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

ORDER

DOE O 452.2A

Issue Date: 1-17-97
Review Date: 1-17-99

SUBJECT: SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS

1. OBJECTIVES.

   a. To establish the applicability, requirements, and responsibilities for ensuring the safety of the Department of Energy's (DOE's) nuclear explosive operations and associated activities and facilities, and for protecting the environment and the health and safety of workers and the public.

   b. In the context of this Order, to address safety in two broad areas: nuclear explosive safety (NES) and environment, safety, and health (ES&H).

   c. To integrate portions of a number of Orders or their corresponding Rules, in order to integrate NES and ES&H and to require the same level of safety assurance for DOE defense nuclear facilities and DOE facilities in which nuclear explosive operations and associated activities are conducted. The Orders or their corresponding Rules shall be used to the extent specified in this Order for nuclear explosive operations and associated activities and facilities. Responses to unplanned events (e.g., Accident Response Group activities) are addressed in the 5530-series Orders and DOE O 151.1, COMPREHENSIVE EMERGENCY MANAGEMENT SYSTEM, dated 9-25-95.

2. CANCELLATION. DOE O 452.2, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS, dated 4-29-96, is canceled. Cancellation of the above Order does not, by itself, modify or otherwise affect any contractual obligation to comply with the Order. Canceled Orders that are incorporated by reference in a contract shall 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 DOE Headquarters and field elements that manage, oversee, or conduct nuclear explosive operations and associated activities.

DISTRIBUTION:
All Department Elements

INITIATED BY:
Office of Defense Programs

b. Contractors. This Order applies to contractors and subcontractors that manage, oversee, or conduct DOE NEWS program as provided by law and/or contract, as implemented by the appropriate contracting officer. Responsibilities are delineated for contractors and Federal employees within the Orders, referenced Rule, Technical Standards, and Implementation Guide. Responsibilities are in sufficient detail such that an additional document, such as a Contractor Requirement Document, would not be beneficial, and may hamper implementation.

c. Exclusions. None.

4. REQUIREMENTS.

a. General.

(1) Nuclear explosive operations and associated activities and facilities shall be comprehensively reviewed and evaluated to identify hazards and potential accidents and to establish design, construction, and operational means to protect the public and worker health and safety and the environment. Facility safety analysis shall be prepared using hazard category 2 nuclear facility guidance unless (i) a different hazard category is determined by DOE using applicable hazard classification guidance, or (ii) a different hazard category is justified for a facility within the context of an approved integrated safety management program. Additional guidance is provided in DOE G 452.2A-1A, IMPLEMENTATION GUIDE FOR USE WITH DOE O 452.2A, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS, dated 1-17-97.

(2) Operations Offices shall have a comprehensive safety program for nuclear explosive operations and associated activities under their purview and assure contractor implementation.

(3) The safety program shall integrate NES requirements from the 452- and applicable 5610-series Orders and ES&H requirements from other Orders if applicable under their own terms or invoked in this Order. Many of the ES&H Orders are directly applicable, and others exclude nuclear explosive operations. This Order adopts specified requirements from the excluded Orders to provide a complete safety program for nuclear explosive operations and associated activities and facilities. Requirements within or invoked by this Order are implemented by the contractor through means proposed by the contractor and become binding through approval and authorization by DOE line management.

(4) Implementation of a requirement to prevent or mitigate one hazard shall 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 shall be investigated to attempt to implement the requirement without increasing the risk associated with other hazards. Guidelines, best management practices, or other nonmandatory implementation guidance shall be similarly assessed for potential impact on another hazard before being implemented.

(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.

b. Operational Safety Program. The safety program shall include the following elements, tailored for the operations.

(1) Experience Feedback. DOE and DOE contractors and laboratories shall evaluate the safety lessons to be learned from critical evaluations of operating experience and other sources of evidence, such as research results and analyses, that bear upon the validity of the safety analyses and safety bases under which nuclear explosive operations are authorized. In the event that evidence is found that may affect the validity of the safety basis of one or more ongoing nuclear explosive operation, then it should be treated as a potential unreviewed safety question (USQ) under the terms of DOE 5480.21, UNREVIEWED SAFETY QUESTIONS, dated 12-24-91, as modified by paragraph 4c(3) of this Order.

(2) Conduct of Operations. DOE 5480.19, CONDUCT OF OPERATIONS REQUIREMENTS FOR DOE FACILITIES, dated 7-9-90, provides DOE policy and requirements for conducting operations at DOE facilities. The guidelines in Attachment I to DOE 5480.19 shall be applied in a graded approach commensurate with their potential ES&H impact and their potential NES impact.

(3) Administrative Controls. Nuclear explosive operations and associated activities shall be conducted in accordance with the applicable Technical Safety Requirements (TSRs), Nuclear Explosive Safety Rules (NESRs), and operational safety controls (OSCs). Nuclear explosive operations and associated activities shall have safety limits, operating limits, surveillance requirements, limiting conditions of operation, and administrative controls, as necessary, that shall be specified in OSCs and NESRs.

(4) Training and Qualification of Personnel. Each organization responsible for and/or involved in nuclear explosive operations and associated activities shall implement a training and qualification program for their respective

personnel that manage, oversee, perform, or directly support these operations and activities. These personnel include DOE and contractor management and technical support personnel, Personnel Assurance Program (PAP) supervisors, PAP 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 assuring their continuing fitness for duty shall be applied as contained in this Order and Interim Personnel Assurance Program Procedures and Standards.

(b) Training for DOE personnel involved in nuclear explosive operations and associated activities shall comply with applicable portions of DOE O 360.1, TRAINING, dated 5-31-95.

(c) DOE contractor and laboratory training and qualification programs shall 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 shall be commensurate with the particular responsibilities assigned.

(5) Maintenance of Facilities, Tooling, and Equipment. A maintenance program shall 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.

(6) Configuration Management (CM).

(a) The appropriate design laboratories and/or operating contractors shall develop and implement a configuration management program for nuclear explosive operations and associated activities and facilities.

(b) The program shall be documented in appropriate plans that shall be approved by the cognizant Operations Office. Guidance is provided in DOE-STD-1073-93, Guide for Operational Configuration Management Programs, of 11/93.

(c) These plans shall 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. Additional guidance is provided in DOE G 452.2A-1A.

(7) Quality Assurance (QA).

(a) DOE contractors and laboratories shall develop and implement a quality assurance program for nuclear explosive operations and associated activities and facilities that satisfies the criteria in paragraphs (b)(1) and (c) of 10 CFR Part 830.120, "Quality Assurance Requirements."

(b) The QA program shall be approved by the cognizant Operations Office. Guidance is provided in G-830.120, Implementation Guide for use with 10 CFR Part 830.120, Quality Assurance.

(8) Issues Management. DOE and DOE contractors and laboratories shall 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. Additional guidance is provided in DOE G 452.2A-1A.

(9) Occurrence Reporting. Operational occurrences shall be reported and processed in accordance with DOE 0 232.1, OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION, dated 9-25-95, and DOE M 232.1, OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION, dated 9-25-95. Additional guidance is provided in DOE G 452.2A-1A.

(10) Performance Indicators.

(a) A performance indicator program for nuclear explosive operations shall be implemented in accordance with the requirements of DOE O 210.1, PERFORMANCE INDICATORS AND ANALYSIS OF OPERATIONS INFORMATION, 9-27-95, and the guidance of DOE-STD-1048-92, Performance Indicators Guidance Document of 12/92.

(b) The program shall include NES performance indicators, as appropriate, in addition to ES&H performance indicators. Contractors shall identify NES performance indicators and submit them to the cognizant Operations Office for approval before incorporating them into the performance indicator program. Additional guidance is provided in DOE G 452.2A-1A.

c. Safety Analyses.

(1) Process and Documentation.

(a) This section clarifies terms and issues employed in the nuclear safety community concerning the interface between nuclear explosive operations and conventional nuclear safety.

(b) Safety analyses shall be performed for all DOE nuclear explosive operations and associated activities and facilities. The results of facility safety analyses shall be documented in a Safety Analysis Report (SAR). The results of operation- and associated activity-specific safety analyses shall be documented in an operation Hazards Analysis Report (HAR). The HAR shall include a Nuclear Explosive Hazards Assessment (NEHA), as described in DOE-DP-STD-XXXX-96, Preparation Guide for U.S. Department of Energy Hazard Analysis Reports for Nuclear Explosive Operations.

(c) This Order, the guidance in DOE G 452.2A-1A, and the guidance and requirements in DOE-DP-STD-XXXX-96 establish a process for safety analysis of nuclear explosive operations and associated activities and facilities. Processes that illustrate the interactions between the NES Study process, the weapon specific operation hazard analysis, and the facility safety basis are shown in Figure 1 and discussed in the following sections.

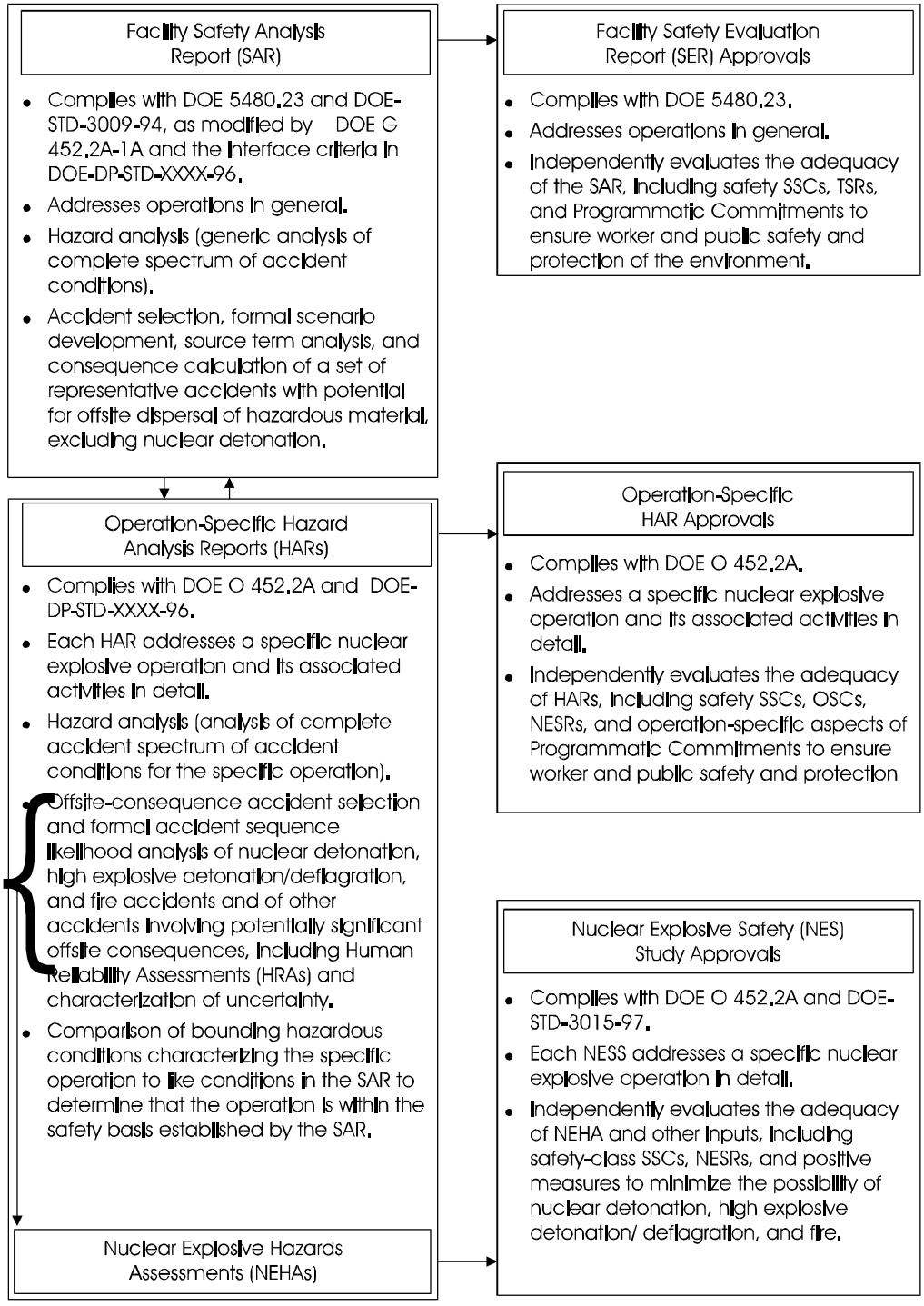

Figure 1. Safety Analysis and Evaluation of Nuclear Explosive Operations and Associated Activities and Facilities.

(d) A safety analysis for nuclear explosive operations and associated activities is an iterative process, performed in parallel with development of the operation being analyzed, so that the operation design benefits from the safety analysis results. Each Operations Office shall comply with the following safety analysis requirements.

1 A safety analysis of facilities used for nuclear explosive operations and associated activities shall be performed and shall be documented in a SAR. The facility safety analyses shall address nuclear explosive operations and associated activities in general and shall address a spectrum of potential accidents based on bounding hazard conditions. The SAR shall be prepared and processed in accordance with the requirements of DOE 5480.23, NUCLEAR SAFETY ANALYSIS REPORTS, dated 4-10-92, and the guidance of its Attachment I, and DOE-STD-3009-94, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports of 7/94. Additional guidance for preparing SARs is provided in DOE G 452.2A-1A.

2 TSRs for facilities in which nuclear explosive operations and associated activities are conducted shall be developed and implemented in accordance with the requirements of DOE 5480.22, TECHNICAL SAFETY REQUIREMENTS, dated 2-25-92. Facility related requirements shall be derived from the SAR.

3 A hazard analysis shall be performed and formally documented in a HAR for each nuclear explosive operation and its associated activities in accordance with DOE-DP-STD-XXXX-96. The HAR shall include a determination of whether or not the operation is within the facility safety basis. HARs for ongoing operations shall be reviewed annually and updated as necessary to ensure that the information in each HAR is current. These reviews shall be comparable to and coordinated with the annual SAR reviews that are required by DOE 5480.23.

4 Those aspects of the operation-specific hazards analysis that involve nuclear detonation, high-explosive detonation and deflagration, and fire shall be assessed using a systematic accident sequence analysis and documented in an HAR and NEHA in accordance with DOE-DP-STD-XXXX-96. The NEHA document shall be submitted to the Nuclear

Explosive Safety Study Group (NESSG) for review and evaluation and included in the NES Study report.

5 The Nuclear Explosive Safety Standards focus on precluding those actions which could lead to high consequence events. The primary purpose of the NEHA is to identify those operations or activities which should be carefully controlled to reduce the possibility or eliminate a specific accident scenario which could result in a NES incident. These actions are focused on the following.

a Precluding high-explosive detonation to preclude nuclear detonation.

b Precluding high-explosive detonation, deflagration or fire situation to preclude fissile material dispersal.

6 OSCs and NESRs shall be iteratively derived from the hazard analysis in the HAR. OSCs shall be reviewed and recommended in DOE HAR reviews; and NESRs shall be reviewed and recommended in the NES Studies. OSCs are approved with the HAR and NESRs are approved with the NES Study report. The criteria for OSCs and NESRs are described in DOE G 452.2A-1A and DOE-DP-STD-XXXX-96.

7 Nothing can be clearly stated prior to conduct of the HAR analysis, but it should be recognized that administrative controls for nuclear explosive operations (NESRs and OSCs) are not normally linked to facility TSRs. If an OSC is linked to a TSR, the TSR should be stated.

(2) Criticality Safety. Nuclear explosive operations and associated activities and facilities shall comply with the criticality safety requirements of DOE 5480.24, NUCLEAR CRITICALITY SAFETY, dated 8-12-92, or DOE O 420.1, FACILITY SAFETY, dated 10-13-95.

(a) Criticality safety analyses of the facility and general nuclear explosive operations and associated activities shall be documented in the SAR in accordance with the criticality safety requirements of DOE 5480.23 and DOE 5480.24 or DOE O 420.1.

(b) Criticality safety analyses of specific nuclear explosive operations and associated activities shall be documented in accordance with DOE-DP-STD-XXXX-95.

(c) Criticality safety of a specific nuclear explosive and its components is evaluated in the design process and need not be discussed in the SAR.

(3) Change Control. Operations Offices shall establish a change control process for nuclear explosive operations and associated activities and facilities. The USQ process shall be used, augmented by the additional NES evaluations listed below. NES evaluations shall be completed prior to implementation of the change. All proposed changes to nuclear explosive operations and associated facilities shall 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.

(a) Proposed changes of a trivial or strictly administrative nature with no likelihood of significance to nuclear explosive safety may be approved by the operating contractor and shall require no further NES evaluation.

(b) For those changes determined by the operating contractor to require a DOE NES evaluation, change documentation shall be evaluated and concurred with by the responsible design laboratories personnel and DOE nuclear explosive safety personnel. Operations Offices shall specify the process for performing such a NES evaluation. This evaluation may result in a determination of the need for a NES Study.

(c) The change control process shall include provisions for incorporating approved changes into the appropriate safety documents.

d. Nuclear Explosive Safety Program. Nuclear explosive operations require additional special safety consideration because of the potential high consequences of an accident or unauthorized act. Operations Offices shall implement a formal, comprehensive Nuclear Explosive Safety Program that includes the following.

(1) DOE Nuclear Explosive Safety Standards. All DOE 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 positive measures 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 NESRs. The general NESRs set forth in this paragraph are mandatory for all DOE nuclear explosive operations. Exemptions from these rules shall be approved in advance by the Assistant Secretary for Defense Programs (DP-1).

(a) Nuclear explosive operations shall not be performed until a NES Study or Survey is approved, and prestart recommendations have been closed.

(b) Operations on nuclear explosives or collocated main charge high-explosive and pit shall be performed in accordance with approved written procedures.

(c) Operations involving a nuclear explosive not known to be one-point safe shall be conducted only at the Nevada Test Site.

(d) Production plant operations shall not be started on a nuclear explosive until it is 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 offsite transportation with that nuclear explosive shall be discontinued. Before operations can be resumed with that nuclear explosive, a NES Study shall be conducted and approved.

(3) Supplemental NESRs. 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) NES Studies, Surveys, and Revalidations. The manager of the Operations Office responsible for a proposed nuclear explosive operation shall determine the type of independent nuclear explosive safety evaluation and shall convene the NESSG to evaluate the proposed operation. These

evaluations shall meet the requirements in DOE-STD-3015-97, Nuclear Explosive Safety Study Process, dated 1-97.

(a) A NES Study shall evaluate proposed operations to ensure that there are adequate positive measures to minimize the possibility of unintended nuclear detonation, high-explosive detonation or deflagration, or fire. NES Studies are valid for 5 years.

(b) A NES Survey may be conducted as necessary for a proposed nuclear explosive operation that is essentially the same as a previously studied and approved operation. NES Surveys are valid for 5 years.

(c) A NES Study Revalidation may be conducted to determine whether a nuclear explosive operation has significantly changed since the NES Study was approved. A NES Study may be revalidated for a maximum of 5 years, not to exceed 10 years from the date of the original approval.

(5) Personnel Assurance Program (PAP). Personnel assigned nuclear explosive duties shall meet the PAP requirements contained in Interim PAP Procedures and Standards.

(6) Two-Person Concept. The Two-Person Concept requires that a minimum of two authorized people shall be present during all nuclear explosive operations and during other operations designated by the Operations Office. Managers of the Operations Offices responsible for nuclear explosive operations shall 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 DOE PAP;

(b) have technical knowledge of the task being performed; and

(c) be knowledgeable of pertinent safety and security requirements.

(7) Reader Worker Procedure and Check-off. Reader worker procedures and check-off shall be used for those nuclear explosive operations specified by the cognizant Operations Office manager.

(8) Control of Electrical Testers/Equipment. Managers of Operations Offices responsible for nuclear explosive operations shall establish safety requirements for electrical testers/electrical equipment used in nuclear explosive areas (NEAs).

(a) Testers that introduce electrical energy into a nuclear explosive or high-explosive subassemblies in an NEA shall meet the following requirements as a minimum.

1 Each tester shall have independent safety characteristics that do not rely on the nuclear explosive's safety features.

2 A single-point failure within a tester shall not result in the application of unintended stimuli.

3 Testers shall use the lowest practical values of internal and output currents and voltages that will adequately perform their intended functions.

4 A comprehensive safety analysis shall be performed and documented for each electrical tester and its interface with a nuclear explosive or HE.

5 Procedures shall be established to control, store, maintain, calibrate, and operate testers.

6 Each model of electrical tester and its interface with a nuclear explosive or high explosive shall be evaluated by an NESSG.

7 Operations Offices shall establish and maintain a record of approved electrical testers.

8 Computer-controlled testers shall have positive measures 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 an NEA shall be evaluated in a NES Study.

(9) Offsite Transportation of Nuclear Explosives. The Manager, Albuquerque Operations Office, is responsible for all DOE offsite transportation of nuclear explosives in accordance with DOE 5610.14, TRANSPORTATION SAFEGUARDS SYSTEM PROGRAM OPERATIONS, dated 5-12-93. Offsite transportation operations begin when the loaded conveyance is closed and ends with the opening of the conveyance at its destination. The following requirements shall be met.

(a) Nuclear explosives shall not be transported offsite in the same conveyance with any other cargo.

(b) Nuclear explosives shall be transported offsite in safe-secure-trailers (SSTs) or other conveyances specifically reviewed and approved through the nuclear explosive safety study process. Nuclear explosive conveyances shall be validated as acceptable for conveying hazardous material in conformance with applicable Department of Transportation regulations.

(c) Nuclear explosives shall be transported and restrained in compliance with the general instructions of Technical Publication (TP) 35-51, General Instructions Applicable to Nuclear Weapons; the specific procedures, equipment descriptions, and restraint requirements specified in TP 45-51, Transportation of Nuclear Weapons Material, General Shipping and Limited Life Components, TP 45-51A, Transportation of Nuclear Weapons Material (Supplement), Shipping and Identification Data for Stockpile Major Assemblies, and TP 45-51D, Transportation of Nuclear Weapons Material (Supplement), Shipment by Safe-Secure-Trailer (SST); and TP 20-7, Nuclear Safety Criteria.

(10) Onsite Transportation of Nuclear Explosives. Managers of Operations Offices responsible for nuclear explosive operations shall establish requirements and procedures to ensure safe onsite transportation of nuclear explosives at their respective sites. Onsite transportation operations shall be reviewed and approved through the nuclear explosive safety study process.

(11) Nuclear Explosive-Like Assembly (NELA) Requirements.

(a) Technical criteria for NELA requirements shall be established and issued by the Manager, Albuquerque Operations Office, in coordination with Headquarters and the Nevada (NV) and Oakland (OAK) Operations Offices. These requirements shall support the following qualitative NELA Standards.

1 There shall be positive measures to minimize the possibility of accidental, inadvertent, or deliberate unauthorized assembly of a nuclear explosive in place of a NELA configuration.

2 There shall be positive measures to minimize the possibility of accidental, inadvertent, or deliberate unauthorized transfer of a nuclear explosive in place of a NELA configuration.

(b) Managers of Operations Offices responsible for NELA operations shall implement the NELA requirements.

(12) Marking Instructions. Marking nuclear explosives and NELAs is intended to provide a rapid and accurate method to distinguish between configurations capable of a nuclear detonation and those that are not.

(a) NELAs that are routinely assembled and disassembled for training, development, testing, evaluation, or demonstration purposes need not be permanently marked provided the NELA is not shipped offsite; however, temporary markings shall be applied.

(b) Permanent and temporary marking instructions shall be established and issued by the Manager, Albuquerque Operations Office. Managers of Operations Offices shall implement these marking instructions.

(13) Reporting Nuclear Explosive Occurrences. DOE O 232.1 and DOE M 232.1 provide requirements for categorizing and reporting nuclear explosive occurrences under Group 9, Nuclear Explosive Safety. The detailed classification for emergencies and the emergency responses to be taken are provided in DOE O 151.1. Additional guidance is provided in DOE G 452.2A-1A.

e. Process Design (Defense-in-Depth).

(1) Multiple layers of protection shall be used to prevent accidents and/or to mitigate the consequences of an accident. Configuration management shall be implemented to ensure that no changes are made that could adversely affect the safety of operations. A positive verification process shall be implemented to ensure use of correct equipment, qualified personnel, operationally ready facilities, and current procedures. Additional guidance is provided in DOE G 452.2A-1A.

(2) Equipment used in nuclear explosive operations (including tooling, mechanical equipment, and electrical equipment) shall be designed, fabricated, tested, and maintained to standards commensurate with the safety importance of the function to be performed. Existing Technical Standards may be adopted or new Standards developed, as appropriate, considering the unique application to nuclear explosive operations. Design criteria shall be maintained for tooling and equipment. Human factors requirements shall be included in the design criteria documentation.

(3) Requirements for selecting, training, and qualifying personnel involved with nuclear explosive operations and associated activities and for assuring their

continuing fitness for duty shall be applied as contained in this Order and the Interim PAP Procedures and Standards.

(4) Facilities in which nuclear explosive operations and associated activities are performed shall be operationally ready. Interfaces between those facilities and nuclear explosive operations shall be controlled. Appropriate preventive maintenance programs shall be established to ensure reliability of facility equipment.

(5) Procedures governing nuclear explosive operations and associated activities shall be developed, controlled, reviewed, and approved. Human factors shall be considered in the development of procedures. Procedures shall be written and formatted to facilitate the safe accomplishment of the task (e.g., cautions, hold points, illustrations).

(6) The configuration and condition of a nuclear explosive and its components shall be known or determined during any planned operation. In case of unknown conditions, appropriate contingency plans shall be available.

(7) Requirements and guidance appropriate for nuclear explosive operations contained in DOE M 440.1-1, DOE EXPLOSIVES SAFETY MANUAL, dated 9-30-95, shall be followed.

f. Internal Safety Reviews. DOE contractors and laboratories shall perform internal, objective, and independent safety reviews of nuclear explosive operations and associated activities. The safety review system shall include items of potential safety significance from the perspectives of both NES and ES&H. Additional guidance is provided in DOE G 452.2A-1A.

g. Readiness Reviews.

(1) Facility Readiness Reviews.

(a) Readiness reviews for facilities shall be performed in accordance with DOE 5480.31 or DOE O 425.1, STARTUP AND RESTART OF NUCLEAR FACILITIES, dated 9-29-95, and Operations Office implementing directives and procedures.

(b) Requirements for hazard category 2 nuclear facilities stated in DOE 5480.31 and DOE O 425.1 shall be used for this purpose.

(c) A facility readiness review is generally 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 Operation Readiness Reviews.

(a) A readiness review shall be performed for startup of a nuclear explosive operation, restarting an operation following a shutdown greater than one year, after a significant change to the operation, or after an unplanned shutdown due to significant safety concerns.

(b) Operations Offices shall develop and implement an operations readiness review process that addresses nuclear explosive operations. The process shall incorporate the attributes of facility readiness reviews from DOE 5480.31 or DOE O 425.1 by adopting appropriate requirements from the Orders. Requirements unique to nuclear explosive operations shall be specified. Additional guidance is provided in DOE G 452.2A-1A.

h. Occupational Safety and Health Program.

(1) Nuclear explosive operations and associated activities and facilities shall comply with DOE 5483.1A, OCCUPATIONAL SAFETY AND HEALTH PROGRAM FOR DOE CONTRACTOR EMPLOYEES AT GOVERNMENT-OWNED CONTRACTOR-OPERATED FACILITIES, dated 6-22-83; or DOE O 231.1, ENVIRONMENT, SAFETY, AND HEALTH REPORTING, dated 9-30-95; DOE O 440.1, WORKER PROTECTION MANAGEMENT FOR DOE FEDERAL AND CONTRACTOR EMPLOYEES, dated 9-30-95; DOE 5480.11, RADIATION PROTECTION FOR OCCUPATIONAL WORKERS, dated 6-17-92; 10 CFR Part 835, Occupational Radiation Protection; DOE N 441.1, RADIOLOGICAL PROTECTION FOR DOE ACTIVITIES, dated 9-30-95; and DOE M 440.1-1.

(2) Several references are being revised at this time. Until such time as all contractual documentation is adjusted to reflect changes in the DOE directives system, implementation plans should include the most current applicable directive(s) and an assessment of the possible impacts of anticipated changes from the specific reference used. When the word "or" is used, several references may apply; when the word "and" is used, the intent is that all references apply.

i. Exemptions.

(1) Exemptions shall be requested when release is sought from a requirement in this Order or in a referenced mandatory Manual or Standard. DOE M 251.1, DIRECTIVES SYSTEM MANUAL, dated 10-16-95, shall 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 Deputy Assistant Secretary for Military Application and Stockpile Management (DP-20) when the exemption would ensure adequate protection, but would not result in an equivalent level of safety. The Operations Office manager shall concur with these exemption requests and forward them to DP-20 for approval.

(c) DP-1 approves requests for exemption from general NESRs.

(2) Release from a requirement that has been adopted by reference into this Order shall be processed as relief from this Order and not from the referenced Order.

j. Implementation. 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 do 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; and

(4) identify those compensatory measures deemed necessary to provide for adequate protection during the period of noncompliance.

5. RESPONSIBILITIES.

a. Assistant Secretary for Defense Programs (DP-1).

(1) Ensures that safety programs are implemented.

(2) Adjudicates any appeals of the Operations Office manager's decisions to deny or revoke PAP certifications.

(3) Approves requests for exemptions from general NESRs.

(4) Authorizes sites for the assembly, disassembly, and storage of nuclear explosives.

b. Assistant Secretary for Environment, Safety and Health (EH-1) assists DP-1 in ES&H disciplines concerning the safety of nuclear explosive operations and associated activities and facilities.

c. Deputy Assistant Secretary for Military Application and Stockpile Management (DP-20).

(1) Approves NES Study Reports and resolves minority opinions.

(2) Approves revalidations of NES Study Reports.

(3) Approves administrative extensions to NES Studies.

(4) Approves exemptions to the requirements of this Order in accordance with the provisions of 4i, above.

(5) Evaluates reported nuclear explosive occurrences and corrective actions for safety implications.

(6) Interfaces with EH in the future development of ES&H Orders to ensure that the requirements are integrated with the requirements of DOE O 452.1A, NUCLEAR EXPLOSIVE AND WEAPON SURETY PROGRAM, dated 1-17-97, and that divergence does not occur.

d. Managers of Operations Offices.

(1) Ensure that responsibilities and authorities are clearly defined and delegated at appropriate management and supervisory levels.

(2) Authorize nuclear explosive operations in accordance with the requirements of this Order.

(3) Approve HARs.

(4) Integrate ES&H requirements into nuclear explosive operations and associated activities while maintaining appropriate focus on nuclear explosive safety.

(5) Approve NES Survey Reports.

(6) Designate PAP certifying officials.

(7) Approve exemptions to the requirements of this Order in accordance with the provisions of 4i, above.

6. REFERENCES.

a. DOE O 151.1, COMPREHENSIVE EMERGENCY MANAGEMENT SYSTEM, dated 9-25-95.

b. DOE O 210.1, PERFORMANCE INDICATORS AND ANALYSIS OF OPERATIONS INFORMATION, dated 9-27-95.

c. DOE O 231.1, ENVIRONMENT, SAFETY, AND HEALTH REPORTING, dated 9-30-95.

d. DOE O 232.1, OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION, dated 9-25-95.

e. DOE O 360.1, TRAINING, dated 5-31-95.

f. DOE O 420.1, FACILITY SAFETY, dated 10-13-95.

g. DOE O 425.1, STARTUP AND RESTART OF NUCLEAR FACILITIES, dated 9-29-95.

h. DOE O 440.1, WORKER PROTECTION MANAGEMENT FOR DOE FEDERAL AND CONTRACTOR EMPLOYEES, dated 9-30-95.

i. DOE O 452.1A, NUCLEAR EXPLOSIVE AND WEAPON SURETY PROGRAM, dated 1-17-97.

j. DOE G 452A-1A, IMPLEMENTATION GUIDE FOR USE WITH DOE O 452.2A, SAFETY OF NUCLEAR EXPLOSIVE OPERATIONS, dated 1-17-97.

k. DOE O 470.1, SAFEGUARDS AND SECURITY PROGRAM, dated 9-28-95.

l. DOE 4330.4B, MAINTENANCE MANAGEMENT PROGRAM, dated 2-10-94.

m. DOE 5480.11, RADIATION PROTECTION FOR OCCUPATIONAL WORKERS, dated 6-17-92.

n. DOE 5480.19, CONDUCT OF OPERATIONS REQUIREMENTS FOR DOE FACILITIES, dated 7-9-90.

o. DOE 5480.20A, PERSONNEL SELECTION, QUALIFICATION, AND TRAINING REQUIREMENTS FOR DOE NUCLEAR FACILITIES, dated 11-15-94.

p. DOE 5480.21, UNREVIEWED SAFETY QUESTIONS, dated 12-24-91.

q. DOE 5480.22, TECHNICAL SAFETY REQUIREMENTS, dated 2-25-92.

r. DOE 5480.23, NUCLEAR SAFETY ANALYSIS REPORTS, dated 4-10-92.

s. DOE 5480.24, NUCLEAR CRITICALITY SAFETY, dated 8-12-92.

t. DOE 5480.31, STARTUP AND RESTART OF NUCLEAR FACILITIES, dated 9-15-93.

u. DOE 5483.1A, OCCUPATIONAL SAFETY AND HEALTH PROGRAM FOR DOE CONTRACTOR EMPLOYEES AT GOVERNMENT-OWNED CONTRACTOR-OPERATED FACILITIES, dated 6-22-83.

v. DOE 5610.14, TRANSPORTATION SAFEGUARDS SYSTEM PROGRAM OPERATIONS, dated 5-12-93.

w. DOE P 450.4, SAFETY MANAGEMENT SYSTEM POLICY, dated 10-15-96.

x. DOE M 232.1-1, OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION, dated 9-25-95.

y. DOE M 251.1-1, DIRECTIVES SYSTEM MANUAL, dated 10-16-95.

z. DOE M 440.1-1, DOE EXPLOSIVES SAFETY MANUAL, dated 9-30-95.

aa. DOE N 441.1, RADIOLOGICAL PROTECTION FOR DOE ACTIVITIES, dated 9-30-95.

bb. DOE-STD-1048-92, Performance Indicators Guidance Document, dated 12-92.

cc. DOE-STD-1073-93, Guide for Operational Configuration Management Programs, dated 11-93.

dd. DOE-STD-3009-94, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports, dated 7-94.

ee. DOE-STD-3015-97, Nuclear Explosive Safety Study Process, dated 1-97.

ff. DOE-DP-STD-XXXX-96, Preparation Guide for U.S. Department of Energy Hazard Analysis Reports for Nuclear Explosive Operations, TBD.

gg. Interim Personnel Assurance Program Procedures and Standards, published on 10-02-96.

hh. 10 CFR Part 830, Nuclear Safety Management, Section 120, "Quality Assurance Requirements."

ii. 10 CFR Part 835, Occupational Radiation Protection.

jj. G-830.120, Implementation Guide for use with 10 CFR Part 830.120, Quality Assurance, dated 4-15-94.

kk. Joint Department of Energy/Department of Defense (DOE/DoD) Technical Publication 20-7, Nuclear Safety Criteria, dated 9-1-86.

ll. Joint DOE/DoD Technical Publication 35-51, General Instructions Applicable to Nuclear Weapons, dated 11-27-89.

mm. Joint DOE/DoD Technical Publication 45-51, Transportation of Nuclear Weapons Material, General Shipping and Limited Life Components (LLC), dated 3-16-84.

oo. Joint DOE/DoD Technical Publication 45-51A, Transportation of Nuclear Weapons Material (Supplement), Shipping and Identification Data for Stockpile Major Assemblies, dated 2-1-80.

pp. Joint DOE/DoD Technical Publication 45-51D, Transportation of Nuclear Weapons Material (Supplement), Shipment by Safe-Secure-Trailer (SST), dated 7-14-89.

7. CONTACT. DP-20, Office of Weapons Surety (DP-21), 301-903-3463.

DEFINITIONS

This attachment provides the definitions pertinent to DOE O 452.2A.

1. Access. The proximity to a nuclear explosive that affords a person the opportunity to tamper with it or to cause a detonation.

2. Certified Personnel (for nuclear explosive duties). Operations personnel who are current with respect to Personnel Assurance Program (PAP) certification and the training and qualification program for the specific nuclear explosive operation to which they are assigned.

3. Custody. Responsibility for control of and access to nuclear explosives.

4. 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.

5. 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.

6. 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.

7. 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.

8. Facility. Any equipment, structure, system, process, or activity that fulfills a specific purpose.

9. Fissile Material Contamination. Release of fissile material in excess of that controlled and monitored by DOE radiological protection programs.

10. Fissile Material Dispersal. The aerosolization and transport of fissile material by a driving force, such as fire, high-explosive deflagration, or high-explosive detonation.

11. Graded Approach. A process by which the level of analysis, documentation, and actions necessary to comply with a requirement in this Order are commensurate with the relative importance to safety and the magnitude of any hazard involved.

12. 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.

13. Hazard Analysis Report (HAR). 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.

14. High-Explosive Deflagration. A rapid chemical reaction in which the output of heat is sufficient for 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.

15. 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.

16. Main Charge. The high explosive whose explosive energy implodes the pit.

17. 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).

18. 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).

19. Nuclear Explosive Area (NEA). Any area that contains a nuclear explosive or collocated pit and main charge high-explosive parts.

20. Nuclear Explosive Duty. Work assignments that allow custody of a nuclear explosive or access to a nuclear explosive area.

21. Nuclear Explosive Hazards Assessment (NEHA). A systematic evaluation of hazards that could lead to a nuclear detonation, high-explosive detonation or deflagration, or fire in nuclear explosive areas.

22. Nuclear Explosive-Like Assembly (NELA). An assembly that is not a nuclear explosive but that 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 which represents a weaponized nuclear explosive such as a warhead, bomb, reentry vehicle, or artillery shell. A NELA does not contain an arrangement of high-explosive and fissile material capable of producing a nuclear detonation.

23. Nuclear Explosive Operation. Any activity involving a nuclear explosive, including activities in which main charge high-explosive parts and pit are collocated.

24. 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.

25. 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.

26. Nuclear Explosive Safety Rules (NESRs). Safety limits, operating limits, surveillance requirements, safety boundaries, and management and administrative controls that significantly contribute to minimizing the possibility of nuclear detonation, high-explosive detonation or deflagration, or fire in nuclear explosive operations.

27. Nuclear Explosive Safety Study. A formal evaluation of the adequacy of positive measures to meet the DOE Nuclear Explosive Safety Standards.

28. Nuclear Explosive Safety Study Revalidation. A formal evaluation to determine whether a nuclear explosive operation has significantly changed since its Nuclear Explosive Safety Study was approved.

29. Nuclear Explosive Safety Survey. A formal nuclear explosive safety evaluation based on a comparative analysis of the operation with the nuclear explosive operation evaluated in a current and approved Nuclear Explosive Safety Study Report.

30. Nuclear Weapon. A nuclear explosive configured for DoD use.

31. 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.

32. Operational Safety Controls (OSCs). Safety limits, operating limits, surveillance requirements, safety boundaries, and management and administrative controls that significantly contribute to protecting workers, the public, and the environment from hazards other than nuclear detonation, high-explosive detonation and deflagration, and fire (which are addressed by Nuclear Explosive Safety Rules) for specific nuclear explosive operations and associated activities.

33. 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.

34. Personnel Assurance Program (PAP). 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.

35. 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.

36. 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 to 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.

37. Reader Worker Procedure and Check-Off. 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. Readiness Review. A disciplined, systematic, documented, performance-based examination of facilities, equipment, personnel, procedures, and management control systems to ensure that a facility will be operated within its approved safety envelope as defined by the facility safety basis.

39. 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.

40. Safety Analysis. A documented process to: (1) provide systematic identification of hazards within facilities in which nuclear explosive operations and associated activities are conducted and within specific nuclear explosive operations and associated activities; (2) describe and analyze the adequacy of measures taken to eliminate, control, or mitigate identified hazards; and (3) analyze and evaluate potential accidents and their associated risks.

41. Safety Analysis Report (SAR). 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.

42. Safety Basis. The collection of information related to controlling the hazards of an operation used to determine that operations can be conducted safely within the facility.

43. Safety-Class Structures, Systems, and Components (safety-class SSCs). Structures, systems, or components including primary environmental monitors and portions of process

systems, whose failure could adversely affect the environment or safety and health of the public as identified by safety analyses.

44. Safety Critical Equipment. Any equipment that upon failure may cause a significant safety vulnerability.

45. Safety Significant Structures, Systems and Components (safety- significant SSCs). Structures, systems, and components not designated as safety-class SSCs but whose preventive or mitigative function is a major contributor to defense-in-depth (i.e., prevention of uncontrolled material releases) and/or worker safety as determined from hazard analysis.

46. Significant Safety Incident. An incident that results in serious injury or abnormal radiation exposure to personnel, initiation of any explosive or pyrotechnic, rupture of a high-pressure vessel, or abnormal release of radiological contamination. This list is not meant to be all inclusive; reasonable judgment is expected.

47. Technical Safety Requirements (TSR). Those requirements that define the conditions, the safe boundaries, and the management or administrative controls necessary to ensure the safe operation of a nuclear facility and to reduce the potential risk to the public and facility workers from uncontrolled releases of radioactive materials or from radiation exposures due to inadvertent criticality. TSRs consist of safety limits, operating limits (limiting condition for operation and limiting control setting), surveillance requirements, administrative controls, use and application instructions, and the basis thereof. TSRs were formerly known as "operational safety requirements" for nonreactor nuclear facilities and "technical specifications" for reactor facilities.

48. Temporary Marking. A nondurable marking method on an external area, attached to an assembly, or otherwise marked, indicating the configuration of a nuclear explosive-like assembly.

49. 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).