

# American Nuclear Society

## estimating tornado, hurricane, and extreme straight line wind characteristics at nuclear facility sites

### an American National Standard

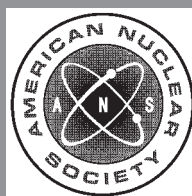
**REAFFIRMED**

**June 29, 2016**

**ANSI/ANS-2.3-2011; R2016**

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This standard does not necessarily reflect recent industry initiatives for risk informed decision-making or a graded approach to quality assurance. Users should consider the use of these industry initiatives in the application of this standard.



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**American National Standard  
Estimating Tornado, Hurricane, and  
Extreme Straight Line Wind Characteristics  
at Nuclear Facility Sites**

Secretariat  
**American Nuclear Society**

Prepared by the  
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## **American National Standard**

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## Foreword

(This Foreword is not a part of American National Standard “Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites,” ANSI/ANS-2.3-2011.)

This standard is a revision to ANSI/ANS 2.3-1983, “Standard for Estimating Tornado and Extreme Wind Characteristics at Nuclear Power Sites.” The revision of the 1983 standard began in May of 2005. In this revision, the scope of the standard was expanded to include hurricane wind characteristics. A change to the Fujita damage scale as a function of wind velocities, adopted in 2007 by the National Weather Service, resulted in the wind speeds associated with the Fujita damage scale being replaced by the Enhanced Fujita Scale as shown in Table 1. Also included in the scope expansion is the applicability of this standard to all nuclear facility sites, not just nuclear power plant sites.

This standard might reference documents and other standards that have been superseded or withdrawn at the time the standard is applied. A statement has been included in the reference section that provides guidance on the use of references.

This standard does not incorporate the concepts of generating risk-informed insights, performance-based requirements, or a graded approach to quality assurance. The user is advised that one or more of these techniques could enhance the application of this standard.

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<b>Contents</b>	<b>Section</b>	<b>Page</b>
	<b>1</b> Scope .....	1
	<b>2</b> Definitions .....	1
	<b>3</b> Characterization of rare and extreme wind events .....	2
	3.1 Regionalization of wind speeds .....	2
	3.2 Rare events .....	2
	3.2.1 Tornadoes .....	2
	3.2.2 Hurricanes .....	4
	3.3 Extreme straight line wind events .....	6
	3.4 Localization of wind speeds .....	6
	3.4.1 Selection of a database representative of a site .....	10
	3.4.2 Deriving the extreme wind speed .....	10
	3.4.3 Winds at a standard level .....	10
	3.4.4 Tornado design basis wind fields .....	10
	<b>4</b> Wind-generated missiles .....	10
	<b>5</b> References .....	11
	<b>Tables</b>	
	Table 1 Recommended EF-Scale wind speed ranges .....	2
	Table 2 Design basis tornado wind field characteristics .....	5
	Table 3 Data used to generate mean return period and probabilities of exceedence curves .....	7
	Table 4 Standard design missile spectrum for tornado- and hurricane-type winds .....	9
	<b>Figures</b>	
	Figure 1 Regionalization of extreme and rare wind events .....	3
	Figure 2 Wind speeds at a Region I wind hazard site .....	4
	Figure 3 Wind speeds at a Region II wind hazard site .....	5
	Figure 4 Wind speeds at a Region III wind hazard site .....	6



# Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites

## 1 Scope

This standard establishes guidelines to estimate the frequency of occurrence and the magnitude of parameters associated with rare meteorological events such as tornadoes, hurricanes, and extreme straight line winds at nuclear facility sites within the continental United States. The parameters addressed include the following: maximum wind speed (e.g., translational, rotational, and total), maximum atmospheric pressure drop, and design basis missile characteristics. Recommended values of these parameters are provided. This standard does not address the forces on structures that result from these physical phenomena.

The standard also refers to two acceptable methodologies for developing tornado wind hazard curves and recommends the use of a set of hazard curves for determining design basis tornado and hurricane wind speeds and extreme straight line wind speeds for various geographical regions within the continental United States. These curves can be used to determine design basis wind speeds for a predetermined frequency of occurrence or return period that is appropriate for the facility based on safety, relative cost, and strategic importance considerations. The selection or determination of the frequency of occurrence is not addressed in this standard.

The values of the design parameters recommended in this standard are intended to assure that public health and safety will be maintained as required in *Code of Federal Regulations*, Title 10, "Energy," Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, Criteria 2 and 4 [1]<sup>1</sup>; *Code of Federal Regulations*, Title 10, "Energy," Part 70, "Domestic Licensing of Special Nu-

clear Material" [2]; and *Code of Federal Regulations*, Title 10, "Energy," Part 830, "Nuclear Safety Management" [3].

The standard does not address the determination of the design basis tornado and other extreme wind effects for sites located outside the continental United States (i.e., Alaska, Hawaii, Virgin Islands, Guam, and Puerto Rico) or over the Atlantic and Pacific Oceans and the Gulf of Mexico. Such determinations should be evaluated on a case-by-case basis. Additionally, the standard does not identify the structures, systems, and components that should be designed to withstand the effects of the design basis extreme or rare wind speeds and remain functional nor does it treat the structural design requirements for protection from these winds.

## 2 Definitions

**cyclostrophic wind:** The cyclostrophic wind is the horizontal wind velocity for which the centrifugal force exactly balances the horizontal pressure gradient force. The cyclostrophic wind is a good approximation of the real wind in cases of very great wind speed and strong curvature such that the centrifugal force is clearly dominant over nonpressure gradient forces (e.g., Coriolis force).

**design basis hurricane:** The design basis hurricane is a postulated hurricane used for design purposes only, having characteristics with a frequency of exceedance commensurate with the facility safety goal.

**design basis tornado:** The design basis tornado is a postulated tornado, used for design purposes only, having characteristics consistent with a frequency of exceedance commensurate with the facility safety goal.

<sup>1</sup>Numbers in brackets refer to corresponding numbers in Sec. 5, "References."