

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

**ORDER**

**DOE O 452.1**

4-29-96

**SUBJECT: NUCLEAR EXPLOSIVE AND WEAPONS SURETY  
PROGRAM**

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1. OBJECTIVE.

- a. To establish policy, responsibilities, and requirements for the Department of Energy's (DOE's) Nuclear Explosive and Weapon Surety (NEWS) Program.
- b. To maintain a formal, comprehensive, and systematic NEWS Program to protect the public and worker health and safety and the environment while supporting national defense requirements.
- c. To establish nuclear explosive surety standards, nuclear weapon design surety requirements, and appraisal requirements for the DOE NEWS Program.
- d. To establish specific requirements for related elements of the NEWS Program as provided in the 452 and 5610-series Orders identified in paragraph 4a. Responses to unplanned events (e.g., Accident Response Group activities) are addressed in the 5500-series Orders and DOE O 151.1, COMPREHENSIVE EMERGENCY MANAGEMENT SYSTEM.

2. CANCELLATION. DOE 5610.10, NUCLEAR EXPLOSIVE AND WEAPON SAFETY PROGRAM, of 10-10-90 is canceled.

3. APPLICABILITY.

- a. DOE Elements. This Order applies to DOE Headquarters and field elements involved in the NEWS Program.
- b. Contractors. This Order applies to all contractors and subcontractors that manage, oversee, or conduct the NEWS Program as provided by law and/or by contract as implemented by the appropriate contracting officer. Development of a Contractor Requirement Document is being considered which may separately delineate the contractor requirements.
- c. Exclusions. None.

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All Departmental Elements

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**INITIATED BY:**  
Office of Defense Programs

4. REQUIREMENTS.

- a. Nuclear Explosive and Weapon Surety Orders. The DOE NEWS Program shall be governed by this Order and the following related DOE Orders.
  - (1) DOE O 452.2, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS, of 4-29-96, which establishes DOE policy, responsibilities, and requirements for ensuring the safe conduct of DOE nuclear explosive operations. It addresses both nuclear explosive safety (NES) and environment, safety, and health (ES&H).
  - (2) DOE 5610.12, PACKAGING AND OFFSITE TRANSPORTATION OF NUCLEAR COMPONENTS, AND SPECIAL ASSEMBLIES ASSOCIATED WITH THE NUCLEAR EXPLOSIVE AND WEAPON SAFETY PROGRAM, of 7-26-94, which establishes policy, objectives, responsibilities and authorities, and requirements for the safe packaging and offsite transportation of nuclear components and special assemblies associated with the nuclear weapon program requiring the use of the Transportation Safeguards System (TSS).
  - (3) DOE 5610.13, JOINT DEPARTMENT OF ENERGY/DEPARTMENT OF DEFENSE NUCLEAR WEAPON SYSTEM SAFETY, SECURITY AND CONTROL ACTIVITIES, of 10-10-90, which establishes DOE policy, responsibilities and authorities, and requirements for addressing joint nuclear weapon and nuclear weapon system safety issues in conjunction with the Department of Defense (DoD). It covers DOE participation in DoD Nuclear Weapon System Safety Groups, which conduct safety studies of nuclear weapon systems operated by the DoD and develop weapon system safety rules governing those operations.
  - (4) DOE 5610.14, TRANSPORTATION SAFEGUARDS SYSTEM PROGRAM OPERATIONS, of 5-12-93, which establishes DOE policy, authorities and responsibilities, and requirements for the management and operation of the TSS Program which includes transportation of nuclear explosives.
- b. Nuclear Explosive Surety Standards. All DOE nuclear explosive operations shall meet the following qualitative surety standards to prevent unintended nuclear detonation, fissile material dispersal from the pit, or loss of control. There shall be positive measures to:
  - (1) minimize the possibility of accidents, inadvertent acts, or authorized activities that could lead to fire, high explosive deflagration, or unintended high explosive detonation;

- (2) minimize the possibility of fire, high explosive deflagration, or high explosive detonation, given accidents or inadvertent acts;
  - (3) minimize the possibility of deliberate unauthorized acts that could lead to high explosive deflagration or high explosive detonation;
  - (4) ensure adequate security of nuclear explosives;
  - (5) minimize the possibility of or delay unauthorized nuclear detonation.
- c. Nuclear Explosive Safety. Safety Standards, paragraphs 4b(1), (2), and (3), above, shall be met for all nuclear explosive operations conducted by the Department and/or its contractors to ensure adequate nuclear explosive safety. The adequacy of positive measures to meet these standards shall be evaluated by the Nuclear Explosive Safety Study Group (NESSG). Additional requirements are specified in DOE O 452.2.
- d. Nuclear Explosive Security. The Security Standard, paragraph 4b(4), above, shall be met to ensure adequate nuclear explosive security for all nuclear explosive operations conducted by the Department and/or its contractors. Nuclear explosives shall be secured in accordance with the requirements in the 5630-series Orders. The adequacy of these safeguards and security measures shall be documented in Operations Office site security surveys and EH-4 inspections and evaluations. Security operations shall be evaluated for potential adverse impact on nuclear explosive safety by the NESSG.
- e. Nuclear Explosive Use Control. Use Control Standards, paragraphs 4b(3) and (5), above, shall be met for all nuclear explosive operations conducted by the Department and/or its contractors. Use control measures shall be evaluated by the NESSG for potential adverse impact on nuclear explosive safety. The Operations Office manager shall implement the use control policy as described in the Atomic Energy Act of 1954, as amended, Executive Order 2, National Security Decision Directives 281 and 309, "An Agreement Between the AEC and the DoD for the Development, Production, and Standardization of Atomic Weapons," and "Memorandum of Understanding Between the DoD and the DOE on Objectives and Responsibilities for Joint Nuclear Weapon Activities," and evaluate the effectiveness of use control measures.
- f. Nuclear Test Detonation Safety. There shall be positive measures to minimize the possibility for the initiation of the nuclear explosive test device detonator(s) until detonation is authorized.
- g. Nuclear Weapon Design Surety.

- (1) Surety shall be an integral part of design and development of new weapons and the modification of existing weapons. Explicit consideration of surety shall begin at the concept definition phase and continue throughout development and engineering.
- (2) New nuclear weapon designs shall incorporate current surety features unless there are overriding reasons for not doing so and explicitly documented agreements to this effect are reached between the Secretaries of Energy and Defense. The following shall be implemented in the design of new nuclear weapons.
  - (a) Nuclear Detonation Safety. Nuclear weapons shall incorporate design features that minimize the possibility of accidental and/or inadvertent nuclear detonation. The following are design goals for nuclear weapons delivered to the DoD.
    - 1 Normal Environment. Prior to receipt of the enabling stimuli and the arming signal, the probability of a premature nuclear detonation shall not exceed one in 10<sup>9</sup> per nuclear weapon lifetime.
    - 2 Abnormal Environment. Prior to receipt of the enabling stimuli, the probability of a premature nuclear detonation shall not exceed one in 10<sup>6</sup> per credible nuclear weapon accident or exposure to abnormal environments.
    - 3 One-Point Safety. The probability of achieving a nuclear yield greater than four pounds of trinitrotoluene (TNT) equivalent in the event of a one-point initiation of the weapon's high explosive shall not exceed one in 10<sup>6</sup>.
    - 4 Multi-Point Safety. Multi-point initiation in abnormal environments shall be evaluated as part of the design process.
  - (b) Fissile Material Dispersal Safety. Design features for reducing the possibility of fissile material dispersal from the pit under credible abnormal environments shall be incorporated for each new nuclear weapon unless the responsible Military Service requests and properly justifies an exception.
  - (c) Use Control. Use control features shall include design features that allow timely authorized use of a nuclear weapon while precluding or delaying unauthorized use.

- (d) Inadvertent Criticality. The criticality safety of a nuclear weapon shall be evaluated by the design agency to document the intrinsic safety of the design in both normal and abnormal environments.
- h. Nuclear Weapons Surveillance Program. The surveillance program contributes to assessing the surety of weapons and components in the stockpile. The knowledge gained shall be used as appropriate to improve nuclear weapons surety.
- i. Authorization for a Nuclear Explosive Operation. Before a nuclear explosive operation can begin, the following documentation shall be completed and approved in accordance with the requirements of this Order.
  - (1) Facility Safety Analysis Report (SAR).
  - (2) Operation Hazard Analysis Report (HAR).
  - (3) Any required Technical Safety Requirements (TSRs), Operational Safety Controls (OSCs), or Nuclear Explosive Safety Rules (NESRs).
  - (4) Nuclear explosive operation readiness review.
  - (5) Required facility readiness reviews.
  - (6) Nuclear Explosive Safety Study Report.
  - (7) Certification that all nuclear explosive surety standards are met.
- j. Appraisals. Organizations that have NEWS Program responsibilities shall be periodically appraised as follows.
  - (1) DP-1 shall schedule and conduct an appraisal of DOE Headquarters.
  - (2) DP-20 shall schedule and conduct an appraisal of the Operations Offices.
  - (3) Operations Offices shall schedule and conduct an appraisal of the area offices, laboratories, and contractors to determine compliance with requirements in the 452 and 5610-series Orders and associated field directives. Appraisals shall be conducted in accordance with a schedule promulgated by the cognizant Operations Office manager and approved by DP-20. The Albuquerque Operations Office shall appraise the Transportation Safeguards Division. A Headquarters observer may be included in the team for these appraisals.
  - (4) Operations Office appraisals of the safety of nuclear explosive operations and associated activities and facilities (DOE O 452.2) shall include both

nuclear explosive surety and ES&H elements, although not necessarily in the same appraisal. The field organizations' responsibilities in DOE 5482.1B, ENVIRONMENT, SAFETY AND HEALTH APPRAISAL PROGRAM, and the requirements of DOE 5700.6C shall apply to ES&H appraisals with the following modifications.

- (a) NES concerns, as described in DOE O 452.2, shall be integrated into the process used to assess the adequacy of the implementation of ES&H requirements.
  - (b) NES personnel shall evaluate all corrective action plans on nuclear explosive operations and associated activities and facilities to ensure that proposed actions do not adversely affect nuclear explosive safety.
- (5) Nuclear explosive surety appraisals shall evaluate compliance with applicable directives and requirements and assess the overall effectiveness of the NEWS Program. Nuclear explosive surety appraisals shall be planned and conducted in accordance with ASME NQA-1-1994, Quality Assurance Requirements for Nuclear Facility Applications, "Basic Requirement 18, Audits," and "Supplement 18S-1, Supplementary Requirements for Audits." Additional guidance is provided in ASME NQA-1 Appendix 18A-1, "Nonmandatory Guidance on Audits."
- (6) The organization responsible for conducting appraisals shall develop a training and qualification program for appraisal personnel.
- k. Implementation Requirements. Within 12 months after this Order is issued, Operations Offices shall develop an implementation plan to describe how the requirements of this Order will be implemented. The implementation plan shall be submitted to DP-20 for approval and shall include the following.
  - (1) Identify the programs, plans, practices, procedures, and other actions to be used in complying with the requirements.
  - (2) Establish a schedule for actions necessary to achieve compliance.
  - (3) Identify needed resources.
  - (4) Identify those compensatory measures deemed necessary to provide for adequate protection during the period of noncompliance.

5. RESPONSIBILITIES.

- a. The Secretary (S-1).

- (1) Is responsible for the surety of all nuclear explosive operations conducted by the Department and/or its contractors.
  - (2) Exercises dual-agency responsibility with DoD for the surety of nuclear weapons in DoD custody.
  - (3) Designates the DOE member to the Nuclear Weapons Council.
- b. Assistant Secretary for Defense Programs (DP-1).
- (1) Implements DOE policy for the NEWS Program, including those aspects of the program related to public and worker health and safety and protection of the environment.
  - (2) Reviews and concurs or does not concur on DoD-proposed nuclear weapon system safety rules.
  - (3) Coordinates with the Assistant Secretary for Environment, Safety and Health (EH-1) to ensure that appropriate ES&H requirements are integrated with NEWS requirements and that divergence does not occur.
  - (4) Conducts appraisals of the DOE Headquarters Weapon Surety Program to evaluate management of the NEWS Program.
- c. Assistant Secretary for Environment, Safety and Health (EH-1).
- (1) Provides assistance to DP-1 for ES&H disciplines.
  - (2) Coordinates with DP-1 on ES&H requirements to ensure that divergence between ES&H and NEWS Programs does not occur.
- d. Deputy Assistant Secretary for Military Application and Stockpile Management (DP-20).
- (1) Serves as the focal point for the Department's dual-agency responsibility with the DoD for nuclear weapon surety.
  - (2) Develops NEWS Program policy, requirements, and standards for approval by the Secretary.
  - (3) Provides overall NEWS Program management and direction including implementing surety policy and developing surety directives.

- (4) Ensures that there is an active and continuous review of the stockpile to identify surety concerns and a program to provide for the stockpile improvements or positive measures to address identified concerns.
  - (5) Ensures that all surety actions related to nuclear weapons requiring a DOE concurrence to the DoD are thoroughly analyzed from a surety viewpoint by qualified experts, with special emphasis on DOE's dual-agency responsibility.
  - (6) Conducts appraisals of Operations Offices to evaluate their implementation of the NEWS Program.
  - (7) Coordinates nuclear explosive safety, security, and use control policies to ensure balance and consistency with the nuclear explosive surety standards.
  - (8) Develops, implements, and maintains a DP-20 quality assurance (QA) program and approves Operations Office QA program and implementing plans, which shall include nuclear explosive operations in accordance with DOE 5700.6C, QUALITY ASSURANCE.
- e. Director, Office of Security Affairs (NN-50).
  - (1) Establishes safeguards and security policies and standards for nuclear explosives, nuclear components, and special nuclear assemblies.
  - (2) Advises DP-1 as to the adequacy of DOE and DOE contractor safeguards and security programs.
- f. Deputy Assistant Secretary for Security Evaluation (EH-4) provides Safeguards and Security Inspection Reports related to the NEWS program to DP-20 and cognizant Operations Office.
- g. Managers of Operations Offices are responsible to DP-20 for implementing the provisions of this and related Orders, which include the following.
  - (1) Ensuring that NEWS Program responsibilities, as appropriate, are assigned to Operations Office organizations, laboratories, contractors, and subcontractors.
  - (2) Ensuring that management and staff have full access and free communications with the Operations Office manager on NEWS matters.
  - (3) Developing and publishing field directives to implement this and related Orders.



- (4) Conducting operational aspects of the NEWS Program for onsite transportation activities.
  - (5) Ensuring surety of nuclear explosives during nuclear explosive operations.
  - (6) Developing, implementing, and maintaining an Operations Office QA program in accordance with DOE 5700.6C, and approving contractor QA program and implementing plans, which shall include nuclear explosive operations in accordance with the requirements of DOE O 452.2.
  - (7) Conducting appraisals of area offices and contractors to evaluate implementation of the NEWS Program.
  - (8) Certifying that all nuclear explosive surety standards are met.
- h. Manager, Albuquerque Operations Office, in addition to the responsibilities in paragraph 5g, above, is responsible to DP-20 for the following.
- (1) Conducting operational aspects of the NEWS Program for offsite transportation activities.
  - (2) Administering DOE's participation in the DoD nuclear weapon system safety program and assisting in the processing of DoD safety rules in accordance with DOE 5610.13.
  - (3) Conducting NEWS appraisals of the Transportation Safeguards Division.
- i. Manager, Nevada Operations Office, in addition to the responsibilities in paragraph 5g, is responsible to DP-20 for conducting operational aspects of the NEWS Program and for the authorized detonation of test nuclear explosives.
- j. Design Laboratories and Production Agencies provide support to the NEWS Program. This includes providing qualified personnel to support the NESSG and similar activities.

6. REFERENCES.

- a. DOE O 151.1, COMPREHENSIVE EMERGENCY MANAGEMENT SYSTEM, dated 10-26-95.
- b. DOE 5482.1B, ENVIRONMENT, SAFETY, AND HEALTH APPRAISAL PROGRAM, dated 11-18-91.
- c. DOE O 452.2, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS, dated 4-29-96.

- d. DOE 5610.12, PACKAGING AND OFFSITE TRANSPORTATION OF NUCLEAR COMPONENTS, AND SPECIAL ASSEMBLIES ASSOCIATED WITH THE NUCLEAR EXPLOSIVE AND WEAPON SAFETY PROGRAM, dated 7-26-94.
  - e. DOE 5610.13, JOINT DEPARTMENT OF ENERGY/DEPARTMENT OF DEFENSE NUCLEAR WEAPON SYSTEM SAFETY, SECURITY AND CONTROL ACTIVITIES, dated 10-10-90.
  - f. DOE 5610.14, TRANSPORTATION SAFEGUARDS SYSTEM PROGRAM OPERATIONS, dated 5-12-93.
  - g. DOE 5700.6C, QUALITY ASSURANCE, dated 8-21-91.
  - h. ASME NQA-1-1994, Quality Assurance Requirements for Nuclear Facility Applications, dated 1994.
  - i. Atomic Energy Act of 1954, as amended.
  - j. Executive Order 2.
  - k. National Security Decision Directive 281.
  - l. National Security Decision Directive 309, Safety, Security and Control.
  - m. "An Agreement Between the AEC and the DoD for the Development, Production, and Standardization of Atomic Weapons," dated 3-21-53.
  - n. "Memorandum of Understanding Between the DoD and the DOE on Objectives and Responsibilities for Joint Nuclear Weapon Activities," dated 1-17-83.
7. CONTACT. DP-20, Office of Weapons Surety (DP-21).

BY ORDER OF THE SECRETARY OF ENERGY:



ARCHER L. DURHAM  
Assistant Secretary for  
Human Resources and Administration

## DEFINITIONS

This attachment provides definitions pertinent to DOE O 452.1.

1. Abnormal Environment. In DOE operations, abnormal environment means an environment that is not expected to occur during nuclear explosive operations and associated activities.

In DoD operations, abnormal environments are defined in a weapon's stockpile-to-target-sequence and military characteristics as those environments in which the weapon is not expected to retain full operational reliability.

2. Environment, Safety, and Health (ES&H). The application of risk reduction measures to control or mitigate the possibility of exposing the public, workers, and 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.
3. Fissile Material Dispersal. The aerosolization and transport of fissile material by a driving force, such as fire, high explosive deflagration, or high explosive detonation.
4. High Explosive Deflagration. A rapid chemical reaction in which the output of heat is sufficient for the reaction to proceed and accelerate 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.
5. 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.
6. Normal Environment. In DOE operations, normal environment means the environment in which nuclear explosive operations and associated activities are expected to be performed.

In DoD operations, normal environment means the expected logistical and operational environments as defined in a weapon's stockpile-to-target-sequence and military characteristics that the weapon is required to survive without degradation in operational reliability.

7. 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 four or more pounds of trinitrotoluene (TNT).

8. 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).
9. Nuclear Explosive Area (NEA). An area that contains a nuclear explosive or collocated pit and main charge high explosive parts.
10. Nuclear Explosive and Weapon Surety (NEWS) Program. The DOE program established to ensure adequate safety, security, and control of nuclear explosives and nuclear weapons.
11. Nuclear Explosive Operation. Any activity involving a nuclear explosive, including activities in which main charge high explosive parts and pit are collocated.
12. 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.
13. Nuclear Explosive Safety (NES). The application of positive measures to control or mitigate the possibility of unintended or unauthorized nuclear detonation, high explosive detonation or deflagration, or fire in a nuclear explosive area.
14. Nuclear Explosive Safety Study. A formal evaluation of the adequacy of positive measures to meet the DOE nuclear explosive Safety Standards.
15. Nuclear Weapon. A nuclear explosive configured for DoD use.
16. Nuclear Yield. The nuclear energy released in the detonation of a nuclear explosive, measured in terms of the weight of TNT required to produce the same amount of energy release.
17. 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.
18. Positive Measures. Design features, safety rules, procedures, or other controls used individually or collectively to provide nuclear explosive surety. Positive measures are intended to ensure a safe response in applicable operations and be controllable. Some examples of positive measures are strong-link switches; other safety devices; administrative procedures and controls; general and specific nuclear explosive safety rules; design control of electrical equipment and mechanical tooling; and physical, electrical, and mechanical restraints incorporated in facilities and transport equipment.

19. Surety. Safety, security, and use control of nuclear explosives.
20. Use Control. The application of systems, devices, or procedures that allow timely authorized use of a nuclear explosive while precluding or delaying unauthorized use (nuclear detonation).