

Approved: 4-14-09

SUBJECT: NUCLEAR EXPLOSIVE SAFETY

1. PURPOSE. This Department of Energy (DOE) Order establishes requirements to implement the nuclear explosive safety (NES) elements of DOE O 452.1D, *Nuclear Explosive and Weapon Surety Program*, for routine and planned nuclear explosive operations (NEOs).
2. CANCELLATION. DOE O 452.2C, *Nuclear Explosive Safety*, dated 06-12-06. Cancellation of a directive does not, by itself, modify or otherwise affect any contractual obligation to comply with the directive. Contractor requirements documents (CRDs) that have been incorporated into or attached to a contract remain in effect until the contract is modified to either eliminate requirements that are no longer applicable or substitute a new set of requirements.
3. APPLICABILITY.
 - a. Departmental Elements. Except for the exclusion in paragraph 3c, this Order applies to all those Departmental elements that are involved in performing, managing, overseeing, or directly supporting NEOs or associated activities, including those created after the Order is issued. (Go to <http://www.directives.doe.gov/pdfs/reftools/org-list.pdf> for the most current listing of Departmental elements.)

The Administrator will ensure that NNSA employees and contractors comply with their respective responsibilities under this Order. Nothing in this Order shall be construed to interfere with the NNSA Administrator's authority under section 3212(d) of Public Law (P.L.) 106-65 to establish Administration-specific policies, unless disapproved by the Secretary.

- b. DOE Contractors.
 - (1) Except for the exclusions in paragraph 3c, the Contractor Requirements Document (CRD), Attachment 1, sets forth requirements of this Order that will apply to contracts that include the CRD.
 - (2) This CRD must be included in all contracts that involve performing, managing, overseeing, or directly supporting NEOs or associated activities.
 - (3) Site office managers are responsible for notifying contracting officers of which contracts are affected. Once notified, contracting officers are responsible for incorporating the CRD into each affected contract.

c. Exclusions.

- (1) This Order does not apply to unplanned events. DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*, dated 8-19-03, provides requirements for categorizing and reporting non-emergency NES occurrences. DOE O 151.1C, *Comprehensive Emergency Management*, dated 11-02-05, provides requirements for categorizing and reporting emergency NES occurrences. The senior energy official, or higher authority, will determine when to transition from emergency management directives to this Order.
- (2) The following Departmental elements are excluded: Office of the Chief Financial Officer, Office of the Chief Information Officer, Office of Civilian Radioactive Waste Management, Office of Congressional and Intergovernmental Affairs, Office of Economic Impact and Diversity, Energy Information Administration, Office of Electricity Delivery and Energy Reliability, Office of Energy Efficiency and Renewable Energy, Office of Environmental Management, Office of Fossil Energy, Office of Hearings and Appeals, Office of Human Capital Management, Office of Intelligence and Counterintelligence, Office of Legacy Management, Office of Management, Office of Nuclear Energy, Office of Policy and International Affairs, Office of Public Affairs, Office of Science, Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, and Western Area Power Administration.
- (3) In accordance with the responsibilities and authorities assigned by Executive Order 12344, codified at 50 USC sections 2406 and 2511 and to ensure consistency through the joint Navy/DOE Naval Nuclear Propulsion Program, the Deputy Administrator for Naval Reactors (Director) will implement and oversee requirements and practices pertaining to this Directive for activities under the Director's cognizance, as deemed appropriate.

4. REQUIREMENTS

- a. Nuclear Explosive Safety Program. NEOs require special consideration because of the potentially unacceptable consequences of an accident or unauthorized act. The NES program outlined in this section supports the requirement that NEOs must be designed and conducted in a manner that meets the NES Standards of DOE O 452.1D or successor directive. It includes the following: NES Rules (general and supplemental NESRs), formal NES evaluations, fundamental NEO process requirements (procedures, facilities, equipment, and people), requirements for onsite and offsite transportation (mobile NEOs), sustaining requirements (positive verification, change control and configuration management), requirements for nuclear explosive-like assemblies (NELAs), and permanent marking of nuclear explosives and NELAs.

- (1) General Nuclear Explosive Safety Rules (NESRs). The general NESRs set forth in this paragraph are mandatory for all NEOs.
 - (a) Nuclear Explosive Safety Evaluation. NEOs must not be performed until a NES study (NESS) has been conducted, the NESS has been approved, and approved pre-start findings have been closed.
 - (b) Nuclear Explosive Operating Procedures. NEOs must be performed in accordance with approved written procedures.
 - (c) One-Point Safety.
 - 1 NEOs involving a nuclear explosive not certified to be one-point safe must be conducted only at Nevada Test Site (NTS), except as authorized in accordance with paragraph 4a(1)(c)2, below.
 - 2 If it is determined that a nuclear explosive no longer meets the one-point safety criteria, all assembly/disassembly production plant operations (including onsite transportation) and offsite transportation with that nuclear explosive must be discontinued in a safe manner. Before operations with that nuclear explosive can be resumed, a path forward must be developed, a NES evaluation must be conducted, the NES evaluation report must be approved, and approved pre-start findings must be closed.
 - 3 Tooling and equipment must be evaluated as required to ensure that their use does not cause a one-point safety violation of a nuclear explosive certified to be one-point safe.
 - (d) Nuclear Explosive Areas (NEAs).
 - 1 Authorized energy sources must be identified and documented. Unauthorized energy sources must not be available in an NEA during NEOs.
 - 2 Ignition sources in NEAs must be identified and eliminated or minimized and controlled to prevent adverse interaction with combustible/flammable materials and the nuclear explosive.
 - 3 Combustible and flammable materials in NEAs must be identified and eliminated or minimized and controlled to prevent adverse interaction with the nuclear explosive.

- (e) Electrical Testing. Except as authorized in accordance with paragraph 4a(1)(f), Anomalous Units, nuclear explosives must not be subjected to—
 - 1 redundant electrical tests or
 - 2 electrical troubleshooting (i.e., to confirm the existence of a fault or aid in fault isolation) except with authorized test equipment and procedures that have been subjected to a NES evaluation and found to be acceptable for the specific application.
- (f) Anomalous Units.
 - 1 If it is determined that a nuclear explosive is no longer in a condition covered by a NES evaluation, all operations with that nuclear explosive and in the associated facility must be discontinued in a safe manner, resulting in a safe and stable nuclear explosive configuration.
 - 2 Before operations with the anomalous unit can be resumed, a design agency special instruction engineering release (SIER) must be developed, and the NEO change control process must be completed in accordance with paragraph 4a(13).
 - a The responsible design agencies must specifically review the SIER for impact on NES.
 - b Transportation operations, if applicable, must be specifically addressed in the SIER, and offsite transportation operations are subject to the Office of Secure Transportation (OST) NEO change control process.
 - 3 A decision to resume other activities in the facility must include consideration of possible interactions with the anomalous unit.
- (2) Supplemental Nuclear Explosive Safety Rules. Supplemental NESRs may be developed as needed to support specific tests, operations, or characteristics of a nuclear explosive.
- (3) Nuclear Explosive Safety Evaluations. NES evaluations are required before a NEO is authorized; periodically for ongoing NEOs; and when proposed changes or emerging information affect an approved NEO. NES

evaluations must be performed in accordance with DOE M 452.2-2, *Nuclear Explosive Safety Evaluation Processes*, or successor directive.

- (4) Procedures. Written procedures (paper or electronic) control the interactions among the nuclear explosive, the operating facility, equipment, and personnel.
 - (a) Design agencies must review and concur with original issues of procedures for NEOs and associated activities.
 - (b) All written procedures for NEOs must place proper emphasis on preventing accidents and detecting abnormal conditions by accomplishing the following.
 - 1 Comply with design specifications and technical requirements.
 - 2 Clearly state cautions and warnings.
 - 3 Identify appropriate points to interrupt work safely.
 - 4 Include generic contingency procedures directed toward quickly achieving a safe and stable nuclear explosive configuration to be applied in response to all unexpected situations not covered by other written procedures.
 - 5 Incorporate human factors considerations.
- (5) Two-Person Concept. DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, requires organizations responsible for NEOs and associated activities and facilities to establish and implement the two-person concept.
- (6) Facilities. Facilities used for nuclear explosive operations must be characterized, evaluated, and specifically approved for that use.
- (7) Equipment. Organizations responsible for NEOs and associated activities and facilities must verify that all equipment used in NEOs (including tooling, testers, and other mechanical and electrical equipment) meet the following requirements. DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive, specifies additional requirements for electrical equipment used in NEAs.
 - (a) Design specifications and technical requirements must be documented.
 - (b) Designs must ensure nuclear explosives will remain in a safe condition should a system or component of the tool/equipment fail.

- (c) Each item used in an NEO must be specifically approved for that operation. Unapproved movable items must be excluded from the NEA. Positive measures must be used to preclude use of facility equipment that is not approved for the NEO and impracticable to remove.
 - (d) Equipment intended to apply energy to a nuclear explosive must incorporate features that limit energy to a known safe level.
- (8) Maintenance of Facilities, Tooling, and Other Equipment. Organizations responsible for NEOs and associated activities and facilities must review maintenance programs and activities for impact on NES. Maintenance implementation plans must include a detailed description of maintenance activity control and approval, including limitations on materials that are allowed in NEAs.
- (9) Personnel. Each organization responsible for and/or involved in NEOs and associated activities must implement training, qualification, and certification programs for personnel that manage, oversee, perform, or directly support these operations and activities.

In addition to the requirements in 10 CFR Part 712, *Human Reliability Program*, and DOE O 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, annual training for personnel assigned to nuclear explosive duty must include the following NES-specific topics.

- (a) Responsibilities associated with custody of nuclear explosives.
 - (b) Use of general and supplemental NESRs, site/facility and program-specific Technical Safety Requirements, and other controls associated with NEOs.
 - (c) The purpose, objective, and responsibilities of the two-person concept for operations.
 - (d) Explosive safety appropriate for assigned responsibilities.
- (10) Transportation of Nuclear Explosives.
- (a) Organizations responsible for NEOs and associated activities and facilities must establish requirements and procedures to ensure safe onsite transportation of nuclear explosives.
 - (b) Offsite transportation of nuclear explosives is performed by OST and begins when the loaded conveyance is closed and ends with the opening of the conveyance at its destination.

- (c) Transportation operations and shipping configurations, including all items in the conveyance, are subject to the NES evaluation requirements of paragraph 4a(1)(a) and 4a(3).
 - 1 Nuclear explosives must be transported in conveyances specifically reviewed and approved through the NES evaluation process.
 - 2 Criteria must be established for protecting nuclear explosives during transportation. The criteria and tie-down designs for specific nuclear explosive configurations must be reviewed and approved through the NES evaluation process.
- (11) Mixed Venues. Nuclear explosives must not be transported or staged with any other assembly that could be mistaken for a nuclear explosive.
- (12) Positive Verification.
 - (a) Organizations responsible for NEOs and associated activities and facilities must develop and implement a verification process to ensure use of qualified personnel who are fit for duty, operationally ready facilities, correct equipment that is current in any required calibration and preventive maintenance, and current approved procedures.
 - (b) The configuration and condition of a nuclear explosive and its safety features must be known or determined as early as practical during any planned NEO.
- (13) Change Control. Organizations responsible for NEOs and associated activities and facilities must establish and implement a NES change evaluation process in accordance with DOE M 452.2-2, *Nuclear Explosive Safety Evaluation Processes*, or successor directive. This NES evaluation is separate and independent from the unreviewed safety question process required by 10 CFR Part 830, *Nuclear Safety Management*, and must be completed before approval and implementation of the change.

All proposed changes to authorized NEOs, including the following, are subject to the NEO change control process.

- (a) Proposals that may have direct NES implications (e.g., procedural, equipment, or facility changes to an approved NEO).
- (b) Proposals that may have indirect NES implications (e.g., changes or new activities that could impact the foundation established by previous NES Master Studies).

- (c) Changes in knowledge affecting an approved NEO (e.g., new understanding of a potential threat to NES or new data regarding the response of a nuclear explosive to a stimulus).

(14) Configuration Management.

- (a) Organizations responsible for NEOs and associated activities and facilities must develop and implement a configuration management program incorporating elements applicable to NEOs and associated activities and facilities.
- (b) To ensure consistency with design requirements and the safety basis, the configuration management program must specifically include the following:
 - 1 control of the physical configuration of a nuclear explosive and its components; the tooling, equipment, and procedures used in NEOs and associated activities; and the interface with the facilities in which these operations and activities are conducted;
 - 2 unique identification of special tooling and equipment used in NEOs;
 - 3 positive identification of tooling and equipment requiring calibration/testing within a calibration/testing control program; and
 - 4 incorporation of approved changes into all affected documents (including design documents, drawings, procedures, and safety basis documents) and programs (including maintenance and training).

(15) Nuclear Explosive-Like Assemblies (NELAs).

- (a) Nuclear Explosive-Like Assembly Standards. All NELA operations must meet the following qualitative NELA standards.
 - 1 There must be controls to minimize the possibility of accidental/inadvertent, or deliberate unauthorized assembly of a nuclear explosive in place of a NELA configuration.
 - 2 There must be controls to minimize the possibility of accidental/inadvertent, or deliberate unauthorized transfer of a nuclear explosive in place of a NELA configuration.
- (b) Nuclear Explosive-Like Assembly Requirements. Organizations responsible for NELA operations must implement the NELA

requirements in accordance with DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive.

- (16) Marking Instructions. Nuclear explosives and NELAs must be marked to distinguish configurations capable of a nuclear detonation from those that are not. Organizations responsible for NEOs or NELA operations must implement marking requirements in accordance with DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive.
 - b. Independent Oversight. The Office of Safety provides independent oversight of the implementation of this Order and associated Manuals by NNSA personnel. This oversight may be carried out through observation of NES evaluations, independent assessments, or other appropriate mechanisms. On an annual basis, the Office of Safety will summarize its oversight activities, along with any recommendations for changes in the NES program in a report to the Assistant Deputy Administrator for Nuclear Safety Operations and the Assistant Deputy Administrator for Science, Engineering and Production Programs. A copy of this report will be provided to the NNSA CTA and CDNS for information.
 - c. Exemptions. Exemptions must be requested when release is sought from a requirement in this Order, DOE M 452.2-1A or DOE M 452.2-2, or their successor directives. The exemption process is outlined in DOE O 251.1C, *Departmental Directives Program*, dated 1-15-09, or successor directive. The approval authority is the Deputy Administrator for Defense Programs with concurrence from the Central Technical Authority.
 - d. Records. Records (documentation) must be maintained in accordance with National Archives and Records Administration-approved DOE or site-specific records retention and disposition schedules in accordance with DOE O 243.1, *Records Management Program*, dated 2-3-06.
 - e. Implementation. This revision involves administrative or programmatic changes from the previous directive, DOE O 452.2C, and an implementation plan is required. This revision is effective upon issuance.
5. RESPONSIBILITIES.
- a. Deputy Administrator for Defense Programs.
 - (1) Ensures implementation of NES Programs.
 - (2) Approves exemptions to this Order.
 - b. NNSA Site Office Manager. Provides oversight of the NNSA M&O Contractor.
 - c. Director, Office of Safety. Provides independent oversight of the implementation of this Order and associated Manuals by NNSA personnel.

- d. Director, Nuclear Weapons Stockpile Division.
 - (1) Provides federal leadership for project teams formed to develop nuclear explosive operations at NNSA production agencies.
 - (2) Ensures that NNSA nuclear explosive operations are designed in a manner that satisfies the NES Program requirements.
 - e. Director, Nuclear Weapon Surety and Quality Division.
 - (1) Manages the NNSA NES evaluation processes.
 - (2) Provides support to NNSA Site Offices as needed for NES oversight of the NNSA M&O Contractors.
6. DEFINITIONS. Definitions from DOE O 452.1D, or successor directive are not repeated here.
- a. Access. The proximity to a nuclear explosive that allows the opportunity to divert, steal, tamper with, and/or damage the nuclear explosive in spite of any controls that have been established to prevent such unauthorized actions.
 - b. Custody of Nuclear Explosives. Responsibility for access to and control of nuclear explosives.
 - c. Electrical Equipment. Includes items that contain or use an electrical energy source and the interface (if any) with the nuclear explosive (NE). For Category 1 electrical equipment (as defined in DOE M 452.2-1A), this includes associated adapters, test cables, switch boxes, etc. For some Category 2 electrical equipment (as defined in DOE M 452.2-1A), this includes a mechanical connection to the NE and associated electrical isolation feature.
 - d. Facility. Any equipment, structure, system, process, or activity that fulfills a specific purpose.
 - e. Main Charge. The high explosive whose explosive energy implodes the pit.
 - f. Nuclear Explosive Duty. Work assignments that allow custody of a nuclear explosive or access to a nuclear explosive device or area.
 - g. Nuclear Explosive-Like Assembly (NELA). An assembly with components representing the main charge HE and pit that has the potential for component substitution resulting in accidental/inadvertent, or deliberate unauthorized assembly or transfer of a nuclear explosive may be considered a NELA. A NELA represents a nuclear explosive in the U.S. Nuclear weapons program, including assemblies for development, testing, training, or other purposes.

- h. Nuclear Explosive Operation Associated Activities. Activities directly associated with a specific nuclear explosive operation, such as work on a bomb nose or tail subassembly, even when physically separated from the bomb's nuclear explosive subassembly.
 - i. Nuclear Explosive Safety Rules (NESRs). Requirements that significantly contribute to minimizing the possibility of nuclear detonation or high explosive detonation/deflagration in nuclear explosive operations.
 - j. One-Point Safe Nuclear Explosive. A nuclear explosive that, in the event a detonation is initiated at any one point in the high explosive system, presents no greater probability than one in a million of producing a nuclear detonation.
 - k. Safety Basis. A safety basis for a DOE nuclear facility is documented in a documented safety analysis and the hazards controls for the nuclear facility.
7. REFERENCES. The following list contains references that are relevant to this Order.
- a. DOE O 151.1C, *Comprehensive Emergency Management System*, dated 11-2-05, which addresses responses to unplanned events.
 - b. DOE O 243.1, *Records Management Program*, dated 2-3-06, which provides a framework for managing information in accordance with Department policy and National Archives and Records Administration-approved DOE record schedules.
 - c. DOE O 226.1A, *Implementation of Department of Energy Oversight Policy*, dated 7-31-07, which provides direction for implementing DOE P 226.1A, Department of Energy Oversight Policy, dated 5-25-07, which establishes DOE policy for assurance systems and processes established by DOE contractors and oversight programs performed by DOE line management and independent oversight organizations.
 - d. DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*, dated 8-19-03, which provides detailed requirements to supplement.
 - e. DOE O 231.1A, *Environment, Safety, and Health Reporting*, dated 8-19-03, sets forth a minimum set of occurrence reporting requirements for DOE/NNSA elements and contractors and includes categorizing occurrences related to safety, environment, health, or operations; notifying DOE; and developing follow-up reports.
 - f. DOE O 251.1C, *Departmental Directives Program*, dated 1-15-09, which details the process for requesting exemptions from directives requirements.
 - g. DOE O 360.1B, *Federal Employee Training*, dated 10-11-01, which establishes requirements and assigns responsibilities for DOE Federal employee training, education, and development under the Government Employees Training Act of 1958, as amended.

- h. DOE O 414.1C, *Quality Assurance*, dated 6-17-05, which ensures that the quality of DOE/NNSA products and services meets or exceeds the customers' expectations.
- i. DOE O 420.1B, *Facility Safety*, dated 12-22-05, which establishes the DOE/NNSA facility safety for nuclear safety design, criticality safety, fire protection, and natural phenomena hazards mitigation.
- j. DOE M 440.1-1A, *DOE Explosives Safety Manual*, dated 1-9-06, which describes DOE's explosives safety requirements applicable to operations involving the development, testing, handling, and processing of explosives or assemblies containing explosives.
- k. DOE O 452.1D, *Nuclear Explosive and Weapon Surety Program*, dated 4-14-09, which establishes requirements and responsibilities for the DOE Nuclear Explosive and Weapon Surety Program.
- l. DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, dated 4-14-09, which establishes mandatory procedures in selected topical areas to ensure the nuclear explosive safety of all nuclear explosive operations conducted by DOE/NNSA and its contractors.
- m. DOE M 452.2-2, *Nuclear Explosive Safety Study Processes*, dated 4-14-09, which provides requirements and guidance for nuclear explosive safety studies, operational safety reviews, and nuclear explosive safety change evaluations.
- n. DOE O 5480.20A Chg 1, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, dated 07-12-01, which establishes selection, qualification, and training requirements for management and operating contractor personnel involved in the operation, maintenance, and technical support of DOE/NNSA Category A and B reactors and nonreactor nuclear facilities.
- o. DOE-STD-1073-2003, *Configuration Management Program*, dated October 2003, which defines the objectives of a configuration management process for DOE nuclear facilities (including activities and operations) and provides detailed examples and supplementary guidance on methods to achieve those objectives.
- p. DOE-STD-1104-96, *Review and Approval of Nuclear Facility Safety Basis Documents (Documented Safety Analyses and Technical Safety Requirements)*, dated February 1996, which describes DOE review and approval of documented safety analyses and Technical Safety Requirements for existing Hazard Category 1, 2, and 3 nuclear facilities that document their safety basis in accordance with 10 CFR 830.
- q. DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, dated July 1994,

which describes a Safety Analysis Report preparation method that satisfies 10 CFR 830 requirements.

- r. DOE-DP-STD-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*, dated May 2006, which clarifies the requirements and provides guidance for conducting hazard analyses and preparing Hazard Analysis Reports for nuclear explosive operations and associated activities.
 - s. 10 CFR Part 712, *Human Reliability Program*, which establishes the policies and procedures for the DOE, including NNSA, human reliability program (HRP). The HRP is a security and safety reliability program designed to ensure that individuals who occupy positions affording access to certain materials, nuclear explosive devices, facilities, and programs meet the highest standards of reliability and physical and mental suitability.
 - t. 10 CFR Part 820, *Procedural Rules for DOE Nuclear Activities*, which sets forth procedures to govern the conduct of persons involved in DOE nuclear activities and, in particular, to achieve compliance with the DOE Nuclear Safety Requirements by all persons subject to those requirements.
 - u. 10 CFR Part 830, *Nuclear Safety Management*, which governs the conduct of DOE contractors, DOE personnel, and other persons conducting activities (including providing items and services) that affect, or may affect, the safety of DOE nuclear facilities.
 - v. Title 32 of P.L. 106-65, the National Nuclear Security Administration Act, dated October 5, 1999, as amended, which established a separately organized agency within the Department of Energy.
 - w. Joint Department of Energy/Department of Defense (DOE/DoD) Technical Publication 20-7, *Nuclear Safety Criteria*, dated 01-02-02.
 - x. Joint DOE/DoD Technical Publication 35-51 Chg. 10, *General Instructions Applicable to Nuclear Weapons*, dated 08-14-08.
 - y. Joint DOE/DoD Technical Publication 45-51 Chg. 2, *Transportation of Nuclear Weapons Materiel, General Shipping and Limited Life Component Data (LLC)*, dated 08-01-07.
 - y. Joint DOE/DoD Technical Publication 45-51A Chg. 5, *Transportation of Nuclear Weapons Materiel (Supplement), Shipping and Identification Data for Stockpile Major Assemblies*, dated 03/20/2007.
8. CONTACT. Questions concerning this Order should be addressed to the Nuclear Weapon Surety and Quality Division, 202-586-5624.



STEVEN CHU
Secretary of Energy

CONTRACTOR REQUIREMENTS DOCUMENT DOE O 452.2D, *NUCLEAR EXPLOSIVE SAFETY*

This Contractor Requirements Document (CRD) establishes the requirements for Department of Energy (DOE) contractors, including National Nuclear Security Administration (NNSA) contractors, whose contracts involve the performance, management, oversight, or direct support of DOE/NNSA nuclear explosive operations (NEOs) or associated activities.

Regardless of the performer of the work, the contractor is responsible for complying with the requirements of this CRD. The contractor is responsible for flowing down the requirements of this CRD to subcontractors at any tier to the extent necessary to ensure the contractor's compliance with the requirements.

All contractors with this CRD incorporated in their contracts must comply with the following requirements.

Nuclear Explosive Safety Program.

1. General Nuclear Explosive Safety Rules (NESRs). Contractors must ensure that NEOs under their purview are designed and performed in a manner that satisfies the following General NESRs.
 - a. Nuclear Explosive Safety Evaluation. NEOs must not be performed until a NES study (NESS) has been conducted, the NESS report has been approved, and approved pre-start findings have been closed.
 - b. Nuclear Explosive Operating Procedures. NEOs must be performed in accordance with approved written procedures.
 - c. One-Point Safety.
 - (1) NEOs involving nuclear explosives not certified to be one-point safe must be performed only at the Nevada Test Site (NTS), except as authorized in accordance with paragraph 1a(3)(b) below.
 - (2) If it is determined that a nuclear explosive no longer meets the one-point safety criteria, all assembly/disassembly production plant operations (including onsite transportation) with that nuclear explosive must be discontinued in a safe manner. Before operations with that nuclear explosive can be resumed, a NES evaluation report must be approved, and approved pre-start findings must be closed.
 - (3) Tooling and equipment must be evaluated as required to ensure that their use does not cause a one-point safety violation of a nuclear explosive certified to be one-point safe.

- d. Nuclear Explosive Areas (NEAs).
 - (a) Authorized energy sources must be identified and documented. Unauthorized energy sources must not be available in an NEA during NEOs.
 - (b) Ignition sources in NEAs must be identified and eliminated or minimized and controlled to prevent adverse interaction with combustible/flammable materials and the nuclear explosive.
 - (c) Combustible and flammable materials in NEAs must be identified and eliminated or minimized and controlled to prevent adverse interaction with the nuclear explosive.
- e. Electrical Testing. Except as authorized in accordance with paragraph 1a(6), Anomalous Units, nuclear explosives must not be subjected to —
 - (1) redundant electrical tests, or
 - (2) electrical troubleshooting (i.e., to confirm the existence of a fault or aid in fault isolation) except with authorized test equipment and procedures that have been subjected to a NES evaluation and found to be acceptable for the specific application.
- f. Anomalous Units.
 - (1) If it is determined that a nuclear explosive is no longer in a condition covered by a NES evaluation, all operations with that nuclear explosive and in the associated facility must be discontinued in a safe manner, resulting in a safe and stable nuclear explosive configuration.
 - (2) Before operations with the anomalous unit can be resumed, a design agency special instruction engineering release (SIER) must be developed and the NEO change control process must be completed in accordance with paragraph 1m.
 - (a) The responsible design agencies must specifically review the SIER for impact on NES.
 - (b) Transportation operations, if applicable, must be specifically addressed in the SIER, and offsite transportation operations are subject to the Office of Secure Transportation (OST) NEO change control process.
 - (3) A decision to resume other activities in the facility must include consideration of possible interactions with the anomalous unit.

2. Supplemental Nuclear Explosive Safety Rules. Contractors may propose supplemental NESRs to support specific tests, operations, or characteristics of a nuclear explosive.
3. Nuclear Explosive Safety Evaluations. Contractors must ensure that all NEOs under their purview are covered by an approved NES evaluation and request and support NES evaluations as needed. NES evaluation requirements are specified in DOE M 452.2-2, *Nuclear Explosive Safety Evaluation Processes*, or successor directive.
4. Procedures.
 - a. Contractors responsible for NEOs and associated activities and facilities must follow approved written procedures (paper or electronic) for all NEOs to control interactions among the nuclear explosive, the operating facility, equipment, and personnel.
 - b. Contractors must ensure design agency concurrence with original issues of procedures for NEOs and associated activities.
 - c. Proposed changes to procedures must be assessed by the contractor NEO change control process.
 - d. Contractors must ensure NEO procedures place the proper emphasis on preventing accidents and detecting abnormal conditions by accomplishing the following—
 - (1) comply with design specifications and technical requirements,
 - (2) clearly state cautions and warnings,
 - (3) identify appropriate points to safely interrupt work,
 - (4) include generic contingency procedures directed toward quickly achieving a safe and stable nuclear explosive configuration to be applied in response to all unexpected situations not covered by other written procedures, and
 - (5) incorporate human factors considerations.
5. Two-Person Concept. Contractors responsible for NEOs and associated activities and facilities must establish and implement the two-person concept in accordance with DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive, to ensure no lone individual has access to a nuclear explosive.
6. Facilities. Contractors must ensure that facilities used for nuclear explosive operations are characterized, evaluated, and specifically approved for that use.
7. Equipment. Contractors responsible for NEOs and associated activities and facilities must ensure that all equipment used in NEOs (including tooling, testers, and other mechanical and electrical equipment) meet the following requirements. DOE M 452.2-1A, *Nuclear*

Explosive Safety Manual, or successor directive, specifies additional requirements for electrical equipment used in NEAs.

- a. Design specifications and technical requirements are documented.
 - b. Designs must ensure that the nuclear explosive remains in a safe condition should a system or component of the equipment fail.
 - c. Each item used in an NEO must be specifically approved for that operation. Unapproved movable items must be excluded from the NEA. Positive measures must be used to preclude use of facility equipment that is not approved for the NEO and impracticable to remove.
 - d. Equipment intended to apply energy to a nuclear explosive must incorporate features that limit energy to a known safe level.
8. Maintenance of Facilities, Tooling, and Other Equipment. Contractors responsible for NEOs and associated activities and facilities must review maintenance programs and activities for impact on NES. Maintenance implementation plans must include a detailed description of maintenance activity control and approval, including limitations on materials that are allowed in NEAs.
9. Personnel. Contractors responsible for and/or involved in NEOs and associated activities must implement training, qualification, and certification programs for personnel that manage, oversee, perform, or directly support these operations and activities.

In addition to the requirements referenced in 10 CFR 712 and DOE O 5480.20, contractors must provide annual training for personnel assigned to nuclear explosive duty that includes the following NES-specific topics.

- a. Responsibilities associated with custody of nuclear explosives.
 - b. Use of general and supplemental NESRs, site/facility and program specific Technical Safety Requirements, and other controls associated with NEOs.
 - c. The purpose, objective, and responsibilities of the two-person concept for operations.
 - d. Explosive safety appropriate for assigned responsibilities.
10. Transportation of Nuclear Explosives.
- a. Contractors responsible for NEOs and associated activities and facilities must establish requirements and procedures to ensure safe onsite transportation of nuclear explosives.

- b. Transportation operations and shipping configurations, including all items in a conveyance, are subject to the NES evaluation requirements of paragraph 1a(1) and 1c of this CRD.
 - (1) Contractors must ensure nuclear explosives are transported in conveyances specifically reviewed and approved through the NES evaluation process.
 - (2) Contractors must ensure appropriate criteria are established for protecting nuclear explosives during transportation. Contractors must ensure the criteria and tie-down designs for specific nuclear explosive configurations are reviewed and approved through the NES evaluation process.
- 11. Mixed Venues. Contractors responsible for NEOs must not transport or stage nuclear explosives with any other assembly that could be mistaken for a nuclear explosive.
- 12. Positive Verification.
 - a. Contractors responsible for NEOs and associated activities and facilities must develop and implement a verification process to ensure use of qualified personnel who are fit for duty, operationally ready facilities, correct equipment that is current in any required calibration and preventive maintenance, and current approved procedures.
 - b. Contractors must ensure the configuration and condition of a nuclear explosive and its safety features are known or determined as early as practical during any planned NEO.
- 13. Change Control. Contractors responsible for NEOs and associated activities and facilities must establish and implement a NES change evaluation process in accordance with DOE M 452.2-2, or successor directive. This NES evaluation is separate and independent from the USQ process required by 10 CFR Part 830, *Nuclear Safety Management*, and must be completed before approval and implementation of the change.

Contractors must ensure that their change control process captures all proposed changes to approved NEOs including the following:

 - a. Proposals that may have direct NES implications (e.g., procedural, equipment, or facility changes to an approved NEO).
 - b. Proposals that may have indirect NES implications (e.g., changes or new activities that could impact the foundation established by previous NES Master Studies).
 - c. Changes in knowledge affecting an approved NEO (e.g., new understanding of a potential threat to NES or new data regarding the response of a nuclear explosive to a stimulus).
- 14. Configuration Management. Contractors responsible for NEOs and associated activities and facilities must develop and implement a configuration management program

incorporating elements applicable to NEOs and associated activities and facilities. To ensure consistency with design requirements and the safety basis, the configuration management program must specifically include the following:

- a. control of the physical configuration of a nuclear explosive and its components; the tooling, equipment, and procedures used in NEOs and associated activities; and the interface with the facilities in which these operations and activities are conducted;
- b. unique identification of special tooling and equipment used in NEOs;
- c. positive identification of tooling and equipment requiring calibration/testing within a calibration/testing control program; and
- d. incorporation of approved changes into all affected documents (including design documents, drawings, procedures, and safety basis documents) and programs (including maintenance and training).

15. Nuclear Explosive-Like Assemblies (NELAs).

- a. Nuclear Explosive-Like Assembly Standards. Contractors responsible for NELA operations must ensure those operations meet the following qualitative NELA standards.
 - (1) There must be controls to minimize the possibility of accidental/inadvertent, or deliberate unauthorized assembly of a nuclear explosive in place of a NELA configuration.
 - (2) There must be controls to minimize the possibility of accidental/inadvertent, or deliberate unauthorized transfer of a nuclear explosive in place of a NELA configuration.
- b. Contractors responsible for NELA operations must implement the NELA requirements in accordance with DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive.

16. Marking Instructions. Nuclear explosives and NELAs must be marked to distinguish configurations capable of a nuclear detonation from those that are not. Contractors responsible for NEOs or NELA operations must permanently mark nuclear explosives and NELAs in accordance with the instructions in DOE M 452.2-1A, *Nuclear Explosive Safety Manual* or successor directive.

17. Records. Contractors must maintain records (documentation) in accordance with National Archives and Records Administration-approved DOE or site-specific records retention and disposition schedules (See CRD to DOE O 243.1, *Records Management Program*, dated 2-3-06 or successor directive).