory

September 11, 1989

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From: H. H. King, 773-41A *HHK*
Nonreactor Safety Research

Design Wind Speeds for High Hazard,
Moderate Hazard, Important/Low Hazard and
General Use Facilities at the Savannah River Site (U)

INTRODUCTION:

The design wind speeds for High Hazard, Moderate Hazard, Important/Low Hazard and General Use facilities at the Savannah River Site are developed below using the procedures and site-specific hazards model required by DOE Order 6430.1A¹.

SUMMARY:

The design wind speeds, calculated according to DOE Order 6430.1A, for each type of facility at the Savannah River Site are listed below. These are less than the previously required Design Wind Speeds.

High Hazard (Maximum Resistance) Facility	185 mph
Moderate Hazard (High Resistance) Facility	137 mph
Important/Low Hazard (Intermediate) Facility	83 mph
General Use (Standard) Facility	78 mph

Keywords: Design Wind Speed, High Hazard, Moderate Hazard,
Important, Low Hazard, General Use

Retention Period: Lifetime

Charles M. Ebra-Jinn
Authorized Derivative Classifier

DISCUSSION:

DOE Order 6430.1A (0111-2.4.2 & 0111-99.0.2) specifies that the procedures for determining basic wind speeds of UCRL-15910² be used in applying the site-specific hazard model studies summarized in UCRL-53526.³ Additionally, DOE Order 6430.1A states that the specific guidance on relating frequency of occurrence to facility hazard levels shall be obtained from UCRL-15910.

For each building category, a basic wind speed is determined from the Wind/Tornado Hazard Curve for SRS in UCRL-53526 (Figure 1) corresponding to the hazard exceedance probability recommended for the building category by UCRL-15910. This wind speed must be fastest-mile. The wind speeds corresponding to the exceedance probability for Important/Low Hazard and General Use facilities are from the straight wind region of the curve and are already in fastest-mile. The wind speeds corresponding to the exceedance probability for High and Moderate Hazard facilities are in the tornado region of the curve. Tornado winds are gusts which must be converted to equivalent fastest mile. This is done by UCRL-15910, Table 5-2 and the equation:

$$V_{fm} = 0.958V_t - 11.34$$

The UCRL-15910 procedure to obtain the design wind speed (V_d) is to multiply the fastest-mile basic wind speed (V_{fm}) by an Importance factor (I) given by UCRL-15910, Table 5-3. Importance factors are multipliers to reduce the probability of damage to meet the performance goal of the building category. Therefore, to obtain the design wind speed:

$$V_d = V_{fm}I.$$

HIGH AND MODERATE HAZARD FACILITIES

UCRL-15910 recommends that SRS design for tornado type wind for High and Moderate Hazard facilities. For High Hazard and Moderate Hazard facilities requiring tornado resistance, the recommended basic wind speed is based on an annual hazard exceedance probability of 2×10^{-5} .²

The tornado wind recommended basic wind speed from Figure 1 corresponding to a probability of 2×10^{-5} is 155 mph, converting to equivalent fastest mile by the equation above:

$$V_{fm} = 0.958V_t - 11.34 = 0.958(155) - 11.34 = 137 \text{ mph.}$$

This agrees with the basic wind speeds for the Savannah River Site given in UCRL-15910, Table 5-4.

For High Hazard facilities, the tornado wind Importance factor given by UCRL-15910, Table 5-3 is 1.35. Thus, for High Hazard facilities the Design Wind Speed (V_d) based on tornado winds is:

$$V_d = V_{fm}I = (137)(1.35) = \underline{185 \text{ mph.}}$$

For Moderate Hazard facilities, the tornado wind Importance factor given by UCRL-15910, Table 5-3 is 1.0. Thus, for Moderate Hazard facilities the Design Wind Speed (V_d) based on tornado winds is:

$$V_d = V_{fm}I = (137)(1.0) = \underline{137 \text{ mph.}}$$

IMPORTANT/LOW HAZARD AND GENERAL USE FACILITIES

For Important/Low Hazard and General Use facilities, the recommended basic wind speed is based on an annual hazard exceedance probability of 2×10^{-2} .² The recommended basic wind speed from Figure 1 corresponding to a probability of 2×10^{-2} is 78 mph. This also agrees with the basic wind speeds for the Savannah River Plant given in UCRL-15910, Table 5-4.

For Important/Low Hazard facilities, the Importance factor given by UCRL-15910, Table 5-3 is 1.07. Thus, for Important/Low Hazard facilities the Design Wind Speed (V_d) is:

$$V_d = V_{fm}I = (78)(1.07) = \underline{83 \text{ mph.}}$$

For General Use facilities, the Importance factor given by UCRL-15910, Table 5-3 is 1.0. Thus, for General Use facilities the Design Wind Speed (V_d) is:

$$V_d = V_{fm}I = (78)(1.0) = \underline{78 \text{ mph.}}$$

REFERENCES:

1. DOE Order 6430.1A, "General Design Criteria", United States Department of Energy (April 6, 1989).
2. UCRL-15910, "Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards", Lawrence Livermore National Laboratory, University of California, Livermore, California (Draft - May 1989).
3. UCRL-53526, Rev. 1, "Natural Phenomena Hazards Modeling Project: Extreme Wind/Tornado Hazard Models for Department of Energy Sites", Lawrence Livermore National Laboratory, University of California, Livermore, California (August 1985).

Figure 1
(From UCRL-53526, Rev. 1)

Wind Hazard at the Savannah River Plant, South Carolina

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