Department Of Energy

Natural Phenomena Hazards Program

Sharon Jasim-Hanif, Ph.D.
Office of Nuclear Safety Basis & Facility Design (AU-31)

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Agenda

- **Program Overview**
- **Policy**
  - DOE Order 420.1C
  - DOE Standard 1020-2016
  - DOE Handbook 1220-2017
  - DOE Handbook XXXX-YR
- **Schedule**
- **Questions**

NPH Program Overview

- **DOE Office**: Office of Nuclear Safety (AU-30)
- **Mission**: Develop & maintain requirements, standards and guidance for DOE facilities exposed to NPHs
- **Driver**: Established through DOE Order (O) 420.1C, *Facility Safety*
- **Direction & Guidance**: Seismic, extreme wind, tornado, precipitation, flood, volcanic & lightning hazards
- **How**: Provides assistance, training, communications & support to facilitate effective implementation of DOE's NPH Standards to assure public & worker health & safety

DOE-O-420.1C, Facility Safety

Chapter 4: NPH Mitigation

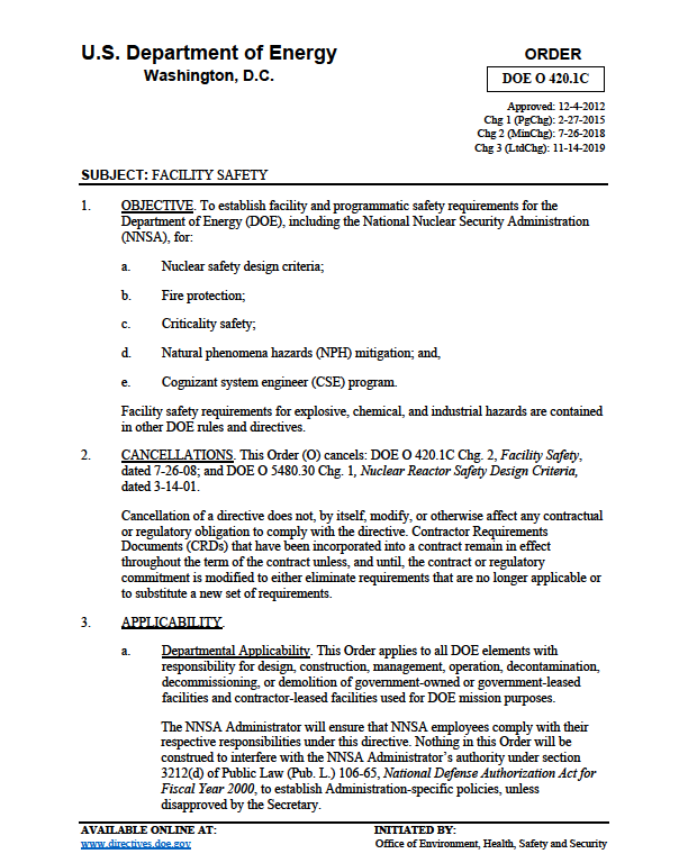
- Establish facility design, construction and operations requirements for NPH events

Applies to:

- Government-owned and leased nuclear and nonnuclear facilities and sites
- New construction
- Existing facilities
- Major modifications to existing facilities

Requirements:

- General
- NPH Design Criteria: DOE-STD-1020-2016
- NPH Accident Analysis
- Periodic Review
- Seismic Detection
- Post-NPH Event Procedures



U.S. Department of Energy
Washington, D.C.

ORDER
DOE O 420.1C

Approved: 12-4-2012
Chg 1 (PgChg): 2-27-2015
Chg 2 (MinChg): 7-26-2018
Chg 3 (LtdChg): 11-14-2019

SUBJECT: FACILITY SAFETY

1. OBJECTIVE. To establish facility and programmatic safety requirements for the Department of Energy (DOE), including the National Nuclear Security Administration (NNSA), for:

   a. Nuclear safety design criteria;

   b. Fire protection;

   c. Criticality safety;

   d. Natural phenomena hazards (NPH) mitigation; and,

   e. Cognizant system engineer (CSE) program.

   Facility safety requirements for explosive, chemical, and industrial hazards are contained in other DOE rules and directives.

2. CANCELLATIONS. This Order (O) cancels: DOE O 420.1C Chg. 2, *Facility Safety*, dated 7-26-08; and DOE O 5480.30 Chg. 1, *Nuclear Reactor Safety Design Criteria*, dated 3-14-01.

   Cancellation of a directive does not, by itself, modify, or otherwise affect any contractual or regulatory obligation to comply with the directive. Contractor Requirements Documents (CRDs) that have been incorporated into a contract remain in effect throughout the term of the contract unless, and until, the contract or regulatory commitment is modified to either eliminate requirements that are no longer applicable or to substitute a new set of requirements.

3. APPLICABILITY.

   a. Departmental Applicability. This Order applies to all DOE elements with responsibility for design, construction, management, operation, decontamination, decommissioning, or demolition of government-owned or government-leased facilities and contractor-leased facilities used for DOE mission purposes.

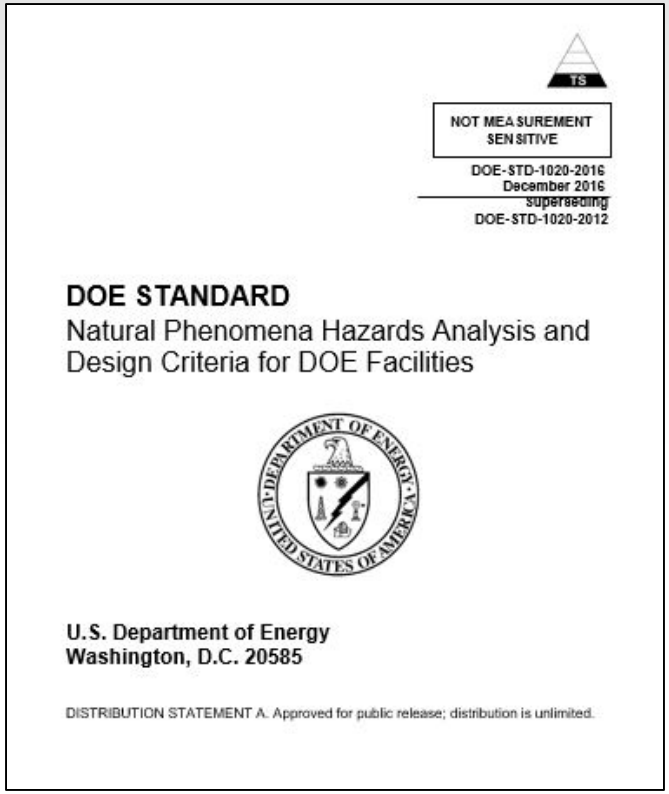
   The NNSA Administrator will ensure that NNSA employees comply with their respective responsibilities under this directive. Nothing in this Order will be construed to interfere with the NNSA Administrator's authority under section 3212(d) of Public Law (Pub. L.) 106-65, *National Defense Authorization Act for Fiscal Year 2000*, to establish Administration-specific policies, unless disapproved by the Secretary.

AVAILABLE ONLINE AT: www.directives.doe.gov
INITIATED BY: Office of Environment, Health, Safety and Security

DOE-STD-1020-2016

Purpose:

- Provides criteria and guidance in NPH analysis and design of structures, systems, and components (SSCs) for:
  - Implementing requirements of DOE O 420.1C, *Facility Safety*, and to ensure SSCs perform safely under NPH events.
  - Use of industry building codes and voluntary consensus standards encouraged by 1995 National Technology Transfer & Advancement Act



TS

NOT MEASUREMENT SENSITIVE

DOE-STD-1020-2016
December 2016
superseding
DOE-STD-1020-2012

DOE STANDARD

Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities

U.S. Department of Energy
Washington, D.C. 20585

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

DOE-STD-1020-2016
Evolution

Background documents supporting implementation of the NPH requirements:

Year	DOE Standards	Background Documents
1989		UCRL-15910
1994	DOE STD-1020-94	
1996	DOE STD-1020 Change Notice #1	
2002	DOE STD-1020-2002	
2005		ASCE 43
2008		DOE STD-1189-2008
2012	DOE STD-1020-2012	DOE STD-1189, ANS 2.26, ASCE 43
2016	DOE STD-1020-2016	DOE STD-3009-2014

DOE-STD-1020-2016
Revision Scope

- **Summary of Technical Changes:**
  - Corrected errors & omissions in DOE-STD-1020-2012 (Table 2-1)
  - Aligned with updated DOE-STD-3009-2014, DOE-STD-1189-2016, and DOE O 420.1C, Chg. 1 (Table A-1)
  - Implemented results from 10 Year NPH Assessment Review Report
  - Aligned with updated industry standards and voluntary consensus codes
  - Invoked updated Executive Order (EO) requirements
- **Summary of General Changes:**
  - Consolidated 'shall' statements from 400 to 140 requirements
  - Minimized rephrasing of requirements from industry standards
  - Improved clarity significantly
  - Overall length reduced from 90 to 55 pages
  - Reorganized sections to better emphasize DOE NPH requirements

DOE-STD-1020-2016
Structure of Standard

Organization - NO change:

Section 1. Introduction

Section 2. General Criteria for NPH Design

Section 3. Seismic Design

Section 4. Wind, Tornado, and Hurricane Design

Section 5. Flood, Seiche, and Tsunami Design

Section 6. Lightning Design

Section 7. Precipitation Design

Section 8. Volcanic Eruption Design

Section 9. Evaluation and Modification of SSCs in Existing Facilities

Section 10. Quality Assurance and Peer Review

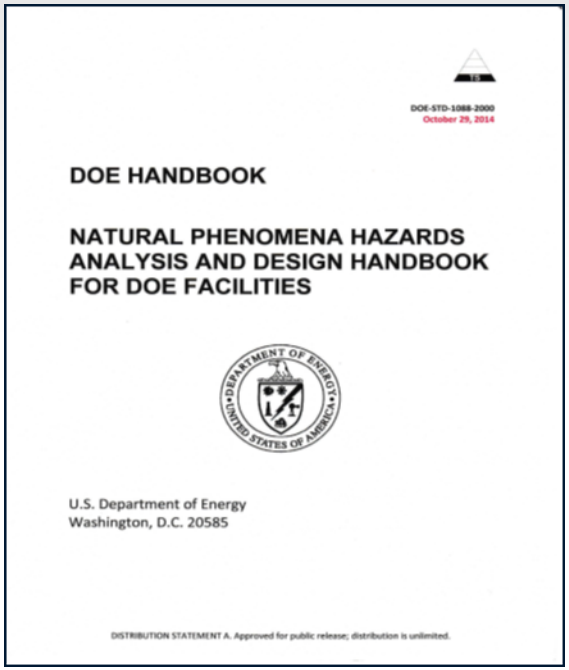
DOE-HDBK-1220-2017

Purpose:

- Companion document to DOE-STD-1020-2016
- Captures & updates useful and applicable technical information from DOE-STD-1020-2002, DOE-STD-1020-2012 & DOE Guide 420.1-2.
- Good practices & implementation aid to meet the Standard's requirements and guidance.
- First issuance 2017

Applies to:

- Same as DOE-STD-1020-2016
- Format and organization is same as the Standard



DOE-STD-1088-2000
October 29, 2014

DOE HANDBOOK

NATURAL PHENOMENA HAZARDS ANALYSIS AND DESIGN HANDBOOK FOR DOE FACILITIES

U.S. Department of Energy
Washington, D.C. 20585

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Under Development

DOE Handbook (HDBK) XXXX-YR
Seismic Evaluation Procedure for Equipment in U.S. DOE Facilities.

Purpose:

- Based on DOE Report, DOE/EH-0545, *Seismic Evaluation Procedure for Equipment in U.S. Department of Energy Facilities, 1997*.
- Provide technical updates since its issuance in 1997 and convert the report into a Handbook to clearly identify criteria and guidance for enhancing the seismic safety of facilities.
- Referenced in DOE-STD-1020-2016-Section 3.6 Building and Equipment Capacity Evaluation
- Adapted from the Seismic Qualification Utility Group (SQUG) Generic Implementation Procedure (GIP) used by the nuclear power industry.
- In the late 1970s, the U.S. Nuclear Regulatory Commission (NRC) expressed concern that nuclear equipment seismically qualified to standards preceding to IEEE-344-1975, *Recommended Practices for Seismic Qualification of A Class 1E Equipment for Nuclear Power Generating Stations* and newer more rigorous seismic design criteria might not provide sufficient assurance of seismic adequacy in older facilities.

Under Development

DOE Handbook (HDBK) XXXX-YR
Seismic Evaluation Procedure for Equipment in U.S. DOE Facilities

Background:

- The DOE/EH-0545 procedure involves facility walkdowns and applying screening criteria to identify deficiencies. Evaluates the seismic adequacy of equipment greater than or equal to the seismic demand imposed on it.
- DOE-EH/0545 adopts many of the GIP 20 classes, and amends those with DOE specific equipment.
- DOE facilities are not structurally equivalent to nuclear power plants, which are typically stiff, with shear wall structures.
- The approach in the SQUG GIP for comparing seismic capacity with seismic demand has been modified for DOE usage.

Revision Scope:

- Based on revision 3A of SQUG GIP,
- Consistency with current DOE policy orders, and standards (DOE-STD-1020-2016 seismic design categories and other terminology), and
- Update references to relevant industry standards where additional SQUG guidance exists

Handbook Team

DOE Steering Group	DOE Writing Group	Technical peer review
Sharon Jasim-Hanif **Brian Dinunno** **Steve McDuffie** **Brent Gutierrez**	Sharon Jasim-Hanif Michael W. Salmon (c) Glenn Cox (v) Greg Mertz (c) George Antaki (c) Seth Johnson(c) Joe Vasquez (v) F. George Abatt (c) Steve Eder (c) Jim Johnson (c) Rick Cutsinger (c)	Senior managers Independent panel of industry experts familiar with SQUG GIP Users of DOE-EH/0545

Policy Revision Schedule

Policy Document	Revision Timeline
DOE Order 420.1C Chg3(LtdChg)	Complete Nov 14, 2019
DOE Standard 1020-2016	Next 2021
DOE Handbook 1220-2017	Next 2021
DOE Handbook XXXX-YR	Active 2020/21

Questions

- **Sharon Jasim-Hanif, DOE-STD-1020-2016 Lead**
  Office of Nuclear Safety Basis and Facility Design (AU-31)
  Phone: (301)-903-4664;
  E-mail: sharon.jasim-hanif@hq.doe.gov

- **Brian Dinunno, Director, (AU-31)**
  Office of Nuclear Safety Basis and Facility Design (AU-31)
  Phone: (301)-903-0926;
  E-mail: brian.dinunno@hq.doe.gov