

**SUBJECT: SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS**

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1. OBJECTIVES.

- a. To establish requirements and responsibilities for ensuring the safety of both routine and planned Department of Energy (DOE) nuclear explosive operations and associated activities and facilities.
- b. To address the safety of nuclear explosive operations in two broad areas: (1) nuclear explosive safety and (2) environment, safety, and health (ES&H).
- c. To address requirements and responsibilities for planned nuclear explosive operations. Responses to unplanned events (e.g., Accident Response Group activities) are addressed in the 5530-series Orders and DOE O 151.1A, *Comprehensive Emergency Management System*, dated 11-1-00.

2. CANCELLATIONS. This Order cancels DOE O 452.2A, *Safety of Nuclear Explosive Operations*, dated 1-17-97, and DOE G 452.2A-1A, *Implementation Guide for DOE O 452.2A, Safety of Nuclear Explosive Operations*, dated 1-17-97. Cancellation of an Order does not, by itself, modify or otherwise affect any contractual obligation to comply with the Order. Canceled Orders incorporated by reference in a contract remain in effect until the contract is modified to delete the reference to the requirements in the canceled Orders.

3. APPLICABILITY.

- a. DOE Elements. This Order applies to all DOE elements, including those in the National Nuclear Security Administration (NNSA), and all DOE contractors, including those in the NNSA, involved in the Nuclear Explosive and Weapon Surety (NEWS) Program.
- b. Contractors. The Contractor Requirements Document (CRD), Attachment 1, sets forth requirements to be applied to major facilities management contractors that conduct NEWS Program activities. Regardless of the performer of the work, contractors are responsible for compliance with the requirements of this Order. Contractors are responsible for flowing down the requirements of this order to subcontracts at any tier to the extent necessary to ensure the contractor's

compliance with the requirements. The applicability of this Order to a contractor is dependent on its incorporation in the relevant contract.

c. Exclusions. None.

#### 4. REQUIREMENTS.

a. General.

- (1) Locations identified as potential sites for assembling, disassembling, and storing nuclear explosives and associated activities and facilities must be comprehensively reviewed and evaluated to identify hazards and potential accidents and to establish design, construction, and operational means to protect the public, worker health and safety, and the environment. Safety analyses for facilities in which nuclear explosive operations are performed must be prepared using hazard category 2 nuclear facility guidance, unless a different hazard category is determined using applicable hazard classification guidance or a different hazard category is justified for a facility within the context of an approved integrated safety management program.
- (2) Operations offices must have a comprehensive safety program for nuclear explosive operations and associated activities under their purview and ensure contractor implementation.
- (3) The safety program must integrate nuclear explosive safety requirements from the 452-series Orders with nuclear safety requirements from other Orders to provide a comprehensive safety program for nuclear explosive operations and associated activities and facilities.
- (4) Implementation of a requirement to prevent or mitigate one hazard must be assessed to ensure that the likelihood of a significant safety incident involving another hazard is not increased. If any such instance is identified, alternative methods must be investigated to attempt to implement the requirement without increasing the risk associated with other hazards. Guidelines, graded approach, best management practices, or other nonmandatory implementation guidance must be similarly assessed for potential impact on another hazard before being implemented. The following general hazard types may be present during nuclear explosive operations and associated activities:
  - (a) nuclear explosive;
  - (b) high explosive;

- (c) electro-explosive and pyrotechnic devices;
  - (d) high-pressure vessels, with and without radioactive gases;
  - (e) criticality; and
  - (f) occupational (industrial, radiological, and chemical).
- (5) The requirements in this Order may be implemented using a DOE-approved integrated safety management approach as described in DOE P 450.4, *Safety Management System Policy*, dated 10-15-96. A “graded approach” to the requirements in this Order is not permitted unless in the context of an approved integrated safety management program.
- (6) When the word “or” is used, any one or more of several references may apply; when the word “and” is used, the intent is that all references apply.
- b. Operational Safety Program. The operational safety program must include the following elements, tailored for the operations.
- (1) Experience Feedback. DOE and nuclear weapons laboratories and other management and operating (M&O) contractors and support contractors must examine the safety lessons to be learned from critical evaluations of operating experience and other sources to ensure a continuous enhancement process is in place. If evidence is found that may affect the validity of the safety basis of one or more ongoing nuclear explosive operations, it should be treated as a potential unreviewed safety question (USQ) under the terms of 10 CFR 830, Section 203, “Unreviewed Safety Question Process.” In addition, such new information must be evaluated for nuclear explosive safety implications as specified in paragraph 4d of this Order.
  - (2) Conduct of Operations. Operations at DOE facilities must be conducted in accordance with DOE 5480.19, *Conduct of Operations Requirements for DOE Facilities*, dated 7-9-90. The guidelines in Attachment I to DOE 5480.19 must be applied in a graded approach commensurate with their potential ES&H impact and their potential nuclear explosive safety impact.
  - (3) Safety Controls. Nuclear explosive operations and associated activities must be conducted and associated facilities must be operated in accordance with a system of documented controls (see paragraph 4c). This system must be derived from facility- and operation-specific hazard analyses and must incorporate the philosophies of independence, redundancy, and defense-in-depth. Multiple layers of protection must be used to prevent accidents and/or to mitigate the consequences of an accident.

- (4) Site Identification. Identify potential sites for the assembly, disassembly, and storage of nuclear explosives.
- (5) Training and Qualification of Personnel. Each organization responsible for and/or involved in nuclear explosive operations and associated activities (e.g., access and custody) must implement training and qualification programs for their respective personnel that manage, oversee, perform, or directly support these operations and activities. These personnel include DOE and M&O contractor management and technical support personnel, Personnel Assurance Program supervisors, Personnel Assurance Program medical personnel, and operations and maintenance personnel.
  - (a) Requirements for selecting, training, and qualifying personnel involved with nuclear explosive operations and associated activities and for ensuring their continuing fitness for duty must be applied as contained in this Order and 10 CFR Part 711, "Personnel Assurance Program (PAP)," Final Rule.
  - (b) Training for personnel involved in nuclear explosive operations and associated activities must comply with applicable portions of DOE O 360.1A, *Federal Employee Training*, dated 9-21-99.
  - (c) DOE operations offices and nuclear weapons laboratories and other M&O contractor and support contractor training and qualification programs must comply with DOE 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, dated 11-15-94, except Chapters II and III (Reactor Operations), and develop requirements equivalent to those in Chapter IV. Training and qualification requirements must be commensurate with the particular responsibilities assigned.
  - (d) Radiation safety training for individuals exposed to ionizing radiation must be provided in accordance with 10 CFR 835, Section 901, "Radiation Safety Training."
- (6) Maintenance of Facilities, Tooling, and Equipment. A maintenance program must be developed and implemented for facilities, tooling, and equipment used for nuclear explosive operations and associated activities in accordance with the nuclear facility requirements in DOE 4330.4B *Maintenance Management Program*, dated 2-10-94.

- (7) Configuration Management. Configuration management plans must address the measures for managing the configuration of nuclear explosive assemblies; the configuration of tooling, equipment, and procedures used in nuclear explosive operations and associated activities; and the interface with the facilities in which these operations and activities are conducted by individuals with assigned nuclear explosive safety responsibilities.
  - (a) Each organization responsible for nuclear explosive operations and associated activities and facilities must develop and implement a configuration management program using DOE-STD-1073-93, *Guide for Operational Configuration Management Programs*, dated November 1993, incorporating elements applicable to nuclear explosive operations and associated activities.
  - (b) All proposed changes must be reviewed for potential impact on nuclear explosive safety as discussed in paragraph 4d.
- (8) Issues Management. DOE, operations offices, and nuclear weapons laboratories and other M&O contractors and support contractors must develop and implement corrective action and commitment tracking systems to assist in identifying, tracking, and monitoring required actions related to the safety of nuclear explosive operations and associated activities and facilities.
- (9) Occurrence Reporting. Operational occurrences must be reported, evaluated for safety implications and processed in accordance with DOE O 232.1A, *Occurrence Reporting and Processing of Operations Information*, dated 7-21-97, and DOE M 232.1-1A, *Occurrence Reporting and Processing of Operations Information*, dated 7-21-97. [See also the unique provisions applicable to nuclear explosive operations contained in paragraph 4e(18) of this Order.]
- (10) Performance Indicators. Operations offices and nuclear weapons laboratories and other M&O contractors and support contractors must develop nuclear explosive safety performance indicators tailored to the specific operations and site-unique facilities and conditions.
  - (a) The performance indicator program for nuclear explosive operations must be implemented in accordance with the requirements of DOE O 210.1, *Performance Indicators and Analysis of Operations Information*, dated 9-27-95.

- (b) Performance indicators should be added or deleted as appropriate, based on a review of operations, appraisal results, and management assessments.
- (11) Positive Verification. A verification process must be implemented to ensure use of correct equipment, qualified personnel, operationally ready facilities, and current procedures.
- c. Safety Basis. The Safety Basis must be established and maintained in accordance with 10 CFR 830, Subpart B, "Safety Basis Requirements."
- d. Change Control. Operations offices must establish a change control process for nuclear explosive operations and associated activities and facilities. The USQ process [paragraph 4b(1)] must be augmented by the additional nuclear explosive safety evaluations listed below. Nuclear explosive safety evaluations must be completed before the change is implemented. All proposed changes to nuclear explosive operations and associated facilities must be evaluated against applicable nuclear explosive safety documents by operating contractor personnel assigned nuclear explosive safety responsibilities. The responsible laboratory performs this function at the Nevada Test Site.
  - (1) Proposed changes of a trivial or strictly administrative nature with no likelihood of significance to nuclear explosive safety require no further nuclear explosive safety evaluation.
  - (2) Operations offices must specify the process for performing nuclear explosive safety evaluations of nontrivial proposed changes. These evaluations may result in a determination of the need for a nuclear explosive safety study.
  - (3) The change control process must include provisions for incorporating approved changes into the appropriate safety documents to ensure they are maintained in an up-to-date condition.
- e. Nuclear Explosive Safety Program. Nuclear explosive operations require special safety consideration because of the potential high consequences of an accident or unauthorized act. Operations offices must implement a formal, comprehensive Nuclear Explosive Safety Program that includes the following.
  - (1) DOE Nuclear Explosive Safety Standards. All nuclear explosive operations shall meet the following qualitative safety standards to prevent unintended nuclear detonation or fissile material dispersal from the pit. There shall be controls to—

- (a) minimize the possibility of accidents, inadvertent acts, or authorized activities that could lead to fire, high-explosive deflagration, or unintended high-explosive detonation;
  - (b) minimize the possibility of fire, high-explosive deflagration, or high-explosive detonation, given accidents or inadvertent acts; and
  - (c) minimize the possibility of deliberate, unauthorized acts that could lead to high-explosive deflagration or high-explosive detonation.
- (2) General Nuclear Explosive Safety Rules. The general nuclear explosive safety rules (NESRs) set forth in this paragraph are mandatory for all nuclear explosive operations. Exemptions from these rules must be approved in advance by the Deputy Administrator for Defense Programs.
- (a) Nuclear explosive operations must not be performed until a nuclear explosive safety study has been approved, and prestart findings have been closed.
  - (b) Nuclear explosive operations must be performed in accordance with approved written procedures.
  - (c) Operations involving a nuclear explosive not certified to be one-point safe must be conducted only at the Nevada Test Site.
  - (d) Production plant operations must not be conducted on a nuclear explosive until it has been certified by the design laboratory to be one-point safe.
  - (e) If it is determined that a nuclear explosive no longer meets the one-point safety criteria, all production plant operations and off-site transportation with that nuclear explosive must be discontinued in a safe manner. Before operations can be resumed with that nuclear explosive, a nuclear explosive safety study must be conducted and approved.
- (3) Supplemental Nuclear Explosive Safety Rules. Additional safety rules shall be developed as needed to supplement the general NESRs for specific operations or to address specific characteristics of an individual design of a nuclear explosive, a specific test, or an operation.

- (4) Nuclear Explosive Safety Studies. The operations office responsible for a proposed nuclear explosive operation must convene the Nuclear Explosive Safety Study Group (NESSG) to evaluate the proposed operation.
- (a) These evaluations must meet the requirements in DOE-STD-3015-2001, *Nuclear Explosive Safety Study Process*.
  - (b) A nuclear explosive safety study must evaluate proposed nuclear explosive operations to assess the adequacy of controls to satisfy the nuclear explosive safety standards listed in paragraph 4e(1).
  - (c) Nuclear explosive safety studies approved after January 1997 that used the requirements finalized and promulgated in DOE O 452.2A have no specific expiration date. All other nuclear explosive safety studies approved prior to January 1997 are valid for 5 years.
- (5) Nuclear Explosive Operational Safety Reviews. A nuclear explosive operational safety review (OSR) must be conducted at least once every 60 months, typically 48 to 60 months, for all authorized nuclear explosive operations with a nuclear explosive safety study approved after January 1997 (i.e., nuclear explosive safety studies which have no expiration date).
- (a) The nuclear explosive OSR team must evaluate the adequacy of controls for the authorized nuclear explosive operations. Based on this evaluation, the OSR team shall provide a conclusion as to whether or not the NES standards continue to be met. This conclusion is provided to the operations office manager in a report signed by the OSR team.
  - (b) The nuclear explosive OSR team must consist of a subset of the NESSG as defined in DOE-STD-3015-2001. The OSR team composition is determined by the review chairperson and should include at least one NESSG senior technical advisor.
  - (c) The operations office managers must direct the NES organization to schedule and conduct a nuclear explosive OSR within the prescribed time interval. If the OSR is not completed at the end of the review interval, the manager must notify the Assistant Deputy Administrator for Military Application and Stockpile Operations of his remediation plan.
  - (d) The operations office managers must establish a formal process for conducting and approving OSRs and for responding to OSR findings in accordance with the requirements in DOE O 452.1B, *Nuclear Explosive and Weapon Surety Program*, paragraph 4h.



- (6) Personnel Assurance Program. Personnel assigned nuclear explosive duties must meet the Personnel Assurance Program requirements contained in 10 CFR, Part 711.
- (7) Two-Person Concept. The two-person concept requires that a minimum of two authorized people must be present during all nuclear explosive operations and during other operations designated by the operations office. Operations office managers responsible for nuclear explosive operations must establish implementing instructions for the two-person concept. The two people must be in a position to detect incorrect or unauthorized acts and—
  - (a) be certified in the Personnel Assurance Program,
  - (b) have technical knowledge of the task being performed, and
  - (c) be knowledgeable of pertinent safety and security requirements.
- (8) Reader Worker Procedure and Checkoff. Reader worker procedures and checkoff must be used for those nuclear explosive operations specified by the cognizant operations office.
- (9) Tooling and Equipment. Safety class or safety significant tooling and equipment used in nuclear explosive operations must be designed to remain in a safe condition should a system or component fail and documented as such in design criteria. All tooling and equipment must be evaluated as required, to ensure that one-point safety is not impacted.
- (10) Procedures. Nuclear explosive operations and associated activities operating procedures must have the following attributes.
  - (a) Comply with design specifications and technical requirements.
  - (b) Clearly state cautions and warnings.
  - (c) Have design laboratory review and approval.
  - (d) Place proper emphasis on preventing an accident, detecting abnormal conditions, and protecting the worker, the public, and the environment.
  - (e) Identify appropriate points to safely interrupt work.
  - (f) Include human factors considerations in the development of procedures.

- (11) Control of Electrical Testers/Equipment. Operations offices responsible for nuclear explosive operations must establish safety requirements for electrical testers/electrical equipment used in nuclear explosive areas.
- (a) Testers that introduce electrical energy into a nuclear explosive or high-explosive subassembly in a nuclear explosive area must meet the following requirements as a minimum.
- 1 Each tester must have independent safety characteristics that do not rely on the nuclear explosive's safety features.
  - 2 A single-point failure within a tester must not result in the application of unintended stimuli.
  - 3 Testers must use the lowest practical values of internal and output currents and voltages that will adequately perform their intended functions.
  - 4 A comprehensive safety analysis must be performed and documented for each electrical tester and its interface with a nuclear explosive or high explosive.
  - 5 Procedures must be established to control, store, maintain, calibrate, and operate testers.
  - 6 Each model of an electrical tester and its interface with a nuclear explosive or high explosive must be evaluated by an NESSG.
  - 7 Operations offices must establish and maintain a record of approved electrical testers.
  - 8 Computer-controlled testers must have controls that preclude inadvertent or unauthorized actuation of nuclear explosive safety critical components (e.g., strong-link switches).
- (b) The process used to evaluate and approve any electrical energy source or electrical equipment intended for use within a nuclear explosive area must be evaluated in a nuclear explosive safety study.

- (12) Off-site Transportation of Nuclear Explosives. Off-site transportation operations begin when the loaded conveyance is closed and ends with the opening of the conveyance at its destination. Off-site transportation operations must be reviewed and approved through the nuclear explosive safety study process. The following requirements and the appropriate requirements of 10 CFR 830 must be met.
- (a) Nuclear explosives must not be transported off-site in the same conveyance with any other cargo.
  - (b) Nuclear explosives must be transported off-site in safe-secure trailers/safeguard transporters or other conveyances specifically reviewed and approved through the nuclear explosive safety study process. Nuclear explosive conveyances must be validated as acceptable for conveying hazardous material in conformance with applicable Department of Transportation regulations.
  - (c) Nuclear explosives must be transported and restrained in compliance with the general instructions of Joint DOE/DoD Technical Publication (TP) 35-51, *General Instructions Applicable to Nuclear Weapons*, and the specific procedures, equipment descriptions, and restraint requirements specified in TP 45-51, *Transportation of Nuclear Weapons Materiel, General Shipping and Limited Life Component Data (LLC)*; TP 45-51A, *Transportation of Nuclear Weapons Materiel (Supplement), Shipping and Identification Data for Stockpile Major Assemblies*; TP 45-51D, *Transportation of Nuclear Weapons Materiel (Supplement), Shipment by Safe-Secure Trailer (SST) and Safeguard Transporter (SGT)*; and TP 20-7, *Nuclear Safety Criteria*.
- (13) On-site Transportation of Nuclear Explosives. Operations offices responsible for nuclear explosive operations must establish requirements and procedures to ensure safe on-site transportation of nuclear explosives at their respective sites. On-site transportation operations must be reviewed and approved through the nuclear explosive safety study process.
- (14) Nuclear Explosive-Like Assembly Requirements.
- (a) Technical criteria for nuclear explosive-like assembly (NELA) requirements must be established and issued by the operations office manager (Albuquerque), in coordination with Headquarters, and operations office managers (Nevada and Oakland). These requirements must support the following qualitative NELA standards.



off-site authorities. In addition to the situations described in DOE O 151.1A, Chapter V, the following are categorized as emergency occurrences.

- 1 Unplanned nuclear or high-explosive detonation, or high-explosive deflagration.
- 2 Fissile material dispersal from a nuclear explosive.
- 3 Seizure, theft, or loss of a nuclear explosive.
- 4 Inadvertent or deliberate unauthorized arming of a nuclear explosive.
- 5 Safeguards or security event, or a transportation accident, involving nuclear explosives that is a credible threat to DOE operations, facilities, or personnel and results or could result in significant effects on the public health and safety and/or national security.

(b) Unusual Occurrences. An unusual occurrence is a significant unplanned occurrence involving a nuclear explosive and must be categorized and reported in accordance with the provisions of DOE M 232.1-1A for Group 9, Nuclear Explosive Safety. The following are categorized as unusual occurrences.

- 1 The unauthorized introduction of electrical energy into a nuclear explosive.
- 2 The unauthorized compromise of a nuclear explosive safety feature when installed on a nuclear explosive.
- 3 Damage to a nuclear explosive that results in a credible threat to nuclear explosive safety.
- 4 Inadvertent substitution of a nuclear explosive for an NELA or vice versa.
- 5 A violation of an NESR.

- (c) Off-Normal Occurrences. An off-normal occurrence is an abnormal or unplanned event or condition that adversely affects nuclear explosive safety but is not in the emergency or unusual occurrence category. It must be categorized and reported in accordance with the provisions of DOE M 232.1-1A for Group 9, Nuclear Explosive Safety. The following are categorized as off-normal occurrences.
- 1 A “near miss,” a situation that could (but did not) result in a credible threat to nuclear explosive safety.
  - 2 A violation of the two-person concept of operations.
  - 3 Revocation of the Personnel Assurance Program certification of an individual (for cause).
  - 4 Damage to a training unit during training operations indicative of a hazard to a nuclear explosive.
  - 5 The use of uncertified personnel or unauthorized equipment/tooling during a nuclear explosive operation.
- f. Internal Safety Reviews. DOE and nuclear weapons laboratories and other M&O contractors and support contractors must establish internal, objective, and independent safety reviews of nuclear explosive operations and associated activities. The safety review system must include items of potential safety significance from the perspectives of both nuclear explosive safety and ES&H.
- g. Readiness Reviews.
- (1) Facility Readiness Reviews.
    - (a) Readiness reviews for facilities must be performed in accordance with DOE O 425.1B, *Startup and Restart of Nuclear Facilities*, dated 12-21-00, and operations office implementing directives and procedures. Requirements for hazard category 2 nuclear facilities must be used for this purpose.
    - (b) A facility readiness review generally is not required when a new nuclear explosive operation is introduced and there are no changes to the facility or its safety basis.

- (2) Nuclear Explosive Readiness Reviews.
  - (a) A readiness review must be performed for startup of a nuclear explosive operation, for restarting an operation following a shutdown greater than 1 year, after a significant change to the operation, or after an unplanned shutdown because of significant safety concerns.
  - (b) Operations offices must develop and implement a readiness review process that addresses nuclear explosive operations. The process must incorporate the attributes of facility readiness reviews from DOE O 425.1B by adopting appropriate requirements from the Order. Requirements unique to nuclear explosive operations must be specified.
- h. Occupational Safety and Health Program. Nuclear explosive operations and associated activities and facilities must comply with DOE O 231.1, *Environment, Safety, and Health Reporting*, dated 9-30-95; DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, dated 3-27-98; and 10 CFR, Part 835, "Occupational Radiation Protection," as amended 11-4-98.
- i. Nuclear Safety Coordination. The nuclear explosive safety program involves application and integration of DOE nuclear safety programs, policies, and standards that incorporate special aspects related to collocation of high explosives and fissile material under controls focused on the nuclear explosive safety standards. Changes or modifications in DOE nuclear safety policies and/or the NEWS Program must be coordinated to assure that divergence does not occur.
- j. Exemptions.
  - (1) Exemptions must be requested when release is sought from a requirement in this Order or in a referenced mandatory Manual or Standard. 10 CFR 820, "Procedural Rules for DOE Nuclear Activities," dated 8-1-90, must be used to prepare, process, and approve exemption requests. The approval authority is as follows.
    - (a) The cognizant operations office manager responsible for the activity when an equivalent level of safety has been demonstrated.
    - (b) The Assistant Deputy Administrator for Military Application and Stockpile Operations when the exemption would ensure adequate protection but would not result in an equivalent level of safety.

- (c) The Assistant Deputy Administrator for Military Application and Stockpile Operations is the approval authority for administrative extensions to the expiration dates of NES studies. Approval of extension requests must be based on adequate assurance of the continued safety of the operation.
    - (d) Exemptions from general NESRs require the approval of the Deputy Administrator for Defense Programs.
  - (2) Release from a requirement that has been adopted by reference into this Order must be processed as relief from this Order and not from the referenced Order except for DOE regulations.
- k. Documentation. Maintain documentation (records) in accordance with National Archives and Records Administration-approved DOE or site-specific records retention and disposition schedules.
- l. Implementation. This revision involves no substantive administrative or programmatic changes from the previous directive, DOE O 452.2A, and no implementation plan is required. This revision is effective upon issue.

## 5. RESPONSIBILITIES.

- a. Secretary of Energy.
  - (1) Establishes policy to ensure the safety/surety of all nuclear explosive operations conducted by DOE, including NNSA, and DOE contractors, including those in the NNSA.
  - (2) Responsible for the nuclear explosive operations safety programs for all nuclear explosive operations conducted by DOE, including NNSA, and DOE contractors, including those in the NNSA.
- b. Administrator for Nuclear Security.
  - (1) Responsible for the safety/surety of all nuclear explosive operations conducted by the NNSA elements and/or its contractors.
  - (2) Serves as a member of the Joint Nuclear Weapons Council under Title 10, United States Code, section 179.



- (3) Exercises dual-agency responsibility with the Department of Defense (DoD) for the surety of nuclear weapons in DoD custody in accordance with both the Memorandum of Understanding Between DoD and DOE on “Objectives and Responsibilities for Joint Nuclear Weapons Activities,” and the “Joint Policy Statement on Nuclear Weapons Surety.”
- c. Deputy Administrator for Defense Programs.
- (1) Ensures that nuclear explosive operations safety programs are implemented.
  - (2) Approves requests for exemptions from general NESRs.
  - (3) Authorizes sites for the assembly, disassembly, and storage of nuclear explosives.
  - (4) Once an emergency situation for nuclear weapons in a damaged or abnormal state (or improvised nuclear device) has been terminated in accordance with the provisions of DOE 5530- and DOE O 150-series directives, ensures that this Order applies.
- d. Assistant Secretary for Environment, Safety and Health. Assists the Deputy Administrator for Defense Programs in ES&H disciplines concerning the safety of nuclear explosive operations and associated activities and facilities.
- e. Assistant Deputy Administrator for Military Application and Stockpile Operations.
- (1) Approves nuclear explosive safety study reports and resolves minority opinions.
  - (2) Approves administrative extensions to nuclear explosive safety studies.
  - (3) Approves exemptions to the requirements of this Order in accordance with the provisions listed in paragraph 4j.
  - (4) Evaluates reported nuclear explosive occurrences and corrective actions for safety implications.
  - (5) Interfaces with the Office of Environment, Safety and Health in the future development of ES&H Orders to ensure that the requirements are integrated with the requirements of this Order and that divergence does not occur.

- f. Operations Office Managers (Albuquerque and Nevada).
- (1) Establish a cadre of experienced technical professionals to serve as permanent members on the NESSG, and maintain a minimum of one proficient NESSG chair at each operations office.
  - (2) Ensure that responsibilities and authorities are clearly defined and delegated at appropriate management and supervisory levels.
  - (3) Approve the nuclear explosive operation authorization basis.
  - (4) Authorize nuclear explosive operations in accordance with the requirements of this Order.
  - (5) Ensure that DOE ES&H requirements are integrated into nuclear explosive operations and associated activities while maintaining appropriate focus on nuclear explosive safety.
  - (6) Ensure that nuclear explosive OSRs are conducted within 60 months following approval of NESSG reports and provide the nuclear explosive OSR report to the Assistant Deputy Administrator for Military Application and Stockpile Operations.
  - (7) Approve proposed membership for specific NESSGs.
  - (8) Designate topics based on performance evaluations to incorporate in the nuclear explosive safety performance indicator program.
  - (9) Approve exemptions to the requirements of this Order in accordance with the provisions listed in paragraph 4j.
  - (10) Identify which contracts this Order applies to and ensure those contracts are modified to reflect the attached CRD within 6 months.
  - (11) Ensure that the identified contractors are responsible for compliance with the requirements of this Order, regardless of the performer of the work.
  - (12) The Nevada Operations Office manager must develop and promulgate specific nuclear explosive safety requirements for disposition plans.
  - (13) The Albuquerque Operations Office manager is responsible for all off-site transportation of nuclear explosives.

- g. Nuclear Weapons Laboratories and Other Management and Operating Contractors. Support the NES Program for the safety of nuclear explosive operations. Each organization is responsible to ensure that hazards associated with nuclear explosive operations are identified, mitigated, and/or controlled by providing qualified personnel to support the NES Program and related activities, such as readiness reviews, hazard analysis report and safety analysis report preparation, NESSG activities, program appraisals, identification of performance indicators, evaluation of nuclear explosive occurrence reports and corrective actions, and providing technical advice and expertise.
6. DEFINITIONS. See Attachment 2 for definitions relevant to this Order.
7. REFERENCES. The following list contains references that are relevant to the NEWS Program.
  - a. DOE O 151.1A, *Comprehensive Emergency Management System*, dated 11-1-00, which addresses responses to unplanned events.
  - b. DOE O 200.1, *Information Management Program*, dated 9-30-96, which provides a framework for managing information and approved DOE records schedules, which provide requirements for the retention and disposition of government records.
  - c. DOE O 210.1, *Performance Indicators And Analysis of Operations Information*, dated 9-27-95, which establishes requirements for identifying, monitoring, and analyzing data that measure the ES&H performance of DOE facilities, programs, and organizations.
  - d. DOE O 231.1, *Environment, Safety, and Health Reporting, Dated 9-30-95*, which establishes requirements to ensure collection and reporting of information on ES&H that is required by law or regulation to be collected or that is essential for evaluating DOE operations and identifying opportunities for improvement needed for planning purposes within DOE.
  - e. DOE O 232.1A, *Occurrence Reporting and Processing of Operations Information*, dated 7-21-97, which establishes requirements to ensure that the Office of the Secretary and both DOE and DOE contractor line management are kept fully informed on a timely basis of events that could adversely affect national security or the safeguards and security interests of DOE, the health and safety of the public or the workers, the environment, the intended purpose of DOE facilities, or the credibility of the Department.

- f. DOE M 232.1-1A, *Occurrence Reporting and Processing of Operations Information*, dated 7-21-97, which provides detailed requirements to supplement DOE O 232.1A, *Occurrence Reporting and Processing of Operations Information*.
- g. DOE M 251.1-1A, *Directives System Manual*, dated 1-30-98, which provides detailed requirements to supplement DOE O 251.1A, *Directives System*, dated 1-30-98.
- h. DOE O 360.1A, *Federal Employee Training*, dated 9-21-99, which establishes requirements and assigns responsibilities for DOE Federal employee training, education, and development under the Government Employees Training Act of 1958, as amended.
- i. DOE O 420.1, *Facility Safety*, dated 10-13-95, which establishes facility safety requirements related to nuclear safety design, criticality safety, fire protection, and natural phenomena hazards mitigation.
- j. DOE O 425.1B, *Startup and Restart of Nuclear Facilities*, dated 12-21-00, which establishes the requirements for startup of new nuclear facilities and for the restart of existing nuclear facilities that have been shut down.
- k. DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, dated 3-27-98, which establishes the framework for an effective worker protection program that will reduce or prevent injuries, illnesses, and accidental losses by providing DOE Federal and contractor workers with a safe and healthful workplace.
- l. DOE M 440.1-1, *DOE Explosives Safety Manual*, Revision 8, dated 3-29-96, which describes DOE's explosives safety requirements applicable to operations involving the development, testing, handling, and processing of explosives or assemblies containing explosives.
- m. DOE G 450.3-3, *Tailoring for Integrated Safety Management Applications*, dated 2-1-97, which illustrates how tailoring work management functions facilitates the safe and effective accomplishment of work (including design) and demonstrates that tailoring is integral to the integrated safety management system.
- n. DOE P 450.4, *Safety Management System Policy*, dated 10-15-96, which describes DOE safety management systems that must be used to integrate safety into management and work practices at all levels so that missions will be accomplished while protecting the public, the worker, and the environment.

- o. DOE O 452.1B, *Nuclear Explosive and Weapon Surety Program*, dated 8-6-01, which establishes requirements and responsibilities for the NEWS Program.
- p. DOE O 470.1, *Safeguards and Security Program*, dated 9-28-95, which provides an integrated system of activities, systems, programs, facilities, and policies for the protection of classified information, nuclear materials, nuclear weapons, nuclear weapons components, and DOE and certain DOE contractor property and personnel.
- q. DOE O 470.2A, *Security and Emergency Management Independent Oversight and Performance Assurance Program*, dated 3-1-00, which establishes the DOE Safeguards, Security, and Emergency Management Independent Oversight and Performance Assurance Program that provides DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of the effectiveness of DOE safeguards and security policy and programs and the implementation of those policies and programs.
- r. DOE 4330.4B, *Maintenance Management Program*, dated 2-10-94, which establishes the requirement that all DOE property used for nuclear explosive operations and associated activities be maintained in a manner that promotes operational safety, worker health, environmental protection and compliance, property preservation, and cost-effectiveness.
- s. DOE 5480.19, *Conduct of Operations Requirements for DOE Facilities*, dated 7-9-90, which provides requirements and guidelines for DOE elements to use in developing directives, plans, and/or procedures relating to the conduct of operations at DOE facilities.
- t. DOE 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, dated 11-15-94, which establishes selection, qualification, and training requirements for M&O contractor personnel involved in the operation, maintenance, and technical support of DOE-owned Category A and B reactors and nonreactor nuclear facilities.
- u. DOE 5530.1A, *Accident Response Group*, dated 9-20-91, which establishes DOE policy for response to accidents and significant incidents involving nuclear weapons or nuclear weapons components.
- v. DOE-STD-1073-93, *Guide for Operational Configuration Management Program*, dated November 1993, which provides guidance to DOE personnel and contractors on the development and implementation of an operational configuration management program, including two adjunct programs, Design Reconstitution and Material Condition and Aging Management.

- w. DOE-STD-1104-96, *Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports*, dated February 1996, which describes the DOE review and approval process for nonreactor nuclear facility safety analysis reports.
- x. DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, as amended by Change Notice 1, dated January 2000, which describes a Safety Analysis Report preparation method that is acceptable to DOE.
- y. DOE-STD-3015-2001, *Nuclear Explosive Safety Study Process*, dated February 2001, which provides requirements and guidance for nuclear explosive safety studies and associated activities.
- z. DOE-DP-STD-3016-99, *Hazard Analysis Reports for Nuclear Explosive Operations*, dated February 1999, which clarifies the requirements and provides guidance for conducting hazard analyses and preparing Hazard Analysis Reports for nuclear explosive operations and associated activities.
- aa. 10 U.S.C. 179.
- bb. 10 CFR, Part 711, "Personnel Assurance Program (PAP)," Final Rule, published 9-8-98.
- cc. 10 CFR, Part 820, "Procedural Rules for DOE Nuclear Activities," dated 8-1-90.
- dd. 10 CFR, Part 830, "Nuclear Safety Management," dated 12-11-00.
- ee. 10 CFR, Part 835, "Occupational Radiation Protection," as amended 11-4-98.
- ff. Joint Department of Energy/Department of Defense (DOE/DoD) Technical Publication 20-7, *Nuclear Safety Criteria*, dated 6-1-00.
- gg. Joint DOE/DoD Technical Publication 35-51, *General Instructions Applicable to Nuclear Weapons*, dated 8-30-99.
- hh. Joint DOE/DoD Technical Publication 45-51, *Transportation of Nuclear Weapons Materiel, General Shipping and Limited Life Component Data (LLC)*, dated 2-12-99.
- ii. Joint DOE/DoD Technical Publication 45-51A, *Transportation of Nuclear Weapons Materiel (Supplement), Shipping and Identification Data for Stockpile Major Assemblies*, dated 3-24-00.

- jj. Joint DOE/DoD Technical Publication 45-51D, *Transportation of Nuclear Weapons Materiel (Supplement), Shipment by Safe-Secure Trailer (SST) and Safeguard Transporter (SGT)*, dated 11-10-99.
- 8. CONTACT. Questions concerning this Order should be addressed to the Assistant Deputy Administrator for Military Application and Stockpile Operations, Office of Weapons Surety, NNSA, 301-903-3463.

BY ORDER OF THE SECRETARY OF ENERGY:



FRANCIS S. BLAKE  
Deputy Secretary

## **CONTRACTOR REQUIREMENTS DOCUMENT**

### **DOE O 452.2B, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS**

Major facilities management contractors that conduct Department of Energy (DOE) Nuclear Explosive and Weapon Surety (NEWS) program activities must comply with the requirements in this Contractor Requirements Document (CRD). Regardless of the performer of the work, contractors are responsible for compliance with the requirements of this CRD. Contractors are responsible for flowing down the requirements of this CRD to subcontracts at any tier to the extent necessary to ensure the contractor's compliance with the requirements.

1. Assist in managing the Nuclear Explosive Safety (NES) Program. The nuclear weapons laboratories and other management and operating contractors and support contractors must ensure that hazards associated with nuclear explosive operations are identified and mitigated and/or controlled to prevent inadvertent or accidental nuclear detonations, high-explosive detonations or deflagrations or fissile materials dispersals (meet the NES standards for all nuclear explosive operations).
2. Provide personnel to perform duties as members of Nuclear Explosive Safety Study Groups and/or technical teams responsible for preparing hazard and safety analysis information and reports to evaluate nuclear explosive and weapons surety of DOE operations.
3. Provide personnel to participate in NES appraisals, assessments, and readiness reviews; preparation and/or reviews of nuclear explosive operations hazards analysis reports and safety analysis reports; Nuclear Explosive Safety Study Group activities; evaluation of nuclear explosive occurrence reports and related corrective actions; identification of performance indicator measures; and other specialized nuclear explosive technical support and assistance.
4. Contractor self-assessments must include a review of the implementation of NES requirements.
5. Support NES activities related to on-site and off-site transportation of nuclear explosives.
6. Ensure that the identified contractors are responsible for compliance with the requirements of DOE O 452.2B, regardless of the performer of the work. The contractor is responsible for flowing down the necessary requirements for subcontractors at any tier to which the contractor determines such requirements apply.



## DEFINITIONS

This attachment provides the definitions pertinent to DOE O 452.2B, *Safety of Nuclear Explosive Operations*.

1. Access. The proximity to a nuclear explosive that affords a person the opportunity to tamper with it or to cause a detonation.
2. Authorization Basis (AB). For nuclear explosive operations, the AB consists of the applicable safety evaluation report, applicable safety analysis reports (or equivalent interim documents), the applicable hazard analysis reports, associated applicable safety controls, and other Department of Energy (DOE)-approved safety documents designated part of the AB by DOE.
3. Certified Personnel (for nuclear explosive duties). Operations personnel who are current with respect to Personnel Assurance Program certification and the training and qualification program for the specific nuclear explosive operation to which they are assigned.
4. Collocation. Pit and main charge high explosive are considered to be collocated if detonation or deflagration of the high explosive could result in fissile material dispersal.
5. Controls. Design features, safety rules, Technical Safety Requirements, procedures, or other measures that individually or collectively contribute to nuclear explosive surety.
6. Custody. Responsibility for control of and access to nuclear explosives.
7. Defense-In-Depth. Multiple layers of protection (e.g., equipment design, procedures, and training) to prevent accidents and/or to mitigate the consequences of an accident.
8. Deflagration. A rapid chemical reaction in which the output of heat is sufficient to enable the reaction to proceed and be accelerated without input of heat from another source. Deflagration is a surface phenomenon, with the reaction products flowing away from the unreacted material along the surface at subsonic velocity. The effect of a true deflagration under confinement is an explosion. Confinement of the reaction increases pressure, rate of reaction, and temperature and may cause transition into a detonation.
9. Documents. Recorded information (records), regardless of physical form or characteristics, made or received in connection with the transaction of public business and preserved or appropriate for preservation as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities or because of the informational value of data in them.

10. Electrical Equipment. Custom designed and fabricated devices or commercial devices (both modified and unmodified) used in performing operations on a nuclear explosive that do not connect to the electrical circuitry of the nuclear explosive.
11. Electrical Testers. Custom designed and fabricated devices or commercial devices (both modified and unmodified) used in performing operations on the electrical circuitry of a nuclear explosive.
12. Environment, Safety, and Health (ES&H). The application of risk reduction measures to control or mitigate the possibility of exposing the public, workers, or environment to hazardous materials or hazardous energy. This includes, for example, environmental protection, nuclear safety, criticality safety, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, industrial safety, and radioactive and hazardous waste management.
13. Facility. Any equipment, structure, system, process, or activity that fulfills a specific purpose.
14. Fissile Material Dispersal. The aerosolization and transport of fissile material by a driving force, such as fire, high-explosive deflagration, or high-explosive detonation.
15. Graded Approach. A process by which the level of analysis, documentation, and actions necessary to comply with a requirement are commensurate with—
  - a. the relative importance to safety, safeguards, and security;
  - b. the magnitude of any hazard involved;
  - c. the life cycle of the facility;
  - d. the programmatic mission of the facility;
  - e. the particular characteristics of a facility; and
  - f. any other relevant factor.
16. Hazard Analysis. The determination of material, system, process, and plant characteristics that can produce undesirable consequences followed by the assessment of hazardous situations associated with a process or activity.
17. Hazard Analysis Report. A report that documents the systematic evaluation of hazards to workers, the public, and the environment for a specific nuclear explosive operation and its associated activities.
18. High-Explosive Deflagration. A rapid chemical reaction in which the output of heat is significant to proceed and possibly be accelerated without input of energy from an external source. Deflagration is a phenomenon which proceeds through the reacted material toward the unreacted material at subsonic velocity.

19. High-Explosive Detonation. A violent chemical reaction within a chemical compound or mechanical mixture evolving heat and pressure. A detonation is a reaction that proceeds through the reacted material toward the unreacted material at a supersonic velocity.
20. Main Charge. The high explosive whose explosive energy implodes the pit.
21. Nuclear Detonation. An energy release through a nuclear process, during a period of time on the order of one microsecond, in an amount equivalent to the energy released by detonating 4 or more pounds of trinitrotoluene (TNT).
22. Nuclear Explosive. An assembly containing fissionable and/or fusionable materials and main charge high-explosive parts or propellants capable of producing a nuclear detonation (e.g., a nuclear weapon or test device).
23. Nuclear Explosive Area. Any area that contains a nuclear explosive or collocated pit and main charge high-explosive parts.
24. Nuclear Explosive Duty. Work assignments that allow custody of a nuclear explosive or access to a nuclear explosive area.
25. Nuclear Explosive-Like Assembly (NELA). An assembly that is not a nuclear explosive but represents a nuclear explosive in its basic configuration (main charge high explosive and pit) and any subsequent level of assembly up to its final configuration or that represents a weaponized nuclear explosive such as a warhead, bomb, reentry vehicle, or artillery shell. An NELA does not contain an arrangement of high-explosive and fissile material capable of producing a nuclear detonation.
26. Nuclear Explosive Operation. Any activity involving a nuclear explosive, including activities in which main charge high-explosive parts and pit are collocated.
27. Nuclear Explosive Operation-Associated Activities. Activities directly associated with a specific nuclear explosive operation in a nuclear explosive area, such as work on a bomb nose or tail subassembly, even when physically separated from the bomb's nuclear explosive subassembly.
28. Nuclear Explosive Safety (NES). The application of positive measures or controls to prevent or mitigate the possibility of unintended or unauthorized nuclear detonation, or fissile materials dispersal from the pit in a nuclear explosive area.
29. Nuclear Explosive Safety Rules (NESRs). Requirements that significantly contribute to minimizing the possibility of nuclear detonation, high-explosive detonation, deflagration or fire in nuclear explosive operations.

30. Nuclear Explosive Safety Study. A formal evaluation of the adequacy of controls to meet the DOE/National Nuclear Security Administration nuclear explosive safety standards.
31. Nuclear Weapon. A nuclear explosive configured for Department of Defense use.
32. 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.
33. Operational Safety Review. An independent nuclear explosive safety evaluation to determine whether nuclear explosive operations continue to satisfy the nuclear explosive safety standards as established during the nuclear explosive safety study and maintained by the change control process.
34. Permanent Marking. A durable method, normally by metal deformation, of indicating on an external area of an assembly whether it is a nuclear explosive or a nuclear explosive-like assembly.
35. Personnel Assurance Program. A program that establishes the requirements and responsibilities for screening, selecting, and continuously evaluating employees assigned to or being considered for assignment to nuclear explosive duties.
36. Pit (Live). A fissile component, or set of fissile components designed to fit in the central cavity of an implosion system and which if placed therein will create a nuclear explosive.
37. Reader Worker Procedure and Checkoff. A procedure used during specified nuclear explosive operations in which one person reads the description of the operation to be performed, the operation is performed, and the reader checks off on a list that the operation has been performed.
38. Risk. The qualitative or quantitative expression of possible loss that considers both the likelihood that an event will occur and the consequence of that event.
39. Safety Analysis. A documented process to (a) provide systematic identification of hazards within facilities in which nuclear explosive operations and associated activities are conducted and during specific nuclear explosive operations and associated activities; (b) describe and analyze the adequacy of measures taken to eliminate, control, or mitigate identified hazards; and (c) analyze and evaluate potential accidents and their associated risks.
40. Safety Analysis Report. A report that documents the results of safety analysis to ensure that a facility can be constructed, operated, maintained, shut down, and decommissioned safely and in compliance with applicable laws and regulations.

41. 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. As changes are made or potential inadequacies of the safety analysis are discovered, contractors must perform unreviewed safety question (USQ) determinations. The results of the USQ determinations and any associated safety evaluations are part of the safety basis for the facility.
42. Safety Evaluation Report. The safety evaluation report, for a given facility or operation, documents that an appropriate review of the authorization basis documents was conducted. The safety evaluation report also documents the bases for approving the documents and specifies any conditions of approval. (DOE-STD-1104-96)
43. Temporary Marking. A nonpermanent marking method on an external area, attached to an assembly, or otherwise marked, indicating the configuration of a nuclear explosive-like assembly.
44. Use Control. The application of systems, devices, or procedures that allow timely authorized use of a nuclear explosives while precluding or delaying unauthorized nuclear detonation.