



Department of Energy
National Nuclear Security Administration
Washington, DC 20585



October 12, 2018

MEMORANDUM FOR JAMES J. MCCONNELL
CENTRAL TECHNICAL AUTHORITY

FROM: DANIEL SIGG
CHIEF OF DEFENSE NUCLEAR SAFETY

SUBJECT: Action: Central Technical Authority (CTA) Concurrence for
Revision to DOE-NA-STD-3016-2016

- References:
1. DOE-NA-STD-3016-2016, *Hazard Analysis Reports for Nuclear Explosive Operations*
 2. Draft DOE-NA-STD-3016-2018, *Hazard Analysis Reports for Nuclear Explosive Operations*
 3. DOE-HDBK-3010-94 CNI, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities, Volume 1 – Analysis of Experimental Data*
 4. NUREG/CR-6410, *Nuclear Fuel Cycle Facility Accident Analysis Handbook*, March 1998

ISSUE: Whether to concur on a revision to DOE-NA-STD-3016-2016 (reference 1). As the Office of Primary Interest for DOE-NA-STD-3016, NA-12 has proposed changes to the weapon response consequence categories known as High Explosive Violent Reaction (HEVR) and Worker Safety (WS), as documented in the updated Standard, DOE-NA-STD-3016-2018 (reference 2). This revision also incorporates a previously approved change distributed via memorandum establishing low order weapon response screening thresholds.

BACKGROUND: As currently defined in reference 1, HEVR is a category of weapon response used in hazard analysis that includes reactions ranging from a fast deflagration of the high explosive up to and including a detonation of the high explosive. In addition, reference 1 states any Inadvertent Nuclear Detonation (IND) or explosive dispersal (HEVR) of plutonium should be treated as an event that will challenge the Evaluation Guideline (EG) to the maximally-exposed offsite individual (MEOI). Consequently, all hazard scenarios that are not “screened” for IND or HEVR consequences are treated as Design Basis Accidents in the Hazard Analysis Report and safety class controls are identified, as appropriate.



However, given the current broad range of high explosive responses as currently defined by HEVR (i.e., fast deflagration up to and including detonation), weapon responses classified as HEVR have typically resulted in hazard scenarios that pose no potential challenge to the EG. As documented in References 3 and 4, burning dispersal of Pu is calculated to result in a bounding dose three orders of magnitude smaller than that resulting from aerosolized dispersal, on the order of 50 mrem to the MEOI. In order to reach a dose that would be considered challenging to the EG (conservatively based on > 5 rem at the site boundary), aerosolized dispersal of Pu is required to provide a dose approximately ten times larger in magnitude than burning dispersal. Since the current definition of HEVR would include a range of hazard scenarios that cannot result in significant aerosolized dispersal, NA-12 has proposed that HEVR be replaced with a new term, *Aerosolized Dispersal*, defined so that only those hazard scenarios that can result in significant aerosolized dispersal with a likelihood greater than 10^{-9} result in this weapon response category. The new definition is:

Aerosolized Dispersal: A category of weapon response used in hazard analysis that occurs when a main charge detonation results in a Significant Aerosolized Dispersal of fissile material.

NA-12 has revised DOE-NA-STD-3016 to formally incorporate the new definition as reflected in the updated Standard, DOE-NA-STD-3016-2018.

This change also results in a change to the definition of the “Worker Safety” weapon response category. As it is currently defined in DOE-NA-STD-3016-2016, this category specifically excludes lower level HE reactions that do not involve deflagration or detonation. With the change to HEVR, some weapon responses that do have the potential for deflagration or detonation but do not result in significant aerosolized dispersal could be categorized as a Worker Safety consequence. The new definition for Worker Safety is:

Worker Safety: A category of weapon response used in hazard analysis that includes consequence outside of those produced by standard industrial hazards that result in a loss of life to one or more persons, loss of the use of a limb or organ, or other serious injury to a worker including when the HE components undergo deflagration or detonation with no significant aerosolized release of SNM.

It is important to note that this change in high order weapon response categories will only pertain to safety analysis requirements documented in DOE-NA-STD-3016-2018. The Nuclear Explosive Safety (NES) directives still use the term HEVR to ensure NES evaluations continue to look at the sufficiency of positive measures to preclude all hazards that could result in a fast deflagration up to and including inadvertent nuclear detonation. This difference also introduces the possibility that NES evaluations could result in findings wherein the NES standards are not satisfied due to the lack of two independent positive measures since many of the “credited” positive measures are based on the controls that result from the safety analysis.

Once the changes were considered ready for DNFSB review, they were shared with the Board site reps at Pantex. A meeting was held with the Board staff to answer their questions and changes were made to the definition for AD to address some of their concerns. This change includes:

- removing the reference to a source term that results in 5 rem or greater to the MEOI from the definition of Aerosolized Dispersal. This caveat was intended to help define what is meant by “significant aerosolization” but it caused concern to the Board as they interpreted it to mean the Design Agencies (DAs) would be doing dispersion analyses as part of weapons response. The DAs do not intend to do this and will instead use their engineering judgment to determine when the appropriate hazard conditions exist to result in significant aerosolized dispersal so this caveat has been removed from the definition of AD.

A briefing has been scheduled for October 19 to discuss how NNSA will implement the revisions within DOE-NA-STD-3016-2018. NA-12 will detail that the current HARs for all weapons will remain in force until NA-12 initiates revisions to specific weapon HARs, based on program needs.

The other change included in this revision is incorporation of the low order weapon response screening threshold likelihood of less than or equal to 10^{-6} , which was previously disseminated via memorandum and concurred on by the NNSA CTA. Incorporating this screening threshold into the formal revision of the Technical Standard ensures this change is formally disseminated in compliance with the Technical Standards program.


The revision was identified through an approved Project Justification Statement and posted in Revcom, comments were resolved and resolutions were successfully negotiated, and TSM concurrence has been provided.

NA-12 led multiple discussions with staff from the Office of Chief of Defense Nuclear Safety (CDNS), NPO and the Design Agencies that led to successful resolution of review comments on the technical justification documents for the revised standard. NPO staff has concluded that Hazards Analysis Reports based on revised standard will have an adequate technical basis to support approval. CDNS staff concurs with NPO and concludes CTA concurrence is justified.

OPTIONS: Concur on the proposed revision to DOE-NA-STD-3016 as documented in Reference 2 replacing the HEVR weapon response category with Aerosolized Dispersal, revising the Worker Safety weapon response category, and incorporating the low order consequence screening threshold. Concurring with these changes ensures a consistent approach across all design agencies as they apply weapon response categories and appropriate categorization of controls.

All stakeholders have converged on the improved definitions in the revised Standard. Non-concurrence would require continued use of the low order consequence screening threshold memo and the existing standard which would result in negative mission impact.

RECOMMENDATION: That you concur on the revision to DOE-NA-STD-3016 as documented in draft DOE-NA-STD-3016-2018.

CONCUR:  NONCONCUR: _____ DATE: 10/15/2018

Attachments

Redline version of DOE STD 3016-2018

Final revised version of DOE STD 3016-2018