

# A Comparative Study of Design Tornado Missiles at SRS

Shawn Carey<sup>1</sup>, Adeola Adediran<sup>2</sup>, Jay Amin<sup>3</sup>

<sup>1</sup>Savannah River Nuclear Solutions, LLC., 730-2B Savannah River Site, Aiken, SC 29808; PH (803)

952-9182; email: [shawn.carey@srs.gov](mailto:shawn.carey@srs.gov)

<sup>2</sup>Savannah River Remediation, 742-7G Savannah River Site, Aiken, SC 29808; PH (803)

208-3520; email: [adeola.adediran@srs.gov](mailto:adeola.adediran@srs.gov)

<sup>3</sup>Savannah River Remediation, 742-2G Savannah River Site, Aiken, SC 29808; PH (803)

208-8956; email: [jayprakash.amin@srs.gov](mailto:jayprakash.amin@srs.gov)

## ABSTRACT

With the implementation of DOE-STD-1020-2012, a significant change in design tornado missiles has occurred for Department of Energy (DOE) facilities. Previously, DOE-STD-1020 specified a uniform set of tornado missiles (2x4, 3" steel pipe, and rolling and tumbling automobile) for all DOE facilities. The velocity of the prior tornado missiles did not change from site to site. Additionally prior revisions of DOE-STD-1020 provided recommended missile barriers for the 2x4 and pipe missiles.

Presently, DOE-STD-1020-2012 requires the use of ANS 2.3 for design wind missiles unless a site specific Probabilistic Wind Hazard Assessment (PWHA) is performed. The suite of tornado missiles identified by ANS 2.3 includes a significantly heavier pipe missile and a heavier automobile missile that can impact up to an elevation of 30-ft as opposed to a rolling and tumbling automobile. Additionally, there is a 1-in diameter steel sphere missile. The velocity of the missiles is also higher, and now proportional to the design tornado wind speed at the local site.

This paper presents a comparison between the prior design tornado missile requirements of DOE-STD-1020 and the new design missile requirements per ANS 2.3 at the Savannah River Site (SRS). Missile energy is shown to increase over 500%, resulting in increased missile barrier requirements. The previously recommended barriers are shown to be inadequate for the new design missiles and design requirements for more robust barriers are recommended. The automobile missile in particular is shown to pose significant challenges due to increased energy and height requirements. Further discussion is provided on the potential for a PWHA to reduce the required missile speeds.

## References:

DOE-STD-1020-2012, Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities.

ANS 2.3-2011, Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites.