DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
1. PURPOSE. This Department of Energy (DOE) Order establishes requirements to implement the nuclear explosive safety (NES) elements of DOE O 452.1D, *Nuclear Explosive and Weapon Surety Program*, for routine and planned nuclear explosive operations (NEOs).	1. PURPOSE. This Department of Energy (DOE) Order establishes requirements to implement the nuclear explosive safety (NES) elements of DOE O 452.1E, *Nuclear Explosive and Weapon Surety Program*, for routine and planned nuclear explosive operations (NEOs).	
2. CANCELLATION. DOE O 452.2C, *Nuclear Explosive Safety*, dated 06-12-06. Cancellation of a directive does not, by itself, modify or otherwise affect any contractual obligation to comply with the directive. Contractor requirements documents (CRDs) that have been incorporated into or attached to a contract remain in effect until the contract is modified to either eliminate requirements that are no longer applicable or substitute a new set of requirements.	2. CANCELLATION. DOE O 452.2D, *Nuclear Explosive Safety*, dated 4-14-09 and DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, dated 4-14-09. Cancellation of a directive does not, by itself, modify or otherwise affect any contractual obligation to comply with the directive. Contractor requirements documents (CRDs) that have been incorporated into or attached to a contract remain in effect until the contract is modified to either eliminate requirements that are no longer applicable or substitute a new set of requirements.	
3. APPLICABILITY.	*No change from DOE O 452.2D.*	
a. Departmental Elements. Except for the exclusion in paragraph 3c, this Order applies to all those Departmental elements that are involved in performing, managing, overseeing, or directly supporting NEOs or associated activities, including those created after the Order is issued. (Go to http://www.directives.doe.gov/pdfs/reftools/org-list.pdf for the most current listing of Departmental elements.) The Administrator will ensure that NNSA employees and contractors comply with their respective responsibilities under this Order. Nothing in this Order shall be construed to interfere with the NNSA Administrator's authority under section 3212(d) of Public Law (P.L.) 106-65 to establish Administration-specific policies, unless disapproved by the Secretary.	*No change from DOE O 452.2D.*	
b. DOE Contractors. (1) Except for the exclusions in paragraph 3c, the Contractor Requirements Document (CRD), Attachment 1, sets forth requirements of this Order that will apply to contracts that include the CRD. (2) This CRD must be included in all contracts that involve performing, managing, overseeing, or directly supporting NEOs or associated activities. (3) Site office managers are responsible for notifying contracting	b. DOE Contractors. (1) Except for the exclusions in paragraph 3c, the Contractor Requirements Document (CRD), Attachment 1, sets forth requirements of this Order that will apply to contracts that include the CRD. (2) This CRD must be included in all contracts that involve performing, managing, overseeing, or directly supporting NEOs or associated activities.	

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officers of which contracts are affected. Once notified, contracting officers are responsible for incorporating the CRD into each affected contract.	(3) Attachments 2 through 5 apply to both federal and contractor employees. These attachments must be included along with the CRD in all contracts that involve performing, managing, overseeing, or directly supporting NEOs or associated activities. (4) NNSA Field Element managers are responsible for notifying contracting officers of which contracts are affected. Once notified, contracting officers are responsible for incorporating the CRD and Attachments 2 through 5 into each affected contract.	

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c. Exclusions. (1) This Order does not apply to unplanned events. DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*, dated 8-19-03, provides requirements for categorizing and reporting non-emergency NES occurrences. DOE O 151.1C, *Comprehensive Emergency Management*, dated 11-02-05, provides requirements for categorizing and reporting emergency NES occurrences. The senior energy official, or higher authority, will determine when to transition from emergency management directives to this Order. (2) The following Departmental elements are excluded: Office of the Chief Financial Officer, Office of the Chief Information Officer, Office of Civilian Radioactive Waste Management, Office of Congressional and Intergovernmental Affairs, Office of Economic Impact and Diversity, Energy Information Administration, Office of Electricity Delivery and Energy Reliability, Office of Energy Efficiency and Renewable Energy, Office of Environmental Management, Office of Fossil Energy, Office of Hearings and Appeals, Office of Human Capital Management, Office of Intelligence and Counterintelligence, Office of Legacy Management, Office of Management, Office of Nuclear Energy, Office of Policy and International Affairs, Office of Public Affairs, Office of Science, Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, and Western Area Power Administration. (3) In accordance with the responsibilities and authorities assigned by Executive Order 12344, codified at 50 USC sections 2406 and 2511 and to ensure consistency through the joint Navy/DOE Naval Nuclear Propulsion Program, the Deputy Administrator for Naval Reactors (Director) will implement and oversee requirements and practices pertaining to this Directive for activities under the Director's cognizance, as deemed appropriate.	c. Exclusions. (1) This Order does not apply to unscheduled events such as those requiring Accident Response Group action. DOE O 151.1C, *Comprehensive Emergency Management*, dated 11-02-05, addresses emergency NES occurrences. The senior energy official, or higher authority, will determine when to transition from emergency management directives to this Order. (2) The following Departmental elements are excluded: Office of the Chief Financial Officer, Office of the Chief Information Officer, Office of Civilian Radioactive Waste Management, Office of Congressional and Intergovernmental Affairs, Office of Economic Impact and Diversity, Energy Information Administration, Office of Electricity Delivery and Energy Reliability, Office of Energy Efficiency and Renewable Energy, Office of Environmental Management, Office of Fossil Energy, Office of Hearings and Appeals, Office of Human Capital Management, Office of Intelligence and Counterintelligence, Office of Legacy Management, Office of Management, Office of Nuclear Energy, Office of Policy and International Affairs, Office of Public Affairs, Office of Science, Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, and Western Area Power Administration. (3) In accordance with the responsibilities and authorities assigned by Executive Order 12344, codified at 50 USC sections 2406 and 2511 and to ensure consistency through the joint Navy/DOE Naval Nuclear Propulsion Program, the Deputy Administrator for Naval Reactors (Director) will implement and oversee requirements and practices pertaining to this Directive for activities under the Director's cognizance, as deemed appropriate.	
4. REQUIREMENTS	*No change from DOE O 452.2D.*	

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a. Nuclear Explosive Safety Program. NEOs require special consideration because of the potentially unacceptable consequences of an accident or unauthorized act. The NES program outlined in this section supports the requirement that NEOs must be designed and conducted in a manner that meets the NES Standards of DOE O 452.1D or successor directive. It includes the following: NES Rules (general and supplemental NESRs), formal NES evaluations, fundamental NEO process requirements (procedures, facilities, equipment, and people), requirements for onsite and offsite transportation (mobile NEOs), sustaining requirements (positive verification, change control and configuration management), requirements for nuclear explosive-like assemblies (NELAs), and permanent marking of nuclear explosives and NELAs.	a. Nuclear Explosive Safety Program. NEOs require special consideration because of the potentially unacceptable consequences of an accident or unauthorized act. The NES program outlined in this section supports the requirement that NEOs must be designed and conducted in a manner that meets the NES Standards of DOE O 452.1E or successor directive. It includes the following: NES Rules (general and supplemental NESRs), formal NES evaluations, fundamental NEO process requirements (procedures, facilities, equipment, and people), requirements for onsite and offsite transportation (mobile NEOs), sustaining requirements (positive verification, change control and configuration management), requirements for nuclear explosive-like assemblies (NELAs), and permanent marking of nuclear explosives and NELAs.	
(1) General Nuclear Explosive Safety Rules (NESRs). The general NESRs set forth in this paragraph are mandatory for all NEOs.	*No change from DOE O 452.2D.*	
(a) Nuclear Explosive Safety Evaluation. NEOs must not be performed until a NES study (NESS) has been conducted, the NESS has been approved, and approved pre-start findings have been closed.	(a) Nuclear Explosive Safety Evaluation. NEOs must not be performed until a NES evaluation has been completed and findings for which a NES standard has not been met have been closed.	
(b) Nuclear Explosive Operating Procedures. NEOs must be performed in accordance with approved written procedures.	*No change from DOE O 452.2D.*	

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(c) One-Point Safety.	(c) One-Point Safety.	Revised and renumbered. Added new 1. DOE O 452.1 defines one point safety in reference to a nuclear weapon delivered to DoD. Section added here to cover the definition gap.
1 NEOs involving a nuclear explosive not certified to be one-point safe must be conducted only at Nevada Test Site (NTS), except as authorized in accordance with paragraph 4a(1)(c)2, below.	1 The probability of achieving a nuclear yield greater than 4 pound of TNT equivalent in the event of a one-point initiation of the nuclear explosive's high explosive must not exceed one in a million (1E-06).	
2 If it is determined that a nuclear explosive no longer meets the one-point safety criteria, all assembly/disassembly production plant operations (including onsite transportation) and offsite transportation with that nuclear explosive must be discontinued in a safe manner. Before operations with that nuclear explosive can be resumed, a path forward must be developed, a NES evaluation must be conducted, the NES evaluation report must be approved, and approved pre-start findings must be closed.	2 Tooling and equipment must be evaluated to ensure that their use does not cause a one-point safety violation of a nuclear explosive certified to be one-point safe.	
3 Tooling and equipment must be evaluated as required to ensure that their use does not cause a one-point safety violation of a nuclear explosive certified to be one-point safe.	3 If it is determined that a nuclear explosive no longer meets the one-point safety criteria, all assembly/disassembly production plant operations (including onsite transportation) and offsite transportation with that nuclear explosive must be discontinued in a safe manner. Before operations with that nuclear explosive can be resumed, a path forward must be developed, a NES evaluation must be completed and findings for which a NES standard has not been met must be closed.	
	4 NEOs involving a nuclear explosive not certified to be one-point safe must be conducted at the Nevada National Security Site (NNSS), except as authorized in accordance with paragraph 4a(1)(c)2, above.	

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(d) Nuclear Explosive Areas (NEAs). 1 Authorized energy sources must be identified and documented. Unauthorized energy sources must not be available in an NEA during NEOs. 2 Ignition sources in NEAs must be identified and eliminated or minimized and controlled to prevent adverse interaction with combustible/flammable materials and the nuclear explosive. 3 Combustible and flammable materials in NEAs must be identified and eliminated or minimized and controlled to prevent adverse interaction with the nuclear explosive.	(d) Nuclear Explosive Areas (NEAs). 1 Authorized energy sources must be identified and documented. Unauthorized energy sources must not be available in an NEA during NEOs. 2 Ignition sources in NEAs must be identified and eliminated or reasonably minimized and controlled to prevent adverse interaction with combustible/flammable materials and the nuclear explosive. 3 Combustible and flammable materials in NEAs must be identified and eliminated or reasonably minimized and controlled to prevent adverse interaction with the nuclear explosive.	Revised.
(e) Electrical Testing. Except as authorized in accordance with paragraph 4a(1)(f), Anomalous Units, nuclear explosives must not be subjected to— 1 redundant electrical tests or 2 electrical troubleshooting (i.e., to confirm the existence of a fault or aid in fault isolation) except with authorized test equipment and procedures that have been subjected to a NES evaluation and found to be acceptable for the specific application.	*No change from DOE O 452.2D.*	

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(f) Anomalous Units. 1 If it is determined that a nuclear explosive is no longer in a condition covered by a NES evaluation, all operations with that nuclear explosive and in the associated facility must be discontinued in a safe manner, resulting in a safe and stable nuclear explosive configuration. 2 Before operations with the anomalous unit can be resumed, a design agency special instruction engineering release (SIER) must be developed, and the NEO change control process must be completed in accordance with paragraph 4a(13). a The responsible design agencies must specifically review the SIER for impact on NES. b Transportation operations, if applicable, must be specifically addressed in the SIER, and offsite transportation operations are subject to the Office of Secure Transportation (OST) NEO change control process. 3 A decision to resume other activities in the facility must include consideration of possible interactions with the anomalous unit.	(f) Anomalous Units. 1 If it is determined that a nuclear explosive is no longer in a condition covered by a NES evaluation, all operations with that nuclear explosive and in the associated facility must be discontinued in a safe manner, resulting in a safe and stable nuclear explosive configuration. 2 Restart of operations on the anomalous unit and other activities in the affected facility must be in accordance with paragraph 4a(15) below.	Additional instruction with respect to the SIER have been removed here, but are located in Section 4a(15).
(2) Supplemental Nuclear Explosive Safety Rules. Supplemental NESRs may be developed as needed to support specific tests, operations, or characteristics of a nuclear explosive.	*No change from DOE O 452.2D.*	

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(3) Nuclear Explosive Safety Evaluations. NES evaluations are required before a NEO is authorized; periodically for ongoing NEOs; and when proposed changes or emerging information affect an approved NEO. NES evaluations must be performed in accordance with DOE M 452.2-2, Nuclear Explosive Safety Evaluation Processes, or successor directive.	(3) Nuclear Explosive Safety Evaluations. NES evaluations are required before a NEO is authorized; periodically for ongoing NEOs; and when proposed changes or emerging information affect an approved NEO. NES evaluations must be performed in accordance with NA SD 452.2, *Nuclear Explosive Safety Evaluation Processes*, or successor directive.	Revised.
	(4) Human Factors. Human factors principles must be incorporated into NEO procedures, processes, facilities, tooling and equipment, including Category 1 electrical equipment, starting with the NEO design and development phase and maintained throughout the lifecycle of NEOs. Given the human-centric nature of NEOs, human factors principles provide the basic foundation to ensure that NEOs are designed and conducted in a manner that meets human usability guidelines as well as the NES standards of DOE O 452.1E. NEOs shall apply established research in human factors and ergonomics.	Added.
(4) Procedures. Written procedures (paper or electronic) control the interactions among the nuclear explosive, the operating facility, equipment, and personnel.	(5) Procedures. Written procedures (paper or electronic) control the interactions among the nuclear explosive, the operating facility, equipment, and personnel.	Renumbered.
(a) Design agencies must review and concur with original issues of procedures for NEOs and associated activities.	*No change from DOE O 452.2D.*	

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(b) All written procedures for NEOs must place proper emphasis on preventing accidents and detecting abnormal conditions by accomplishing the following. 1 Comply with design specifications and technical requirements. 2 Clearly state cautions and warnings. 3 Identify appropriate points to interrupt work safely. 4 Include generic contingency procedures directed toward quickly achieving a safe and stable nuclear explosive configuration to be applied in response to all unexpected situations not covered by other written procedures. 5 Incorporate human factors considerations	*No change from DOE O 452.2D.*	
(5) Two-Person Concept. DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, requires organizations responsible for NEOs and associated activities and facilities to establish and implement the two-person concept.	(6) Two-Person Concept. Organizations responsible for NEOs and associated activities and facilities must establish and implement the two-person concept as specified in Attachment 2 of this Order.	Revised and renumbered.
(6) Facilities. Facilities used for nuclear explosive operations must be characterized, evaluated, and specifically approved for that use.	(7) Facilities. Facilities used for nuclear explosive operations must be characterized, evaluated, and specifically approved for that use.	Renumbered.

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(7) Equipment. Organizations responsible for NEOs and associated activities and facilities must verify that all equipment used in NEOs (including tooling, testers, and other mechanical and electrical equipment) meet the following requirements. DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive, specifies additional requirements for electrical equipment used in NEAs.	(8) Equipment. Organizations responsible for NEOs and associated activities and facilities must verify that all equipment used in NEAs (including tooling, testers, and other mechanical and electrical equipment) meet the following requirements. Attachment 3 of this Order specifies additional requirements for electrical equipment used in NEAs.	Revised and renumbered.
a) Design specifications and technical requirements must be documented. b) Designs must ensure nuclear explosives will remain in a safe condition should a system or component of the tool/equipment fail. c) Each item used in an NEO must be specifically approved for that operation. Unapproved movable items must be excluded from the NEA. Positive measures must be used to preclude use of facility equipment that is not approved for the NEO and impracticable to remove. d) Equipment intended to apply energy to a nuclear explosive must incorporate features that limit energy to a known safe level.	(a) Design specifications and technical requirements must be documented. (b) Designs must ensure nuclear explosives will remain in a safe condition should a system or component of the tool/equipment fail. (c) Each item used in an NEO must be specifically approved for that operation. Unapproved movable items must be excluded from the NEA. Positive measures must be used to preclude use of facility equipment that is not approved for the NEO and impracticable to remove. (d) Equipment intended to apply energy to a nuclear explosive must incorporate features that limit application of energy to a known safe level. (e) Energetic equipment intended for use in NEAs by emergency responders (e.g., fire department personnel, security force, radiological protection) must be evaluated and characterized with respect to potential hazards.	Revised (d) and added (e).

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(8) Maintenance of Facilities, Tooling, and Other Equipment. Organizations responsible for NEOs and associated activities and facilities must review maintenance programs and activities for impact on NES. Maintenance implementation plans must include a detailed description of maintenance activity control and approval, including limitations on materials that are allowed in NEAs.	(9) Maintenance of Facilities, Tooling, and Other Equipment. Organizations responsible for NEOs and associated activities and facilities must review maintenance programs and activities for impact on NES. Maintenance implementation plans must include a detailed description of maintenance activity control and approval, including limitations on materials that are allowed in NEAs.	Renumbered.
(9) Personnel. Each organization responsible for and/or involved in NEOs and associated activities must implement training, qualification, and certification programs for personnel that manage, oversee, perform, or directly support these operations and activities. In addition to the requirements in 10 CFR Part 712, *Human Reliability Program*, and DOE O 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, annual training for personnel assigned to nuclear explosive duty must include the following NES-specific topics.	(10) Personnel. Each organization responsible for and/or involved in NEOs and associated activities must implement training, qualification, and certification programs for personnel that manage, oversee, perform, or directly support these operations and activities. In addition to the requirements in 10 CFR Part 712, *Human Reliability Program*, and DOE O 426.2 Chg 1, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, annual training for personnel assigned to nuclear explosive duty must include the following NES-specific topics.	Revised and renumbered.
(a) Responsibilities associated with custody of nuclear explosives. (b) Use of general and supplemental NESRs, site/facility and program-specific Technical Safety Requirements, and other controls associated with NEOs. (c) The purpose, objective, and responsibilities of the two-person concept for operations. (d) Explosive safety appropriate for assigned responsibilities.	(a) Responsibilities associated with custody of nuclear explosives. (b) Use of general and supplemental NESRs, site/facility and program-specific safety requirements, and other controls associated with NEOs. (c) The purpose, objective, and responsibilities of the two-person concept for operations. (d) Explosive safety appropriate for assigned responsibilities.	Revised (b).

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(10) Transportation of Nuclear Explosives.	(11) Transportation of Nuclear Explosives. Nuclear explosive transportation is a mobile NEO and involves a mobile NEA. Requirements specified for NEOs and NEAs elsewhere in this Order apply.	Revised and renumbered.
(a) Organizations responsible for NEOs and associated activities and facilities must establish requirements and procedures to ensure safe onsite transportation of nuclear explosives.	*No change from DOE O 452.2D.*	
(b) Offsite transportation of nuclear explosives is performed by OST and begins when the loaded conveyance is closed and ends with the opening of the conveyance at its destination.	*No change from DOE O 452.2D.*	
(c) Transportation operations and shipping configurations, including all items in the conveyance, are subject to the NES evaluation requirements of paragraph 4a(1)(a) and 4a(3). 1 Nuclear explosives must be transported in conveyances specifically reviewed and approved through the NES evaluation process. 2 Criteria must be established for protecting nuclear explosives during transportation. The criteria and tie-down designs for specific nuclear explosive configurations must be reviewed and approved through the NES evaluation process.	(b) Transportation operations and shipping configurations, including all items in the conveyance, are subject to the NES evaluation requirements of paragraph 4a(1)(a) and 4a(3). 1 Nuclear explosives must be transported in conveyances specifically reviewed and approved through the NES evaluation process. 2 Criteria must be established for protecting nuclear explosives during transportation. The criteria and restraint designs for specific nuclear explosive configurations must be reviewed and approved through the NES evaluation process.	Revised 2 ("tie-down" changed to "restraint").

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(11) Mixed Venues. Nuclear explosives must not be transported or staged with any other assembly that could be mistaken for a nuclear explosive.	(12) Mixed Venues. Nuclear explosives must not be transported or staged with any other assembly that could be mistaken for a nuclear explosive. Exception: Nuclear explosives and NELAs may be collocated in Pantex radiography and vacuum chamber bays, provided that operations comply with the NELA standards in paragraph 4.a.(17) and have been evaluated by a NESSG.	Revised and renumbered. Added exception.
(12) Positive Verification. (a) Organizations responsible for NEOs and associated activities and facilities must develop and implement a verification process to ensure use of qualified personnel who are fit for duty, operationally ready facilities, correct equipment that is current in any required calibration and preventive maintenance, and current approved procedures. (b) The configuration and condition of a nuclear explosive and its safety features must be known or determined as early as practical during any planned NEO.	*No change from DOE O 452.2D.*	
(13) Change Control. Organizations responsible for NEOs and associated activities and facilities must establish and implement a NES change evaluation process in accordance with DOE M 452.2-2, *Nuclear Explosive Safety Evaluation Processes*, or successor directive. This NES evaluation is separate and independent from the unreviewed safety question process required by 10 CFR Part 830, *Nuclear Safety Management*, and must be completed before approval and implementation of the change. All proposed changes to authorized NEOs, including the following, are subject to the NEO change control process.	(14) Change Control. Organizations responsible for NEOs and associated activities and facilities must establish and implement a NES change evaluation process in accordance with NA SD 452.2, *Nuclear Explosive Safety Evaluation Processes*, or successor directive. This NES evaluation is separate and independent from the unreviewed safety question process required by 10 CFR Part 830, *Nuclear Safety Management*, and must be completed before approval and implementation of the change. All proposed changes to authorized NEOs, including the following, are subject to the NEO change control process.	Revised and renumbered.

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(a) Proposals that may have direct NES implications (e.g., procedural, equipment, or facility changes to an approved NEO). (b) Proposals that may have indirect NES implications (e.g., changes or new activities that could impact the foundation established by previous NES Master Studies).	*No change from DOE O 452.2D.*	
(c) Changes in knowledge affecting an approved NEO (e.g., new understanding of a potential threat to NES or new data regarding the response of a nuclear explosive to a stimulus).	*No change from DOE O 452.2D.*	

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	(15) Anomalous Unit Determination and Processing. An anomalous unit might be created or discovered in the course of NEOs performed by NNSA or its contractors, or might be received from DoD in a known anomalous condition. The OST NEO change control process must ensure anomalous units accepted for transport are safe to ship and that any special handling, receiving, or staging requirements are known and accepted in advance by the receiving organization. The following apply to anomalous units at the production agency. (a) The production agency Process Engineer, production agency NES representative, and design agency System Engineer collectively have the authority to declare a unit anomalous. A unit in question is treated as an anomalous unit unless there is unanimous agreement otherwise among the three. (b) Before operations with the anomalous unit can be resumed, the NEO change control process must be completed in accordance with paragraph 4a(14). A design agency engineering release (e.g., SIER, IER, or SXR, as appropriate) must be developed as input to the change control process. 1 The responsible design agencies must specifically review the engineering release for impact on NES. A NESSG-certified member from the design agency must be involved in the review. This review must be documented in the engineering release. 2 Transportation operations, if applicable, must be specifically addressed in the engineering release. Offsite transportation operations are subject to the Office of Secure Transportation (OST) NEO change control process.	Added and moved from previous Section 4.a.(1)(f).
(14) Configuration Management.	(16) Configuration Management.	Renumbered.

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(a)	Organizations responsible for NEOs and associated activities and facilities must develop and implement a configuration management program incorporating elements applicable to NEOs and associated activities and facilities.	*No change from DOE O 452.2D.*	
(b)	To ensure consistency with design requirements and the safety basis, the configuration management program must specifically include the following:	*No change from DOE O 452.2D.*	
1	control of the physical configuration of a nuclear explosive and its components; the tooling, equipment, and procedures used in NEOs and associated activities; and the interface with the facilities in which these operations and activities are conducted;		
2	unique identification of special tooling and equipment used in NEOs;		
3	positive identification of tooling and equipment requiring calibration/testing within a calibration/testing control program; and		
4	incorporation of approved changes into all affected documents (including design documents, drawings, procedures, and safety basis documents) and programs (including maintenance and training).		
(15)	Nuclear Explosive-Like Assemblies (NELAs).	(17) Nuclear Explosive-Like Assemblies (NELAs).	Renumbered.

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(a) Nuclear Explosive-Like Assembly Standards. All NELA operations must meet the following qualitative NELA standards. 1 There must be controls to minimize the possibility of accidental/inadvertent, or deliberate unauthorized assembly of a nuclear explosive in place of a NELA configuration. 2 There must be controls to minimize the possibility of accidental/inadvertent, or deliberate unauthorized transfer of a nuclear explosive in place of a NELA configuration.	(a) Nuclear Explosive-Like Assembly Standards. All NELA operations must meet the following qualitative NELA standards. 1 There must be positive measures to prevent accidental/inadvertent, or deliberate unauthorized assembly of a nuclear explosive in place of a NELA configuration. 2 There must be positive measures to prevent accidental/inadvertent, or deliberate unauthorized transfer of a nuclear explosive in place of a NELA configuration. In the context of these NELA Standards, the term "prevent" is applied as described for the Nuclear Explosive Surety Standards in DOE O 452.1E.	Changed "controls" to "positive measures". Added last paragraph.
(b) Nuclear Explosive-Like Assembly Requirements. Organizations responsible for NELA operations must implement the NELA requirements in accordance with DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive.	(b) Nuclear Explosive-Like Assembly Requirements. Organizations responsible for NELA operations must implement the NELA requirements in Attachment 4 of this Order.	Revised.
(16) Marking Instructions. Nuclear explosives and NELAs must be marked to distinguish configurations capable of a nuclear detonation from those that are not. Organizations responsible for NEOs or NELA operations must implement marking requirements in accordance with DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive.	(18) Marking Instructions. Nuclear explosives and NELAs must be marked to distinguish configurations capable of a nuclear detonation from those that are not. Organizations responsible for NEOs or NELA operations must implement the marking requirements in Attachment 5 of this Order.	Revised and renumbered.

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b. Independent Oversight. The Associate Administrator for Safety and Health executes independent oversight of the implementation of this Order and associated Manuals by NNSA personnel. This oversight may be carried out through execution of NNSA NES evaluations, independent assessments, or other appropriate mechanisms. On an annual basis, the Office of the Associate Administrator for Safety and Health will summarize its oversight activities, along with any recommendations for changes in the NES program in a report to the NNSA Deputy Administrator for Defense Programs and the Assistant Deputy Administrator for Stockpile Management. A copy of this report will be provided to the NNSA CTA and CDNS for information.	*No change from DOE O 452.2D.*	
c. Exemptions. Exemptions must be requested when release is sought from a requirement in this Order, DOE M 452.2-1A or DOE M 452.2-2, or their successor directives. The exemption process is outlined in DOE O 251.1C, *Departmental Directives Program*, dated 1-15-09, or successor directive. The approval authority is the Deputy Administrator for Defense Programs with concurrence from the Central Technical Authority.	c. Exemptions. Exemptions must be requested when release is sought from a requirement in this Order or successor directives. The exemption process is outlined in DOE O 251.1C, *Departmental Directives Program*, dated 1-15-09, or successor directive. The approval authority is the Deputy Administrator for Defense Programs with concurrence from the Central Technical Authority.	Revised.
d. Records. Records (documentation) must be maintained in accordance with National Archives and Records Administration-approved DOE or site-specific records retention and disposition schedules in accordance with DOE O 243.1, *Records Management Program*, dated 2-3-06.	d. Records. Records (documentation) must be maintained in accordance with National Archives and Records Administration-approved DOE or site-specific records retention and disposition schedules in accordance with DOE O 243.1B Chg 1, *Records Management Program*, dated 07-08-13.	Revised.
e. Implementation. This revision involves administrative or programmatic changes from the previous directive, DOE O 452.2C, and an implementation plan is required. This revision is effective upon issuance.	e. Implementation. This revision does not involve substantive administrative or programmatic changes from the previous directives, DOE O 452.2D and DOE M 452.2-1A. An implementation plan is not required. This revision is effective upon issuance.	Revised.
5. RESPONSIBILITIES.	*No change from DOE O 452.2D.*	

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a. Deputy Administrator for Defense Programs. i. Ensures implementation of NES Programs. ii. Approves exemptions to this Order.	*No change from DOE O 452.2D.*	
b. NNSA Field Office Manager. Provides oversight of the NNSA M&O Contractor.	b. NNSA Field Element Managers responsible for NEOs. Provide oversight of NNSA M&O Contractors.	Revised.
c. Associate Administrator for Safety and Health. Provides independent oversight of the implementation of this Order and associated Manuals by NNSA personnel.	*No change from DOE O 452.2D.*	
d. Director, Office of Nuclear Weapons Stockpile. (1) Provides federal leadership for project teams formed to develop nuclear explosive operations at NNSA production agencies. (2) Ensures that NNSA nuclear explosive operations are designed in a manner that satisfies the NES Program requirements.	*No change from DOE O 452.2D.*	
e. Director, Office of Nuclear Weapon Surety and Quality. (1) Manages the NNSA NES evaluation processes. (2) Provides support to NNSA Site Offices as needed for NES oversight of the NNSA M&O Contractors.	*No change from DOE O 452.2D.*	

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
6. DEFINITIONS. Definitions from DOE O 452.1D, or successor directive are not repeated here.	*No change from DOE O 452.2D.*	
a. Access. The proximity to a nuclear explosive that allows the opportunity to divert, steal, tamper with, and/or damage the nuclear explosive in spite of any controls that have been established to prevent such unauthorized actions.	*No change from DOE O 452.2D.*	
	b. Anomalous Unit. A configuration in a nuclear explosive operation that has any of the following: (1) Damage or other condition not identified as a credible deviation or otherwise explicitly addressed in an approved technical operating procedure. (2) Damage or other condition that results in an unanalyzed configuration or a configuration not covered by a NES evaluation. (3) Other damage or condition potentially adverse to nuclear explosive safety.	Added.
b. Custody of Nuclear Explosives. Responsibility for access to and control of nuclear explosives.	c. Custody of Nuclear Explosives. Responsibility for access to and control of nuclear explosives.	Renumbered
	d. Dummy Pit. A component or set of components designed to simulate a live pit, but which does not contain fissile material and cannot therefore create a nuclear explosive if placed in the central cavity of an implosion system. A "high-fidelity" dummy pit is one that also has dimensions representative of a live pit.	Added (from DOE M 452.2-1A).
c. Electrical Equipment. Includes items that contain or use an electrical energy source and the interface (if any) with the nuclear explosive (NE). For Category 1 electrical equipment (as defined in DOE M 452.2-1A), this includes associated adapters, test cables, switch boxes, etc. For some Category 2 electrical equipment (as defined in DOE M 452.2-1A), this includes a mechanical connection to the NE and associated electrical isolation feature.	e. Electrical Equipment. Includes items that contain or use an electrical energy source and the interface (if any) with the nuclear explosive (NE). For Category 1 electrical equipment (as defined in Attachment 3 of this Order), this includes associated adapters, test cables, switch boxes, etc. For some Category 2 electrical equipment (as defined in Attachment 3 of this Order), this includes a mechanical connection to the NE and associated electrical isolation feature.	Revised and renumbered.
d. Facility. Any equipment, structure, system, process, or activity that fulfills a specific purpose.	f. Facility. Any equipment, structure, system, process, or activity that fulfills a specific purpose.	Renumbered.

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
	g. Human Factors. A scientific discipline that applies knowledge about human abilities, characteristics, and limitations to design of tasks, equipment, and environments.	Added.
	h. Human Reliability Program (HRP). A program established by 10 CFR 712 to ensure that individuals who occupy positions affording access to certain materials, nuclear explosive devices, facilities, and programs meet the highest standards of reliability and physical and mental suitability.	Added (from DOE M 452.2-1A).
e. Main Charge. The high explosive whose explosive energy implodes the pit.	i. Main Charge. The high explosive whose explosive energy implodes the pit.	Renumbered.
	j. Mock High Explosive. A material that is designed to simulate the main charge high explosive, but which is non-detonable and clear or colored pink.	Added (from DOE M 452.2-1A).
f. Nuclear Explosive Duty. Work assignments that allow custody of a nuclear explosive or access to a nuclear explosive device or area.	k. Nuclear Explosive Duty. Work assignments that allow custody of a nuclear explosive or access to a nuclear explosive device or area.	Renumbered.
g. Nuclear Explosive-Like Assembly (NELA). An assembly with components representing the main charge HE and pit that has the potential for component substitution resulting in accidental/inadvertent, or deliberate unauthorized assembly or transfer of a nuclear explosive may be considered a NELA. A NELA represents a nuclear explosive in the U.S. Nuclear weapons program, including assemblies for development, testing, training, or other purposes.	l. Nuclear Explosive-Like Assembly (NELA). An assembly that is not a nuclear explosive but represents a nuclear explosive in its basic configuration (main charge HE and pit) or any higher level of assembly up to a fully assembled weapon configuration. A NELA does not contain an arrangement of HE and fissile material capable of producing a nuclear detonation but (if inadequately controlled) has the potential for component or unit substitution resulting in accidental, inadvertent, or deliberate unauthorized assembly or transfer of a nuclear explosive in place of a NELA. A NELA represents a nuclear explosive in the U.S. Nuclear weapons program, including assemblies for development, testing, training, or other purposes.	Revised and renumbered.
h. Nuclear Explosive Operation Associated Activities. Activities directly associated with a specific nuclear explosive operation, such as work on a bomb nose or tail subassembly, even when physically separated from the bomb's nuclear explosive subassembly.	m. 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.	Renumbered.
i. Nuclear Explosive Safety Rules (NESRs). Requirements that significantly contribute to minimizing the possibility of nuclear detonation or high explosive detonation/deflagration in nuclear explosive operations.	n. Nuclear Explosive Safety Rules (NESRs). Requirements that significantly contribute to minimizing the possibility of nuclear detonation or high explosive detonation/deflagration in nuclear explosive operations.	Renumbered.

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
j. <u>One-Point Safe Nuclear Explosive</u>. 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.	o. <u>One-Point Safe Nuclear Explosive</u>. 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.	Renumbered.
	p. <u>Permanent Marking</u>. A durable method, normally by metal deformation, indicating on an external area of an assembly whether it is a nuclear explosive or a nuclear explosive-like assembly.	Added (from DOE M 452.2-1A).
k. <u>Safety Basis</u>. A safety basis for a DOE nuclear facility is documented in a documented safety analysis and the hazards controls for the nuclear facility.	q. <u>Safety Basis</u>. A safety basis for a DOE nuclear facility is documented in a documented safety analysis and the hazards controls for the nuclear facility.	Renumbered.
	r. <u>Two-Person Concept (TPC)</u>. TPC is implemented to ensure no lone individual has unrestricted access to a nuclear explosive or other crucial asset as specified by this Order.	Added (from DOE M 452.2-1A).
7. <u>REFERENCES</u>. The following list contains references that are relevant to this Order.	*No change from DOE O 452.2D.*	
a. DOE O 151.1C, *Comprehensive Emergency Management System*, dated 11-2-05, which addresses responses to unplanned events.	a. DOE O 151.1C, *Comprehensive Emergency Management System*, dated 11-2-05, which addresses responses to unplanned events.	Revised to latest version of document.
b. DOE O 243.1, *Records Management Program*, dated 2-3-06, which provides a framework for managing information in accordance with Department policy and National Archives and Records Administration-approved DOE record schedules.	b. DOE O 243.1B Chg 1, *Records Management Program*, dated 07-08-13, which provides a framework for managing information in accordance with Department policy and National Archives and Records Administration-approved DOE record schedules.	
c. DOE O 226.1A, *Implementation of Department of Energy Oversight Policy*, dated 7-31-07, which provides direction for implementing DOE P 226.1A, Department of Energy Oversight Policy, dated 5-25-07, which establishes DOE policy for assurance systems and processes established by DOE contractors and oversight programs performed by DOE line management and independent oversight organizations.	c. DOE O 226.1B, *Implementation of Department of Energy Oversight Policy*, dated 04-25-11, which provides direction for implementing DOE P 226.1A, Department of Energy Oversight Policy, dated 5-25-07, which establishes DOE policy for assurance systems and processes established by DOE contractors and oversight programs performed by DOE line management and independent oversight organizations.	

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
d. DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*, dated 8-19-03, which provides detailed requirements to supplement. e. DOE O 231.1A, *Environment, Safety, and Health Reporting*, dated 8-19-03, sets forth a minimum set of occurrence reporting requirements for DOE/NNSA elements and contractors and includes categorizing occurrences related to safety, environment, health, or operations; notifying DOE; and developing follow-up reports. f. DOE O 251.1C, *Departmental Directives Program*, dated 1-15-09, which details the process for requesting exemptions from directives requirements.	d. DOE O 232.2 Chg 1, *Occurrence Reporting and Processing of Operations Information*, dated 03-12-14, which provides requirements for categorizing and reporting non-emergency NES occurrences. e. DOE O 231.1B *Environment, Safety, and Health Reporting*, Administrative Change 1, dated 11-28-12, sets forth a minimum set of occurrence reporting requirements for DOE/NNSA elements and contractors and includes categorizing occurrences related to safety, environment, health, or operations; notifying DOE; and developing follow-up reports. f. DOE O 251.1C, *Departmental Directives Program*, dated 1-15-09, which details the process for requesting exemptions from directives requirements.	Revised to latest version of document.
g. DOE O 360.1B, *Federal Employee Training*, dated 10-11-01, which establishes requirements and assigns responsibilities for DOE Federal employee training, education, and development under the Government Employees Training Act of 1958, as amended.	g. DOE O 360.1C, *Federal Employee Training*, dated 07-06-11, which establishes requirements and assigns responsibilities for DOE Federal employee training, education, and development under the Government Employees Training Act of 1958, as amended.	Revised to latest version of document.
h. DOE O 414.1C, *Quality Assurance*, dated 6-17-05, which ensures that the quality of DOE/NNSA products and services meets or exceeds the customers' expectations. i. DOE O 420.1B, *Facility Safety*, dated 12-22-05, which establishes the DOE/NNSA facility safety for nuclear safety design, criticality safety, fire protection, and natural phenomena hazards mitigation. j. DOE M 440.1-1A, *DOE Explosives Safety Manual*, dated 1-9-06, which describes DOE's explosives safety requirements applicable to operations involving the development, testing, handling, and processing of explosives or assemblies containing explosives.	h. DOE O 414.1D Chg 1, *Quality Assurance*, dated 05-08-13, which ensures that the quality of DOE/NNSA products and services meets or exceeds the customers' expectations. i. DOE O 420.1C, *Facility Safety*, dated 12-04-12, which establishes the DOE/NNSA facility safety for nuclear safety design, criticality safety, fire protection, and natural phenomena hazards mitigation. j. DOE STD 1212-2012, *Explosives Safety*, dated June 2012, which describes DOE's explosives safety requirements applicable to operations involving the development, testing, handling, and processing of explosives or assemblies containing explosives.	Revised to latest version of document.

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
k. DOE O 452.1D, *Nuclear Explosive and Weapon Surety Program*, dated 4-14-09, which establishes requirements and responsibilities for the DOE Nuclear Explosive and Weapon Surety Program.	k. DOE O 452.1E, *Nuclear Explosive and Weapon Surety Program*, dated XX-XX-XX, which establishes requirements and responsibilities for the DOE Nuclear Explosive and Weapon Surety Program.	Revised. (DOE M 452.2-1A and DOE M 452.2-2 cancelled). Added DOE O 461.1B and new NNSA supplemental directive, NA SD 452.2.
l. DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, dated 4-14-09, which establishes mandatory procedures in selected topical areas to ensure the nuclear explosive safety of all nuclear explosive operations conducted by DOE/NNSA and its contractors.	l. NA SD 452.2, *Nuclear Explosive Safety Study Processes*, dated XX-XX-XX, which provides requirements and guidance for nuclear explosive safety studies, operational safety reviews, and nuclear explosive safety change evaluations.	
m. DOE M 452.2-2, *Nuclear Explosive Safety Study Processes*, dated 4-14-09, which provides requirements and guidance for nuclear explosive safety studies, operational safety reviews, and nuclear explosive safety change evaluations.	m. DOE O 461.1B, *Packaging and Transportation for Offsite Shipment of Materials of National Security Interest*, 12-20-10.	

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
n. DOE O 5480.20A Chg 1, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, dated 07-12-01, which establishes selection, qualification, and training requirements for management and operating contractor personnel involved in the operation, maintenance, and technical support of DOE/NNSA Category A and B reactors and nonreactor nuclear facilities.	n. DOE O 426.2 Chg 1, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, dated 07-29-13, which establishes selection, qualification, and training requirements for management and operating contractor personnel involved in the operation, maintenance, and technical support of DOE/NNSA Category A and B reactors and nonreactor nuclear facilities.	Revised to latest version of document. Added DOE STD 1020.
o. DOE-STD-1073-2003, *Configuration Management Program*, dated October 2003, which defines the objectives of a configuration management process for DOE nuclear facilities (including activities and operations) and provides detailed examples and supplementary guidance on methods to achieve those objectives.	o. DOE STD 1020-2012, *Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities*, dated December 2012, sets performance goals that define a credibly initiated design based scenario. If a safety SSC meets a performance goal requirement based on DOE STD 1020 criteria, the SSC credibly controls the NPH-initiated hazard.	
p. DOE-STD-1104-96, *Review and Approval of Nuclear Facility Safety Basis Documents (Documented Safety Analyses and Technical Safety Requirements)*, dated February 1996, which describes DOE review and approval of documented safety analyses and Technical Safety Requirements for existing Hazard Category 1, 2, and 3 nuclear facilities that document their safety basis in accordance with 10 CFR 830.	p. DOE-STD-1073-2003, *Configuration Management Program*, dated October 2003, which defines the objectives of a configuration management process for DOE nuclear facilities (including activities and operations) and provides detailed examples and supplementary guidance on methods to achieve those objectives. q. DOE-STD-1104-96, *Review and Approval of Nuclear Facility Safety Basis Documents (Documented Safety Analyses and Technical Safety Requirements)*, dated February 1996, which describes DOE review and approval of documented safety analyses and Technical Safety Requirements for existing Hazard Category 1, 2, and 3 nuclear facilities that document their safety basis in accordance with 10 CFR 830.	
q. DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, dated July 1994, which describes a Safety Analysis Report preparation method that satisfies 10 CFR 830 requirements.	r. DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, dated XXX 2014, which describes a Safety Analysis Report preparation method that satisfies 10 CFR 830 requirements.	Revised to the latest version of document.

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
r. DOE-DP-STD-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*, dated May 2006, which clarifies the requirements and provides guidance for conducting hazard analyses and preparing Hazard Analysis Reports for nuclear explosive operations and associated activities.	s. DOE-DP-STD-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*, dated May 2006, which clarifies the requirements and provides guidance for conducting hazard analyses and preparing Hazard Analysis Reports for nuclear explosive operations and associated activities.	Revised to the latest version of document and renumbered.
s. 10 CFR Part 712, *Human Reliability Program*, which establishes the policies and procedures for the DOE, including NNSA, human reliability program (HRP). The HRP is a security and safety reliability program designed to ensure that individuals who occupy positions affording access to certain materials, nuclear explosive devices, facilities, and programs meet the highest standards of reliability and physical and mental suitability.	t. 10 CFR Part 712, *Human Reliability Program*, which establishes the policies and procedures for the DOE, including NNSA, human reliability program (HRP). The HRP is a security and safety reliability program designed to ensure that individuals who occupy positions affording access to certain materials, nuclear explosive devices, facilities, and programs meet the highest standards of reliability and physical and mental suitability.	
t. 10 CFR Part 820, *Procedural Rules for DOE Nuclear Activities*, which sets forth procedures to govern the conduct of persons involved in DOE nuclear activities and, in particular, to achieve compliance with the DOE Nuclear Safety Requirements by all persons subject to those requirements.	u. 10 CFR Part 820, *Procedural Rules for DOE Nuclear Activities*, which sets forth procedures to govern the conduct of persons involved in DOE nuclear activities and, in particular, to achieve compliance with the DOE Nuclear Safety Requirements by all persons subject to those requirements.	

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
d. 10 CFR Part 830, *Nuclear Safety Management*, which governs the conduct of DOE contractors, DOE personnel, and other persons conducting activities (including providing items and services) that affect, or may affect, the safety of DOE nuclear facilities. v. Title 32 of P.L. 106-65, the National Nuclear Security Administration Act, dated October 5, 1999, as amended, which established a separately organized agency within the Department of Energy.	g. 10 CFR Part 830, *Nuclear Safety Management*, which governs the conduct of DOE contractors, DOE personnel, and other persons conducting activities (including providing items and services) that affect, or may affect, the safety of DOE nuclear facilities. v. Title 32 of P.L. 106-65, the National Nuclear Security Administration Act, dated October 5, 1999, as amended, which established a separately organized agency within the Department of Energy.	Revised to the latest version of document and renumbered.
e. Joint Department of Energy/Department of Defense (DOE/DoD) Technical Publication 20-7, *Nuclear Safety Criteria*, dated 01-02-02.	h. Joint Department of Energy/Department of Defense (DOE/DoD) Technical Publication 20-7, *Nuclear Safety Criteria*, dated 01-02-02.	
f. Joint DOE/DoD Technical Publication 35-51 Chg. 10, *General Instructions Applicable to Nuclear Weapons*, dated 08-14-08.	i. Joint DOE/DoD Technical Publication 35-51 Chg. 10, *General Instructions Applicable to Nuclear Weapons*, dated 08-14-08.	
j. Joint DOE/DoD Technical Publication 45-51 Chg. 2, *Transportation of Nuclear Weapons Materiel, General Shipping and Limited Life Component Data (LLC),* dated 08-01-07.	l. Joint DOE/DoD Technical Publication 45-51 Chg. 2, *Transportation of Nuclear Weapons Materiel, General Shipping and Limited Life Component Data (LLC)*, dated 08-01-07.	Revised to the latest version of document and renumbered.
k. Joint DOE/DoD Technical Publication 45-51A Chg. 5, *Transportation of Nuclear Weapons Materiel (Supplement), Shipping and Identification Data for Stockpile Major Assemblies,* dated 03/20/2007.	m. Joint DOE/DoD Technical Publication 45-51A Chg. 5, *Transportation of Nuclear Weapons Materiel (Supplement), Shipping and Identification Data for Stockpile Major Assemblies,* dated 03/20/2007.	
8. CONTACT. Questions concerning this Order should be addressed to the Associate Administrator for Safety and Health, 202-586-3885.	*No change from DOE O 452.2D.*	
Contractor Requirements Document DOE O 452.2D, *Nuclear Explosive Safety*		

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
This Contractor Requirements Document (CRD) establishes the requirements for Department of Energy (DOE) contractors, including National Nuclear Security Administration (NNSA) contractors, whose contracts involve the performance, management, oversight, or direct support of DOE/NNSA nuclear explosive operations (NEOs) or associated activities. Regardless of the performer of the work, the contractor is responsible for complying with the requirements of this CRD. The contractor is responsible for flowing down the requirements of this CRD to subcontractors at any tier to the extent necessary to ensure the contractor's compliance with the requirements. All contractors with this CRD incorporated in their contracts must comply with the following requirements.	This Contractor Requirements Document (CRD) establishes the requirements for Department of Energy (DOE) contractors, including National Nuclear Security Administration (NNSA) contractors, whose contracts involve the performance, management, oversight, or direct support of DOE/NNSA nuclear explosive operations (NEOs) or associated activities. Regardless of the performer of the work, the contractor is responsible for complying with the requirements of this CRD. The contractor is responsible for flowing down the requirements of this CRD to subcontractors at any tier to the extent necessary to ensure the contractor's compliance with the requirements. Attachments 2 through 5 apply to both federal and contractor employees. These attachments must be included along with the CRD in all contracts that involve performing, managing, overseeing, or directly supporting NEOs or associated activities. All contractors with this CRD incorporated in their contracts must comply with the following requirements to support the Nuclear Explosive Safety Program.	Revised to add new attachments which were previously part of DOE M 452.2-1A .
Nuclear Explosive Safety Program.		Deleted.
1. General Nuclear Explosive Safety Rules (NESRs). Contractors must ensure that NEOs under their purview are designed and performed in a manner that satisfies the following General NESRs.	*No change from DOE O 452.2D.*	
a. Nuclear Explosive Safety Evaluation. NEOs must not be performed until a NES study (NESS) has been conducted, the NESS report has been approved, and approved pre-start findings have been closed.	a. Nuclear Explosive Safety Evaluation. NEOs must not be performed until a NES evaluation has been completed and findings for which a NES standard has not been met have been closed.	Revised
b. Nuclear Explosive Operating Procedures. NEOs must be performed in accordance with approved written procedures.	*No change from DOE O 452.2D.*	

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
c. <u>One-Point Safety</u>.	c. <u>One-Point Safety</u>.	Revised.
(1) NEOs involving nuclear explosives not certified to be one-point safe must be performed only at the Nevada Test Site (NTS), except as authorized in accordance with paragraph 1a(3)(b) below.	(1) The probability of achieving a nuclear yield greater than 4 pound of TNT equivalent in the event of a one-point initiation of the nuclear explosive's high explosive must not exceed one in a million (1E-06).	
(2) If it is determined that a nuclear explosive no longer meets the one-point safety criteria, all assembly/disassembly production plant operations (including onsite transportation) with that nuclear explosive must be discontinued in a safe manner. Before operations with that nuclear explosive can be resumed, a NES evaluation report must be approved, and approved pre-start findings must be closed.	(2) Tooling and equipment must be evaluated to ensure that their use does not cause a one-point safety violation of a nuclear explosive certified to be one-point safe.	
(3) Tooling and equipment must be evaluated as required to ensure that their use does not cause a one-point safety violation of a nuclear explosive certified to be one-point safe.	(3) If it is determined that a nuclear explosive no longer meets the one-point safety criteria, all assembly/disassembly production plant operations (including onsite transportation) and offsite transportation with that nuclear explosive must be discontinued in a safe manner. Before operations with that nuclear explosive can be resumed, a path forward must be developed, a NES evaluation must be completed and findings for which a NES standard has not been met must be closed.	
	(4) NEOs involving a nuclear explosive not certified to be one-point safe must be conducted at the Nevada National Security Site (NNSS), except as authorized in accordance with paragraph 1c(3), above.	

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
d. Nuclear Explosive Areas (NEAs). (a) Authorized energy sources must be identified and documented. Unauthorized energy sources must not be available in an NEA during NEOs. (b) Ignition sources in NEAs must be identified and eliminated or minimized and controlled to prevent adverse interaction with combustible/flammable materials and the nuclear explosive. (c) Combustible and flammable materials in NEAs must be identified and eliminated or minimized and controlled to prevent adverse interaction with the nuclear explosive.	d. Nuclear Explosive Areas (NEAs). (1) Authorized energy sources must be identified and documented. Unauthorized energy sources must not be available in an NEA during NEOs. (2) Ignition sources in NEAs must be identified and eliminated or reasonably minimized and controlled to prevent adverse interaction with combustible/flammable materials and the nuclear explosive. (3) Combustible and flammable materials in NEAs must be identified and eliminated or reasonably minimized and controlled to prevent adverse interaction with the nuclear explosive.	Revised and renumbered.
e. Electrical Testing. Except as authorized in accordance with paragraph 1a(6), Anomalous Units, nuclear explosives must not be subjected to — (1) redundant electrical tests, or (2) electrical troubleshooting (i.e., to confirm the existence of a fault or aid in fault isolation) except with authorized test equipment and procedures that have been subjected to a NES evaluation and found to be acceptable for the specific application.	e. Electrical Testing. Except as authorized in accordance with paragraph 1f, Anomalous Units, nuclear explosives must not be subjected to — (1) redundant electrical tests, or (2) electrical troubleshooting (i.e., to confirm the existence of a fault or aid in fault isolation) except with authorized test equipment and procedures that have been subjected to a NES evaluation and found to be acceptable for the specific application.	Revised to correct referenced paragraph.

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
f. Anomalous Units. (1) If it is determined that a nuclear explosive is no longer in a condition covered by a NES evaluation, all operations with that nuclear explosive and in the associated facility must be discontinued in a safe manner, resulting in a safe and stable nuclear explosive configuration. (2) Before operations with the anomalous unit can be resumed, a design agency special instruction engineering release (SIER) must be developed and the NEO change control process must be completed in accordance with paragraph 1m. (a) The responsible design agencies must specifically review the SIER for impact on NES. (b) Transportation operations, if applicable, must be specifically addressed in the SIER, and offsite transportation operations are subject to the Office of Secure Transportation (OST) NEO change control process. (3) A decision to resume other activities in the facility must include consideration of possible interactions with the anomalous unit.	f. Anomalous Units. (1) If it is determined that a nuclear explosive is no longer in a condition covered by a NES evaluation or explicitly addressed in an approved written procedure, all operations with that nuclear explosive and in the associated facility must be discontinued in a safe manner, resulting in a safe and stable nuclear explosive configuration. (2) Restart of operations on the anomalous unit and other activities in the affected facility must be in accordance with paragraph 15 below.	Revised
2. Supplemental Nuclear Explosive Safety Rules. Contractors may propose supplemental NESRs to support specific tests, operations, or characteristics of a nuclear explosive.	*No change from DOE O 452.2D.*	
3. Nuclear Explosive Safety Evaluations. Contractors must ensure that all NEOs under their purview are covered by an approved NES evaluation and request and support NES evaluations as needed. NES evaluation requirements are specified in DOE M 452.2-2, *Nuclear Explosive Safety Evaluation Processes*, or successor directive.	3. Nuclear Explosive Safety Evaluations. Contractors must ensure that all NEOs under their purview are covered by an approved NES evaluation and request and support NES evaluations as needed. NES evaluation requirements are specified in NA SD 452.2, *Nuclear Explosive Safety Evaluation Processes*, or successor directive.	Revised.

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
	4. Human Factors. Contractors must incorporate human factors principles into NEO procedures, processes, facilities, and equipment, including Category 1 electrical equipment, starting with the NEO design and development phase and maintained throughout the lifecycle of NEOs. Given the human-centric nature of NEOs, human factors principles provide the basic foundation to ensure that NEOs are designed and conducted in a manner that meets human usability guidelines as well as the NES standards of DOE O 452.1E. NEOs shall apply established research in human factors and ergonomics, including human-system interface design, human cognition and perception, stress and workload, anthropometry and workspace design, environmental factors, training, and human error.	Added.
4. Procedures.	5. Procedures.	Renumbered.
a. Contractors responsible for NEOs and associated activities and facilities must follow approved written procedures (paper or electronic) for all NEOs to control interactions among the nuclear explosive, the operating facility, equipment, and personnel.	*No change from DOE O 452.2D.*	
b. Contractors must ensure design agency concurrence with original issues of procedures for NEOs and associated activities.	*No change from DOE O 452.2D.*	
c. Proposed changes to procedures must be assessed by the contractor NEO change control process.	*No change from DOE O 452.2D.*	

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
d. Contractors must ensure NEO procedures place the proper emphasis on preventing accidents and detecting abnormal conditions by accomplishing the following— (1) comply with design specifications and technical requirements, (2) clearly state cautions and warnings, (3) identify appropriate points to safely interrupt work, (4) include generic contingency procedures directed toward quickly achieving a safe and stable nuclear explosive configuration to be applied in response to all unexpected situations not covered by other written procedures, and (5) incorporate human factors considerations.	*No change from DOE O 452.2D.*	
5. Two-Person Concept. Contractors responsible for NEOs and associated activities and facilities must establish and implement the two-person concept in accordance with DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive, to ensure no lone individual has access to a nuclear explosive.	6. Two-Person Concept. Contractors responsible for NEOs and associated activities and facilities must establish and implement the two-person concept in accordance with Attachment 2 of DOE O 452.2E-, *Nuclear Explosive Safety*, or successor directive, to ensure no lone individual has access to a nuclear explosive.	Revised and renumbered.
6. Facilities. Contractors must ensure that facilities used for nuclear explosive operations are characterized, evaluated, and specifically approved for that use.	7. Facilities. Contractors must ensure that facilities used for nuclear explosive operations are characterized, evaluated, and specifically approved for that use.	Renumbered.

DOE O 452.2D, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
7. Equipment. Contractors responsible for NEOs and associated activities and facilities must ensure that all equipment used in NEOs (including tooling, testers, and other mechanical and electrical equipment) meet the following requirements. DOE M 452.2-1A, *Nuclear Explosive Safety Manual,* or successor directive, specifies additional requirements for electrical equipment used in NEAs.	8. Equipment. Contractors responsible for NEOs and associated activities and facilities must ensure that all equipment used in NEAs (including tooling, testers, and other mechanical and electrical equipment) meet the following requirements. Attachment 3 of DOE O 452.2E, *Nuclear Explosive Safety,* or successor directive, specifies additional requirements for electrical equipment used in NEAs.	Revised and renumbered.
a. Design specifications and technical requirements are documented. b. Designs must ensure that the nuclear explosive remains in a safe condition should a system or component of the equipment fail. c. Each item used in an NEO must be specifically approved for that operation. Unapproved movable items must be excluded from the NEA. Positive measures must be used to preclude use of facility equipment that is not approved for the NEO and impracticable to remove. d. Equipment intended to apply energy to a nuclear explosive must incorporate features that limit energy to a known safe level.	*No change from DOE O 452.2D.*	
	e. Energetic equipment intended for use in NEAs by emergency responders (e.g., fire fighters, medical personnel, security force) must be evaluated and characterized with respect to potential hazards	Added.
8. Maintenance of Facilities, Tooling, and Other Equipment. Contractors responsible for NEOs and associated activities and facilities must review maintenance programs and activities for impact on NES. Maintenance implementation plans must include a detailed description of maintenance activity control and approval, including limitations on materials that are allowed in NEAs.	9. Maintenance of Facilities, Tooling, and Other Equipment. Contractors responsible for NEOs and associated activities and facilities must review maintenance programs and activities for impact on NES. Maintenance implementation plans must include a detailed description of maintenance activity control and approval, including limitations on materials that are allowed in NEAs.	Renumbered.

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9. Personnel. Contractors responsible for and/or involved in NEOs and associated activities must implement training, qualification, and certification programs for personnel that manage, oversee, perform, or directly support these operations and activities. In addition to the requirements referenced in 10 CFR 712 and DOE O 5480.20, contractors must provide annual training for personnel assigned to nuclear explosive duty that includes the following NES-specific topics.	10. Personnel. Contractors responsible for and/or involved in NEOs and associated activities must implement training, qualification, and certification programs for personnel that manage, oversee, perform, or directly support these operations and activities. In addition to the requirements in 10 CFR Part 712, *Human Reliability Program*, and DOE O 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, contractors must provide annual training for personnel assigned to nuclear explosive duty must include the following NES-specific topics.	Revised and renumbered.
a. Responsibilities associated with custody of nuclear explosives. b. Use of general and supplemental NESRs, site/facility and program specific Technical Safety Requirements, and other controls associated with NEOs. c. The purpose, objective, and responsibilities of the two-person concept for operations. d. Explosive safety appropriate for assigned responsibilities.	*No change from DOE O 452.2D.*	
10. Transportation of Nuclear Explosives.	11. Transportation of Nuclear Explosives. Nuclear explosive transportation is a mobile NEO and involves a mobile NEA. Requirements specified for NEOs and NEAs elsewhere in this CRD apply.	Renumbered and added paragraph.
a. Contractors responsible for NEOs and associated activities and facilities must establish requirements and procedures to ensure safe onsite transportation of nuclear explosives.	*No change from DOE O 452.2D.*	

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b. Transportation operations and shipping configurations, including all items in a conveyance, are subject to the NES evaluation requirements of paragraph 1a(1) and 1c of this CRD. (1) Contractors must ensure nuclear explosives are transported in conveyances specifically reviewed and approved through the NES evaluation process. (2) Contractors must ensure appropriate criteria are established for protecting nuclear explosives during transportation. Contractors must ensure the criteria and tie-down designs for specific nuclear explosive configurations are reviewed and approved through the NES evaluation process.	b. Transportation operations and shipping configurations, including all items in a conveyance, are subject to the NES evaluation requirements of paragraphs 1a and 3 of this CRD. (1) Contractors must ensure nuclear explosives are transported in conveyances specifically reviewed and approved through the NES evaluation process. (2) Contractors must ensure appropriate criteria are established for protecting nuclear explosives during transportation. Contractors must ensure the criteria and restraint designs for specific nuclear explosive configurations are reviewed and approved through the NES evaluation process.	Revised to refer to the correct paragraphs of the CRD.
11. Mixed Venues. Contractors responsible for NEOs must not transport or stage nuclear explosives with any other assembly that could be mistaken for a nuclear explosive.	12. Mixed Venues. Contractors responsible for NEOs must not transport or stage nuclear explosives with any other assembly that could be mistaken for a nuclear explosive. Exception: Nuclear explosives and NELAs may be collocated in Pantex radiography and vacuum chamber bays, provided that operations comply with the NELA standards in paragraph 17 and have been evaluated by a NESSG.	Added exception and renumbered.
12. Positive Verification. a. Contractors responsible for NEOs and associated activities and facilities must develop and implement a verification process to ensure use of qualified personnel who are fit for duty, operationally ready facilities, correct equipment that is current in any required calibration and preventive maintenance, and current approved procedures. b. Contractors must ensure the configuration and condition of a nuclear explosive and its safety features are known or determined as early as practical during any planned NEO.	13. Positive Verification. a. Contractors responsible for NEOs and associated activities and facilities must develop and implement a verification process to ensure use of qualified personnel who are fit for duty, operationally ready facilities, correct equipment that is current in any required calibration and preventive maintenance, and current approved procedures. *b.* Contractors must ensure the configuration and condition of a nuclear explosive and its safety features are known or determined as early as practical during any planned NEO.	Renumbered.

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13. Change Control. Contractors responsible for NEOs and associated activities and facilities must establish and implement a NES change evaluation process in accordance with DOE M 452.2-2, or successor directive. This NES evaluation is separate and independent from the USQ process required by 10 CFR Part 830, *Nuclear Safety Management*, and must be completed before approval and implementation of the change. Contractors must ensure that their change control process captures all proposed changes to approved NEOs including the following:	14. Change Control. Contractors responsible for NEOs and associated activities and facilities must establish and implement a NES change evaluation process in accordance with NA SD 452.2, or successor directive. This NES evaluation is separate and independent from the USQ process required by 10 CFR Part 830, *Nuclear Safety Management*, and must be completed before approval and implementation of the change. Contractors must ensure that their change control process captures all proposed changes to approved NEOs including the following:	Revised and renumbered.
a. Proposals that may have direct NES implications (e.g., procedural, equipment, or facility changes to an approved NEO).	*No change from DOE O 452.2D.*	
b. Proposals that may have indirect NES implications (e.g., changes or new activities that could impact the foundation established by previous NES Master Studies).	*No change from DOE O 452.2D.*	
c. Changes in knowledge affecting an approved NEO (e.g., new understanding of a potential threat to NES or new data regarding the response of a nuclear explosive to a stimulus).	*No change from DOE O 452.2D.*	

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	15. Anomalous Unit Determination and Processing. An anomalous unit might be created or discovered in the course of NEOs performed by NNSA or its contractors, or might be received from DoD in a known anomalous condition. Contractors must support the OST NEO change control process to ensure anomalous units accepted for transport are safe to ship and that any special handling, receiving, or staging requirements are known and accepted in advance by the receiving organization. The following apply to anomalous units at the production agency a. The production agency Process Engineer, production agency NES representative, and design agency System Engineer collectively have the authority to declare a unit anomalous. A unit in question is treated as an anomalous unit unless there is unanimous agreement otherwise among the three. b. Before operations with the anomalous unit can be resumed, the NEO change control process must be completed in accordance with paragraph 14. A design agency engineering release (e.g., SIER, IER, or SXR, as appropriate) must be developed as input to the change control process. (1) The responsible design agencies must specifically review the engineering release for impact on NES. (2) Transportation operations, if applicable, must be specifically addressed in the engineering release. Offsite transportation operations are subject to the Office of Secure Transportation (OST) NEO change control process. (3) A decision to resume other activities in the facility must include consideration of possible interactions with the anomalous unit.	Added.

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14. Configuration Management. Contractors responsible for NEOs and associated activities and facilities must develop and implement a configuration management program incorporating elements applicable to NEOs and associated activities and facilities. To ensure consistency with design requirements and the safety basis, the configuration management program must specifically include the following:	16. Configuration Management. Contractors responsible for NEOs and associated activities and facilities must develop and implement a configuration management program incorporating elements applicable to NEOs and associated activities and facilities. To ensure consistency with design requirements and the safety basis, the configuration management program must specifically include the following:	Renumbered.
a. control of the physical configuration of a nuclear explosive and its components; the tooling, equipment, and procedures used in NEOs and associated activities; and the interface with the facilities in which these operations and activities are conducted;	*No change from DOE O 452.2D.*	
b. unique identification of special tooling and equipment used in NEOs;	*No change from DOE O 452.2D.*	
c. positive identification of tooling and equipment requiring calibration/testing within a calibration/testing control program; and	*No change from DOE O 452.2D.*	
d. incorporation of approved changes into all affected documents (including design documents, drawings, procedures, and safety basis documents) and programs (including maintenance and training).	*No change from DOE O 452.2D.*	
15. Nuclear Explosive-Like Assemblies (NELAs).	17. Nuclear Explosive-Like Assemblies (NELAs).	Renumbered
a. Nuclear Explosive-Like Assembly Standards. Contractors responsible for NELA operations must ensure those operations meet the following qualitative NELA standards. (1) There must be controls to minimize the possibility of accidental/inadvertent, or deliberate unauthorized assembly of a nuclear explosive in place of a NELA configuration. (2) There must be controls to minimize the possibility of accidental/inadvertent, or deliberate unauthorized transfer of a nuclear explosive in place of a NELA configuration.	a. Nuclear Explosive-Like Assembly Standards. Contractors responsible for NELA operations must ensure those operations meet the following qualitative NELA standards. (1) There must be positive measures to prevent accidental/inadvertent, or deliberate unauthorized assembly of a nuclear explosive in place of a NELA configuration. (2) There must be positive measures to prevent accidental/inadvertent, or deliberate unauthorized transfer of a nuclear explosive in place of a NELA configuration.	Revised. Changed "controls" to "positive measures".

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b. Contractors responsible for NELA operations must implement the NELA requirements in accordance with DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, or successor directive.	Contractors responsible for NELA operations must implement the NELA requirements in accordance with Attachment 4 of DOE O 452.2E, or successor directive.	Revised.
16. Marking Instructions. Nuclear explosives and NELAs must be marked to distinguish configurations capable of a nuclear detonation from those that are not. Contractors responsible for NEOs or NELA operations must permanently mark nuclear explosives and NELAs in accordance with the instructions in DOE M 452.2-1A, *Nuclear Explosive Safety Manual* or successor directive.	18. Marking Instructions. Nuclear explosives and NELAs must be marked to distinguish configurations capable of a nuclear detonation from those that are not. Contractors responsible for NEOs or NELA operations must permanently mark nuclear explosives and NELAs in accordance with the instructions in Attachment 5 of DOE O 452.2E or successor directive.	Revised and renumbered.
19. Records. Contractors must maintain records (documentation) in accordance with National Archives and Records Administration-approved DOE or site-specific records retention and disposition schedules (See CRD to DOE O 243.1, *Records Management Program*, dated 2-3-06 or successor directive).	*No change from DOE O 452.2D.*	

DOE M 452.2-1A, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
CHAPTER I. TWO-PERSON CONCEPT	**TWO-PERSON CONCEPT REQUIREMENTS**	Chapter I of DOE M452.2-1A incorporated as Attachment 2 of DOE O 452.2E.
1. PURPOSE. This Department of Energy (DOE) Manual provides supplemental details on selected topics to support the requirements of DOE O 452.2D, *Nuclear Explosive Safety*, dated 4-14-09.		Deleted.
2. CANCELLATIONS. DOE M 452.2-1, *Nuclear Explosive Safety Manual*, dated 6-12-06. Cancellation of a directive does not, by itself, modify or otherwise affect any contractual obligation to comply with the directive. Contractor requirements documents (CRDs) that have been incorporated into or attached to a contract remain in effect until the contract is modified to either eliminate requirements that are no longer applicable or substitute a new set of requirements.		Deleted.
3. APPLICABILITY.		Deleted.
a. DOE Elements. Except for the exclusion in paragraph 3c, this Manual applies to all those Departmental elements that are involved in performing, managing, overseeing, or directly supporting nuclear explosive operations (NEOs) or associated activities, including those created after the Manual is issued. (Go to http://www.directives.doe.gov/pdfs/reftools/org-list.pdf for the most current listing of Departmental elements.). The Administrator of the National Nuclear Security Administration (NNSA) shall ensure that NNSA employees and contractors comply		Deleted.

DOE M 452.2-1A, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
with their respective responsibilities under this Manual. Nothing in this Manual must be construed to interfere with the NNSA Administrator's authority under section 3212(d) of Public Law (P.L.) 106-65 to establish Administration specific policies, unless disapproved by the Secretary.		
b. DOE Elements. Except for the exclusion in paragraph 3c, this Manual applies to all those Departmental elements that are involved in performing, managing, overseeing, or directly supporting nuclear explosive operations (NEOs) or associated activities, including those created after the Manual is issued. (Go to http://www.directives.doe.gov/pdfs/reftools/org-list.pdf for the most current listing of Departmental elements.). The Administrator of the National Nuclear Security Administration (NNSA) shall ensure that NNSA employees and contractors comply with their respective responsibilities under this Manual. Nothing in this Manual must be construed to interfere with the NNSA Administrator's authority under section 3212(d) of Public Law (P.L.) 106-65 to establish Administration specific policies, unless disapproved by the Secretary.		Deleted.
c. Exclusions.		Deleted.
(1) The following Departmental elements are excluded: Office of the Chief Financial Officer, Office of the Chief Information Officer, Office of Civilian Radioactive Waste Management,		Deleted.

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Office of Congressional and Intergovernmental Affairs, Office of Economic Impact and Diversity, Energy Information Administration, Office of Electricity Delivery and Energy Reliability, Office of Energy Efficiency and Renewable Energy, Office of Environmental Management, Office of Fossil Energy, Office of Hearings and Appeals, Office of Human Capital Management, Office of Intelligence and Counterintelligence, Office of Legacy Management, Office of Management, Office of Nuclear Energy, Office of Policy and International Affairs, Office of Public Affairs, Office of Science, Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, and Western Area Power Administration.		
(2) In accordance with the responsibilities and authorities assigned by Executive Order 12344, codified at 50 USC sections 2406 and 2511 and to ensure consistency through the joint Navy/DOE Naval Nuclear Propulsion Program, the Deputy Administrator for Naval Reactors (Director) will implement and oversee requirements and practices pertaining to this Manual for activities under the Director's cognizance, as deemed appropriate.		Deleted.
4. SUMMARY. This Manual is composed of four chapters that provide supplemental requirements to ensure adequate nuclear explosive safety for NEOs conducted by		Deleted.

DOE M 452.2-1A, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
DOE, NNSA, and DOE/NNSA contractors. These chapters specify mandatory procedures and management processes. Chapter I discusses two-person concept requirements. Chapter II discusses electrical equipment requirements. Chapter III establishes nuclear explosive-like assembly requirements. Chapter IV establishes marking requirements for nuclear explosives and nuclear explosive-like assemblies.		
5. DEFINITIONS. Definitions of words or phrases used here but defined in DOE O 452.1D or DOE O 452.2D are not repeated here.		Deleted.
a. Dummy Pit. A component or set of components designed to simulate a live pit, but which does not contain fissile material and cannot therefore create a nuclear explosive if placed in the central cavity of an implosion system. A "high-fidelity" dummy pit is one that also has dimensions representative of a live pit.		Deleted.
b. Human Reliability Program (HRP). A program established by 10 CFR 712 to ensure that individuals who occupy positions affording access to certain materials, nuclear explosive devices, facilities, and programs meet the highest standards of reliability and physical and mental suitability.		Deleted.
c. Mock High Explosive. A material that is designed to simulate the main charge high explosive, but which is non-detonable and clear or colored pink.		Deleted.
d. 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.		Deleted.

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e. Two-Person Concept (TPC). TPC is implemented to ensure no lone individual has unrestricted access to a nuclear explosive or other crucial asset as specified by this manual.		Deleted.
6. REFERENCES. a. Title XXXII of P. L. 106-65, National Nuclear Security Administration Act, as amended, which established a separately organized agency within the Department of Energy. b. DOE O 452.1D, *Nuclear Explosive and Weapon Surety Program*, 4-14-09. c. DOE O 452.2D, *Nuclear Explosive Safety*, 4-14-09. d. DOE O 461.1A, *Packaging and Transfer or Transportation of Materials of National Security Interest*, 04-26-04. e. 10 CFR Part 712, *Human Reliability Program.*		Deleted.
7. CONTACT. The Associate Administrator for Safety and Health is responsible for updating and maintaining this Manual. Questions concerning this Manual should be addressed to 202-586-3885.		Deleted.
Table of Contents		Deleted.

DOE M 452.2-1A, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
1. BASIC REQUIREMENTS. The two-person concept (TPC) is implemented to ensure no lone individual has unrestricted access to a nuclear explosive. A TPC team must be in the nuclear explosive area (NEA) when a nuclear explosive is not protected by a dual-lock system or other NES-approved security system. The TPC is also required in the Metrology Laboratory as specified in Chapter II paragraph 2.c of this Manual. Site offices may also require TPC protection for other operations.	1. BASIC REQUIREMENTS. The two-person concept (TPC) is implemented to ensure no lone individual has unrestricted access to a nuclear explosive. A TPC team must be in the nuclear explosive area (NEA) when a nuclear explosive is not protected by a dual-lock system or other NES-approved security system. The TPC is also required in the Metrology Laboratory as specified in Attachment 3 paragraph 2.c of this Order and for certain NELA assembly steps as specified in Attachment 4 paragraphs 3 and 4 of this Order. NNSA Field Element Offices may also require TPC protection for other operations.	Revised.
Each person on a two-person concept team must— a. be certified in the Human Reliability Program, b. have authorized access to the NEA, c. have technical knowledge of the task being performed, d. be knowledgeable of pertinent safety and security requirements, and e. be in a position to detect incorrect or unauthorized acts and take appropriate action.	*No change from DOE M 452.2-1A.*	
2. IMPLEMENTATION OPTIONS. The two-person concept may be	*No change from DOE M 452.2-1A.*	

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implemented using either zone coverage or person-to-person coverage.		
a. Zone Coverage. Zone coverage is a term used to identify two-person concept implementation that meets the basic requirements of paragraph 1 without the additional requirements specified to protect configurations that require person-to-person coverage.	*No change from DOE M 452.2-1A.*	
b. Person-to-Person Coverage. Person-to-person coverage is the more stringent form of the two-person concept. Person-to-person coverage is designed to protect configurations that are particularly vulnerable to inadvertent acts (errors of omission or commission) or deliberate unauthorized acts.	*No change from DOE M 452.2-1A.*	
(1) Configurations requiring person-to-person coverage must be determined based on specific system characteristics. The application of person-to-person coverage allows recognition of the protection provided by design safety features [such as insensitive high explosive (IHE), coded-signal-controlled detonators, and unique-signal-operated strong-link devices] and physical protection (such as closed shipping and storage containers and specially designed covers).	*No change from DOE M 452.2-1A.*	
(2) Configurations requiring person-to-person coverage include the following:	*No change from DOE M 452.2-1A.*	

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(a) Exposed conventional high explosive (CHE) main charge in an NEA. (b) Main charge high explosives (HEs), both CHE and IHE, with accessible detonator cable assemblies in an NEA. (c) Nuclear explosives connected to Category 1 electrical equipment. (Category 1 electrical equipment is described in Chapter II, paragraph 2, of this Manual.)		
3. WHEN TO APPLY PERSON-TO-PERSON COVERAGE.	*No change from DOE M 452.2-1A.*	
a. Assembly/Disassembly Operations Involving Conventional High Explosive. (1) For assembly operations involving CHE main charge, person-to-person coverage of the CHE components must begin when the CHE container is opened in an NEA. (2) Coverage continues until the nuclear explosive is in a configuration in which the application of design-specific environmental stimuli or unique or coded signals is necessary for nuclear detonation or detonation of the main charge HE. (3) For disassembly operations, this requirement applies in reverse.	*No change from DOE M 452.2-1A.*	
b. Assembly/Disassembly Operations Involving Insensitive High Explosive.	*No change from DOE M 452.2-1A.*	

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(1) For assembly operations involving IHE main charge, person-to-person coverage must be provided for main charge components located in an NEA, and assemblies containing these components, that have accessible detonator cables attached. (2) Coverage continues until the nuclear explosive is in a configuration in which the application of design-specified environmental stimuli or unique or coded signals is necessary for nuclear detonation or detonation of the main charge HE. (3) For disassembly operations this requirement applies in reverse.		
c. For purposes of person-to-person coverage, systems with installed and unactuated (safe/reset) mechanical safe and arm detonators are not considered to have accessible detonator cables. Configurations with physical protection that precludes immediate and unrestricted access to the configuration by a lone individual are not considered to be exposed. When such physical protection is in place, zone coverage provides adequate protection for configurations that would otherwise require person-to-person coverage.	*No change from DOE M 452.2-1A.*	
4. HOW TO APPLY PERSON-TO-PERSON COVERAGE.	*No change from DOE M 452.2-1A.*	

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When a configuration requires person-to-person coverage, a qualified two-person concept team must be either working on or controlling access to the configuration. Specific person-to-person coverage requirements are as follows.	*No change from DOE M 452.2-1A.*	
a. Lone individuals must not be allowed within the immediate vicinity (approximately 6 feet) of a configuration that requires person-to-person coverage.	*No change from DOE M 452.2-1A.*	
b. The two people providing person-to-person coverage must each be responsible for the safe conduct of the operations.	*No change from DOE M 452.2-1A.*	
c. During the performance of operations on a configuration requiring person-to-person coverage—	*No change from DOE M 452.2-1A.*	
(1) the two-person concept team must be in the immediate vicinity of the configuration;	*No change from DOE M 452.2-1A.*	
(2) each person on the two-person concept team must observe all operations, ensure that only authorized operations are performed, and ensure that operations are performed correctly; and	*No change from DOE M 452.2-1A.*	
(3) a reader-worker process that includes the following must be incorporated. (a) The procedure must be read aloud, the operation must be performed, and the completion of the operation must be documented in the stated sequence. (b) One of the two people performing the operation may read the procedure aloud to the other person provided that both people can move away from the immediate vicinity of the configuration while the reading is accomplished. (c) If both people cannot move away from the immediate vicinity of the configuration while the reading is	*No change from DOE M 452.2-1A.*	

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accomplished, then a third person must read the procedure aloud to the other people.		
d. When operations are not being performed on a configuration requiring person-to-person coverage—	*No change from DOE M 452.2-1A.*	
(1) the two-person concept team must be in the immediate vicinity of the configuration when another individual is in the immediate vicinity of the configuration; (2) the two-person concept team is not required to be in the immediate vicinity of the configuration when other individuals are not in the immediate vicinity of the configuration. However, team members must remain in a position to directly observe the approach of any individual to the configuration.	*No change from DOE M 452.2-1A.*	
e. Only one configuration requiring person-to-person coverage is allowed in a vacated bay or cell. This requirement does not apply to emergency evacuations.	*No change from DOE M 452.2-1A.*	
CHAPTER II. ELECTRICAL EQUIPMENT	**ELECTRICAL EQUIPMENT REQUIREMENTS**	Chapter II of DOE M452.2-1A incorporated as Attachment 3 of DOE O 452.2E.
1. BASIC REQUIREMENTS. For purposes of defining electrical equipment requirements, this Manual categorizes electrical equipment used in NEAs as Category 1, Category 2, or Category 3. Electrical equipment categorization is intended to ensure that controls are implemented commensurate with the various levels of potential electrical threat.	*No change from DOE M 452.2-1A.*	
2. CATEGORY 1 ELECTRICAL EQUIPMENT. Electrical equipment intended for connection to an electrical circuit of a nuclear explosive or HE	*No change from DOE M 452.2-1A.*	

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subassembly is referred to as "Category 1 electrical equipment." Category 1 electrical equipment must be clearly identified and meet the following minimum requirements.		
a. <u>General Requirements</u>.	*No change from DOE M 452.2-1A.*	
(1) Category 1 electrical equipment must have a safety requirements document that identifies the safety features.	*No change from DOE M 452.2-1A.*	
(2) Category 1 electrical equipment must use the lowest practical values of internal and output currents and voltages.	*No change from DOE M 452.2-1A.*	
(3) Category 1 electrical equipment must not apply unacceptable stimuli as the result of a single-point failure.	*No change from DOE M 452.2-1A.*	
(4) Each item of Category 1 electrical equipment must have safety characteristics independent of the nuclear explosive's safety features.	*No change from DOE M 452.2-1A.*	
(5) Each item of Category 1 electrical equipment and its interface with a nuclear explosive require the performance and documentation of a comprehensive safety analysis, including consideration of relevant abnormal environments.	*No change from DOE M 452.2-1A.*	
(6) Each drawing issue of Category 1 electrical equipment and its interface with a nuclear explosive requires a completed NES evaluation.	*No change from DOE M 452.2-1A.*	
(7) Procedures must be established to operate, control, calibrate, maintain, and store Category 1 electrical equipment.	*No change from DOE M 452.2-1A.*	
(8) A record of approved Category 1 electrical equipment must be established and maintained. The record must identify each item of Category 1 electrical equipment by	*No change from DOE M 452.2-1A.*	

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its unique designation and/or part number and associate it with the nuclear explosives for which it is authorized and the NES evaluations that examined its specific applications.		
b. Computer-Controlled Electrical Equipment.	*No change from DOE M 452.2-1A.*	
(1) Software must not be relied upon to assure the safe state of the unit under test. If software is used to achieve a safe state then a separate means of verification must also be employed.	*No change from DOE M 452.2-1A.*	
(2) Testers must be designed such that software is incapable of causing safety feature bypass.	*No change from DOE M 452.2-1A.*	
(3) Software failure must not compromise the safety attributes of the equipment or unit under test.	*No change from DOE M 452.2-1A.*	
c. Two-Person Concept. Category 1 electrical equipment requires two-person concept protection. (The TPC is delineated in Chapter I of this Manual.)	c. Two-Person Concept. Category 1 electrical equipment requires two-person concept protection. (The TPC is delineated in Attachment 2 of this Order.)	
(1) Person-to-person coverage is required during calibration and all operations that afford internal access to Category 1 electrical equipment and associated cables and adapters, and while Category I electrical equipment is connected to a nuclear explosive.	*No change from DOE M 452.2-1A.*	
(2) Zone coverage is required for fully assembled Category 1 electrical equipment and associated cables and adapters when that equipment is not protected by a dual-lock system or other NES-approved security system.	*No change from DOE M 452.2-1A.*	

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3. CATEGORY 2 ELECTRICAL EQUIPMENT. Electrical equipment that is not intended for connection to an electrical circuit of a nuclear explosive or HE subassembly but makes mechanical connection to, or could come in contact with, a nuclear explosive or HE subassembly is referred to as "Category 2 electrical equipment." Category 2 electrical equipment must be clearly identified and meet the following minimum requirements.	*No change from DOE M 452.2-1A.*	
a. General Requirements.	*No change from DOE M 452.2-1A.*	
(1) Category 2 electrical equipment must not be connected to the electrical circuitry of a nuclear explosive.	*No change from DOE M 452.2-1A.*	
(2) Category 2 electrical equipment must be positioned in a manner to preclude contact with a nuclear explosive except when a mechanical connection is required to perform its intended and authorized function.	*No change from DOE M 452.2-1A.*	
(3) The potential for inadvertent connection between the Category 2 electrical equipment and the nuclear explosive circuitry must be minimized.	*No change from DOE M 452.2-1A.*	
b. Positive Electrical Isolation. Positive electrical isolation must be established and demonstrated for Category 2 electrical equipment that makes a mechanical connection to a nuclear explosive. Electrical isolation must account for both normal and credible abnormal conditions (such as equipment faults or lightning strikes). The electrical isolation scheme used must be clearly identified and documented using one of the following subcategories, listed in	*No change from DOE M 452.2-1A.*	

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priority order.		
(1) Path-on isolation reducing leakage or fault current from electrical energy sources associated with the equipment to a defined safe value. This must be verified annually.	*No change from DOE M 452.2-1A.*	
(2) Path-off isolation reducing leakage or fault current from electrical energy sources associated with the equipment to a defined safe value. This must be verified annually.	*No change from DOE M 452.2-1A.*	
(3) An electrical isolation scheme requiring at least two independent failures before exposing the nuclear explosive to unacceptable leakage or fault current from electrical energy sources associated with the equipment. Each failure mechanism must be identified.	*No change from DOE M 452.2-1A.*	
c. Records. A record of approved Category 2 electrical equipment must be established and maintained. The record must identify each item of Category 2 electrical equipment by its unique designation and/or part number and associate it with the nuclear explosive operations for which it is authorized.	*No change from DOE M 452.2-1A.*	
4. CATEGORY 3 ELECTRICAL EQUIPMENT. Moveable and facility electrical equipment used in an NEA that is not intended for connection to an electrical circuit of a nuclear explosive or HE subassembly and does not make mechanical connection to, and cannot come in contact with, a nuclear explosive or HE subassembly is referred to as "Category 3 electrical equipment."	*No change from DOE M 452.2-1A.*	
5. NES EVALUATIONS AND CHANGE CONTROL. Electrical equipment used in NEAs and proposed changes to electrical equipment, procedures, and interfaces with a nuclear explosive are subject to the NES evaluation and NEO change control processes required by DOE O	5. NES EVALUATIONS AND CHANGE CONTROL. Electrical equipment used in NEAs and proposed changes to electrical equipment, procedures, and	Revised

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452.2D, *Nuclear Explosive Safety*, and detailed in DOE M 452.2-2, *Nuclear Explosive Safety Evaluation Processes*.	interfaces with a nuclear explosive are subject to the NES evaluation and NEO change control processes required by this Order and detailed in NA SD 452.2, *Nuclear Explosive Safety Evaluation Processes*.	
CHAPTER III. NUCLEAR EXPLOSIVE-LIKE ASSEMBLY (NELA) REQUIREMENTS	**NUCLEAR EXPLOSIVE-LIKE ASSEMBLY (NELA) REQUIREMENTS**	Chapter III of DOE M452.2-1A incorporated as Attachment 4 of DOE O 452.2E.
The following requirements support the NELA standards defined in DOE O 452.2D.	This Attachment applies to both Federal and contractor organizations. The following requirements support the NELA standards defined in paragraph 4a(17)(a) of this Order.	Revised.
1. NUCLEAR EXPLOSIVE-LIKE ASSEMBLY DEFINITION.	*No change from DOE M 452.2-1A.*	
An assembly with components representing the main charge HE and pit that has the potential for component substitution resulting in accidental, inadvertent, or deliberate unauthorized assembly or transfer of a nuclear explosive may be considered a NELA.	An assembly with all the following attributes is considered a NELA. a. Designed or intended to represent a nuclear explosive in the U.S. nuclear weapons program in its basic configuration (main charge HE and pit) or any higher level of assembly up to a fully assembled weapon configuration. b. Lacks an arrangement of HE and fissile material capable of producing a nuclear detonation but (if inadequately controlled) has the potential for component or unit substitution resulting in accidental, inadvertent, or deliberate unauthorized assembly or transfer of a nuclear explosive in place of a NELA. c. Resembles a nuclear explosive to the degree that it can be mistaken for a nuclear explosive (without any disassembly). Availability of a simple visual inspection (such as a viewing port to internal components) is adequate to assure that an item would not be mistaken for an actual nuclear explosive. d. Possesses weight such that the NELA cannot be readily	Revised.

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	distinguished from the nuclear explosive it represents.	
a. A NELA represents a nuclear explosive in the U.S. nuclear weapons program, including assemblies for development, testing, training, or other purposes.		Deleted.
b. A NELA contains one of the following.	2. NUCLEAR EXPLOSIVE-LIKE ASSEMBLY TYPES. There are three types of NELAs:	Revised, reordered, and renumbered.
(1) Mock HE and high-fidelity dummy pit—referred to as an "Inert NELA."	a. A "High Explosive NELA" contains live HE main charge and dummy pit, void, or other non-nuclear items in place of the live pit.	Revised, reordered, and renumbered.
(2) Live HE and high-fidelity dummy pit—referred to as a "High Explosive NELA."	b. An "Inert-with-Live-Pit NELA" contains a live pit and mock HE, void, or substitute non-explosive material in place of the main charge.	Revised, reordered, and renumbered.
(3) Mock HE and live pit—referred to as an "Inert-with-Live-Pit NELA."	c. An "Inert NELA" contains mock HE, void, or substitute non-explosive material in place of the main charge and a dummy pit, void, or other non-nuclear items in place of the live pit.	Revised, reordered, and renumbered.
2. <u>ASSEMBLY/DISASSEMBLY OF NUCLEAR EXPLOSIVE-LIKE ASSEMBLIES</u>. NELAs must not be assembled or disassembled in close proximity to nuclear explosives where components may be interchanged. A two-person concept team is required to perform all assembly/disassembly operations on Inert-with-Live-Pit NELAs.	3. <u>ASSEMBLY/DISASSEMBLY OF NUCLEAR EXPLOSIVE-LIKE ASSEMBLIES</u>. NELAs must not be assembled or disassembled in close proximity to nuclear explosives where components may be interchanged. A two-person concept team is required to perform all assembly/disassembly operations on Inert-with-Live-Pit NELAs.	Renumbered.
3. <u>VERIFICATION OF NUCLEAR EXPLOSIVE-LIKE ASSEMBLY COMPONENTS BEFORE ASSEMBLY</u>.	4. <u>VERIFICATION OF NUCLEAR EXPLOSIVE-LIKE ASSEMBLY COMPONENTS BEFORE ASSEMBLY</u>.	Renumbered.
a. <u>Inert Nuclear Explosive-Like Assemblies</u>.	c. <u>Inert Nuclear Explosive-Like Assemblies</u>.	Reordered to Section 4c.
Repetition of verification requirements of this section is not necessary for repeated disassembly and reassembly training operations provided the mock HE and high-fidelity dummy pit remain in a training area where main charge HE and live pits are not authorized.	Repetition of verification requirements of this section is not necessary for repeated disassembly and reassembly training operations provided the mock HE and high-fidelity dummy pit remain in a training area where main charge HE and live pits are not authorized.	Reordered to Section 4c.

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	Verification requirements of this section are not necessary for NELA configurations for which physical dimensions preclude substitution of live main charge and pit components.	Added to Section 4c.
(1) Mock High Explosive Verification Requirements.	*No change from DOE M 452.2-1A.*	Reordered to Section 4c.
(a) All mock HE used in place of live main charge HE must be non-detonable and must be clear or colored pink. Where possible, preference must be given to noncombustible formulations. Live main charge HE must not be colored pink.	*No change from DOE M 452.2-1A.*	Reordered to Section 4c.
(b) Pink mock HE used in place of live main charge HE must be chemically verified before assembling the NELA. Clear mock HE refers to LEXAN or similar inert substances and does not require chemical verification.	*No change from DOE M 452.2-1A.*	Reordered to Section 4c.
(c) An auditable record of chemical verification of the pink mock HE must be available.	*No change from DOE M 452.2-1A.*	Reordered to Section 4c.
(2) High-Fidelity Dummy Pit Verification Requirements.	*No change from DOE M 452.2-1A.*	Reordered to Section 4c.
(a) Before assembly into an Inert NELA, the pit must be verified by radiation detection means to verify the absence of radioactive material. If radiation is detected, the pit must be assayed by using gamma spectrometry/multi-channel analyzer to verify the absence of fissile material. This verification must be either performed or observed using person-to-person coverage.	(a) Before assembly into an Inert NELA, the pit must be verified by radiation detection means to verify the absence of radioactive material. If radiation is detected, the pit must be assayed by using gamma spectrometry/multi-channel analyzer to verify the absence of fissile material. This verification must be either performed or observed by a two-person concept team.	Reordered to Section 4c. Person-to-person requirement changed to TPC.
(b) After dummy pit verification, the pit must be controlled until the pit is assembled into the basic NELA configuration or until the pit is delivered into an assembly area where live pits are not authorized. This control must be achieved by a two-person concept team or a dual-lock or other NES-approved security system.	*No change from DOE M 452.2-1A.*	Reordered to Section 4c.
(c) An auditable record of radiation detection verification of the high-fidelity dummy pit must be available.	*No change from DOE M 452.2-1A.*	Reordered to Section 4c.
b. High Explosive Nuclear Explosive-Like Assemblies.	a. High Explosive Nuclear Explosive-Like Assemblies.	Reordered to Section 4a.
High Explosive NELAs and Inert-with-Live-Pit NELAs must not be assembled or disassembled in close proximity where components may		Reordered to Section 4a.

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be interchanged.		
	Verification requirements of this section are not necessary for NELA configurations for which physical dimensions preclude substitution of a live pit.	Added.
(1) High-Fidelity Dummy Pit Verification Requirements.	*No change from DOE M 452.2-1A.*	Reordered to Section 4a.
(a) Before assembly into a High Explosive NELA, the pit must be verified by radiation detection means to verify the absence of radioactive material. If radiation is detected, the pit must be assayed by using gamma spectrometry/multi-channel analyzer to verify the absence of fissile material. This verification must be either performed or observed using person-to-person coverage.	(a) Before assembly into a High Explosive NELA, the pit must be verified by radiation detection means to verify the absence of radioactive material. If radiation is detected, the pit must be assayed by using gamma spectrometry/multi-channel analyzer to verify the absence of fissile material. This verification must be either performed or observed by a two-person concept team.	Reordered to Section 4a. Person-to-person requirement changed to TPC.
(b) After dummy pit verification, the pit must be controlled until the pit is assembled into the basic NELA configuration. This control must be achieved by a two-person concept team or a dual-lock or other NES-approved security system.	*No change from DOE M 452.2-1A.*	Reordered to Section 4a.
(c) An auditable record of radiation detection verification of the high-fidelity dummy pit must be available.	*No change from DOE M 452.2-1A.*	Reordered to Section 4a.
(2) Main Charge High Explosive Introduction Sequence.	*No change from DOE M 452.2-1A.*	Reordered to Section 4a.
The high-fidelity dummy pit verification must be accomplished before introduction of the main charge HE and dummy pit into the same immediate assembly area of the High Explosive NELA.	*No change from DOE M 452.2-1A.*	Reordered to Section 4a.
c. Inert-with-Live-Pit Nuclear Explosive-Like Assemblies.	b. Inert-with-Live-Pit Nuclear Explosive-Like Assemblies.	Reordered to Section 4b.
Inert-with-Live-Pit NELAs and High Explosive NELAs must not be assembled or disassembled in close proximity where components may be interchanged.	*No change from DOE M 452.2-1A.*	Reordered to Section 4b.
(1) Mock High Explosive Verification Requirements.	*No change from DOE M 452.2-1A.*	Reordered to Section 4b.
(a) All mock HE used in place of live main charge HE must be non-detonable and must be clear or colored pink. Where possible, preference must be given to noncombustible formulations. Live main charge HE must not be colored pink.	*No change from DOE M 452.2-1A.*	Reordered to Section 4b.

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(b) Pink mock HE used in place of live main charge HE must be chemically verified before assembling the NELA. Clear mock HE refers to LEXAN or similar inert substance and does not require chemical verification.	*No change from DOE M 452.2-1A.*	Reordered to Section 4b.
(c) An auditable record of chemical verification of the mock HE must be available.	*No change from DOE M 452.2-1A.*	Reordered to Section 4b.
(2) Mock High Explosive Two-Person Concept Verification Requirements.	*No change from DOE M 452.2-1A.*	Reordered to Section 4b.
(a) In addition to the mock HE verification requirements, another chemical verification of all mock HE used in place of live main charge HE must be accomplished before assembly into an Inert-with-Live-Pit NELA. This verification must be either performed or observed using person-to-person coverage	(a) In addition to the mock HE verification requirements, another chemical verification of all mock HE used in place of live main charge HE must be accomplished before assembly into an Inert-with-Live-Pit NELA. This verification must be either performed or observed by a two-person concept team.	Reordered to Section 4b. Person-to-person requirement changed to TPC.
(b) After the mock HE two-person concept verification, the mock HE must be controlled until the mock HE is assembled into the basic NELA configuration. This control must be achieved by a two-person concept team or a dual-lock or other NES-approved security system.	*No change from DOE M 452.2-1A.*	Reordered to Section 4b.
(c) An auditable record of two-person concept chemical verification of the mock HE must be available.	*No change from DOE M 452.2-1A.*	Reordered to Section 4b.
(3) Live Pit Introduction Sequence. The mock HE verifications required by paragraphs 3c(1) and 3c(2) must be accomplished before introduction of the live pit and mock HE into the same immediate assembly area of the Inert-with-Live-Pit NELA.	(3) Live Pit Introduction Sequence. The mock HE verifications required by paragraphs 4c(1) and 4c(2) must be accomplished before introduction of the live pit and mock HE into the same immediate assembly area of the Inert-with-Live-Pit NELA.	Revised and reordered to Section 4b.
4. OFFSITE TRANSPORTATION OF NUCLEAR EXPLOSIVE-LIKE ASSEMBLIES.	5. OFFSITE TRANSPORTATION OF NUCLEAR EXPLOSIVE-LIKE ASSEMBLIES.	Renumbered.
a. Inert-with-Live-Pit NELA Transfer Restriction.	*No change from DOE M 452.2-1A.*	

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A configuration assembled as an Inert-with-Live-Pit NELA must not be transferred to the custody of the Department of Defense.	*No change from DOE M 452.2-1A.*	
b. Identification Requirements.	*No change from DOE M 452.2-1A.*	
NELAs that are shipped between DOE sites must be identified externally (e.g., stencil or tag) with the following information.	*No change from DOE M 452.2-1A.*	
(1) NELA contents identified as one of the following.	*No change from DOE M 452.2-1A.*	
(a) Inert NELA.	(c) Inert NELA.	Reordered and renumbered.
(b) High Explosive NELA.	(a) High Explosive NELA.	Reordered and renumbered.
(c) Inert-with-Live-Pit NELA.	(b) Inert-with-Live-Pit NELA.	Reordered and renumbered.
(2) Name and agency of responsible person at the shipping location.	*No change from DOE M 452.2-1A.*	
(3) Name and agency of person who authorized the shipment at the receiving location.	*No change from DOE M 452.2-1A.*	
c. Permission to Ship Between DOE Agencies.	*No change from DOE M 452.2-1A.*	
The shipping agency must obtain permission from the receiving agency to ship before shipment of a NELA.	*No change from DOE M 452.2-1A.*	
d. Nuclear Explosive-Like Assembly Survey Before Transfer.	*No change from DOE M 452.2-1A.*	
(1) Before offsite transfer of a NELA, the NELA must be surveyed in its shipping configuration by radiation detection means to verify the absence or presence of fissile material. Anomalies or ambiguities detected by radiation detection means must be resolved before shipment.	*No change from DOE M 452.2-1A.*	
(2) An auditable record of this survey must be available.	*No change from DOE M 452.2-1A.*	
e. Nuclear Explosive-Like Assembly Survey Upon Receipt.	*No change from DOE M 452.2-1A.*	
(1) Upon receipt of a NELA, the NELA must be surveyed in its shipping configuration by a radiation detection means to verify the absence or presence of fissile material. Anomalies	*No change from DOE M 452.2-1A.*	

DOE M 452.2-1A, AdmChg 1, 10Jul13	DOE O 452.2E	Comments
or ambiguities detected by radiation detection means must be resolved before release.		
(2) An auditable record of this survey must be available.	*No change from DOE M 452.2-1A.*	
CHAPTER IV. MARKING REQUIREMENTS	**MARKING REQUIREMENTS**	Chapter IV of DOE M452.2-1A incorporated as Attachment 5 of DOE O 452.2E.
Nuclear explosives and NELAs must be permanently marked in accordance with the following requirements. Additional markings such as serial numbers and configuration identification may also be required by design agencies.	*No change from DOE M 452.2-1A.*	
1. PERMANENT MARKING LEGENDS.	*No change from DOE M 452.2-1A.*	
a. Nuclear Explosives.	*No change from DOE M 452.2-1A.*	
A "NUCLEAR" permanent marking legend must be applied to nuclear explosives (i.e., units containing a live pit and an HE main charge).	*No change from DOE M 452.2-1A.*	
b. Nuclear Explosive-Like Assemblies.	*No change from DOE M 452.2-1A.*	
(1) Inert Nuclear Explosive-Like Assemblies. The "INERT" permanent marking is applied to a NELA containing mock HE or void in place of the live main charge HE and a dummy pit or void.	(3) Inert Nuclear Explosive-Like Assemblies. The "INERT" permanent marking is applied to a NELA containing mock HE, void, or substitute non-explosive material in place of the live main charge HE and a dummy pit, void, or other non-nuclear items in place of the live pit.	Reordered and renumbered.
(2) High Explosive Nuclear Explosive-Like Assemblies. The "HIGH EXPLOSIVE" permanent marking is applied to a NELA containing live main charge HE and a dummy pit or void.	(1) High Explosive Nuclear Explosive-Like Assemblies. The "HIGH EXPLOSIVE" permanent marking is applied to a NELA containing live main charge HE and a dummy pit, void, or other non-nuclear items in place of the live pit.	Reordered and renumbered.
(3) Inert-with-Live-Pit Nuclear Explosive-Like Assemblies. The "INERT-WITH-LIVE-PIT" permanent marking is applied to a NELA containing mock HE, in place of the live main charge HE, and a live pit.	(2) Inert-with-Live-Pit Nuclear Explosive-Like Assemblies. The "INERT-WITH-LIVE-PIT" permanent marking is applied to a NELA containing a live pit and mock HE, void, or substitute non-explosive material in place of the live main charge HE, and a live pit.	Reordered and renumbered.
Note: Using the permanent marking "INERT" or "INERT WITH LIVE PIT" does not preclude the presence of materials that may	*No change from DOE M 452.2-1A.*	

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present a hazard to personnel.		
2. PERMANENT MARKING LOCATION.	*No change from DOE M 452.2-1A.*	
Nuclear explosives and NELAs must be permanently marked on an external surface.	*No change from DOE M 452.2-1A.*	
a. The permanent marking must be on a part that encloses the live main charge or mock HE.	*No change from DOE M 452.2-1A.*	
b. The marking location must be specified by the applicable design agency.	*No change from DOE M 452.2-1A.*	
3. PERMANENT MARKINGS.	*No change from DOE M 452.2-1A.*	
Nuclear explosives and NELAs must be marked in accordance with the following requirements. The particular marking method must be specified by the applicable design agency.	*No change from DOE M 452.2-1A.*	
a. The permanent marking method must produce the most durable mark possible, consistent with acceptable deleterious effect on the material to which the marking is applied.	*No change from DOE M 452.2-1A.*	
(1) The preferred marking methods are mechanical engraving (with or without fill) and impression-die stamping.	*No change from DOE M 452.2-1A.*	
(2) Other acceptable methods are impression freehand, impression sandblast, and surface conversion.	*No change from DOE M 452.2-1A.*	
b. The preferred marking size is ¼-inch characters with ¼-inch spacing between lines, if space permits.	*No change from DOE M 452.2-1A.*	
4. PERMANENT MARKING OBLITERATION.	*No change from DOE M 452.2-1A.*	
When a nuclear explosive or NELA is altered or disassembled to the point that its permanent marking is no longer valid, the permanent marking must be obliterated in accordance with the following requirements.	*No change from DOE M 452.2-1A.*	
	"INERT" markings need not be obliterated provided they are intended to be used for future assembly into "INERT" NELAs and	Added.

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	positive measures are in place to maintain the NELA standards.	
a. Methodology.	*No change from DOE M 452.2-1A.*	
(1) The preferred method of obliteration is overprinting the letter "X" on each letter of the permanent marking legend using the same permanent marking method as that used to apply the original marking.	*No change from DOE M 452.2-1A.*	
(2) If obliteration by overprinting is not feasible for technical reasons, the permanent marking must be removed using a method specified by the applicable design agency.	*No change from DOE M 452.2-1A.*	
b. Components That Will Be Reassembled.	*No change from DOE M 452.2-1A.*	
Permanent marking need not be obliterated on marked components that will be reassembled into the same configuration in accordance with the following requirements.		
(1) General Requirements.	*No change from DOE M 452.2-1A.*	
(a) After the marked component is removed, the disassembled components must be controlled until the disassembled components and marked component are reassembled into the same configuration.	*No change from DOE M 452.2-1A.*	
(b) Control must be achieved by a two-person concept team or a dual-lock or other NES-approved security system.		Deleted.
	(b) Prior to final assembly of a nuclear explosive or NELA, verification of the permanent marking(s) shall be performed and documented by two HRP certified personnel. Dual (or concurrent) verification is acceptable.	Added.
	(c) Positive measures must be in place to ensure that NELA permanently marked components are not inadvertently introduced into areas where nuclear explosive assembly or disassembly operations are ongoing.	Added.
(2) Nuclear Explosives.	*No change from DOE M 452.2-1A.*	
Nuclear explosive components must not be assembled or disassembled in close proximity to NELAs, where components may be interchanged.	*No change from DOE M 452.2-1A.*	
(3) Nuclear Explosive-Like Assemblies.	*No change from DOE M 452.2-1A.*	

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NELAs must not be assembled or disassembled in close proximity to nuclear explosives, where components may be interchanged.	*No change from DOE M 452.2-1A.*	
(a) Inert Nuclear Explosive-Like Assemblies. Inert NELAs must not be assembled or disassembled in close proximity to High Explosive or Inert-with-Live-Pit NELAs, where components may be interchanged.	(c) Inert Nuclear Explosive-Like Assemblies. Inert NELAs must not be assembled or disassembled in close proximity to High Explosive or Inert-with-Live-Pit NELAs, where components may be interchanged.	Reordered and renumbered.
(b) High Explosive Nuclear Explosive-Like Assemblies. High Explosive NELAs must not be assembled or disassembled in close proximity to Inert or Inert-with-Live-Pit NELAs, where components may be interchanged.	(b) Inert-with-Live-Pit Nuclear Explosive-Like Assemblies. Inert-with-Live-Pit NELAs must not be assembled or disassembled in close proximity to High Explosive or Inert NELAs, where components may be interchanged	Reordered and renumbered.
(c) Inert-with-Live-Pit Nuclear Explosive-Like Assemblies. Inert-with-Live-Pit NELAs must not be assembled or disassembled in close proximity to High Explosive or Inert NELAs, where components may be interchanged.	(a) Inert Nuclear Explosive-Like Assemblies. Inert NELAs must not be assembled or disassembled in close proximity to High Explosive or Inert-with-Live-Pit NELAs, where components may be interchanged	Reordered and renumbered.
Contractor Requirements Document **DOE M 452.2-1A**		Deleted. CRD for DOE M 452.2-1A deleted.
This Contractor Requirements Document (CRD) establishes the requirements for Department of Energy (DOE) contractors, including National Nuclear Security Administration (NNSA) contractors, whose contracts involve the performance, management, oversight, or direct support of DOE/NNSA nuclear explosive operations (NEOs) or associated activities.		Deleted.
Regardless of the performer of the work, the contractor is responsible for complying with the requirements of this CRD. The contractor is responsible for flowing down the requirements of this CRD to subcontractors at any tier to the extent necessary to ensure the contractor's compliance with the requirements.		Deleted.
		Deleted.

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All contractors with this CRD incorporated in their contracts must comply with the following requirements.		Deleted.
1. TWO-PERSON CONCEPT.		Deleted.
Contractors responsible for NEOs and associated activities and facilities must establish and implement the two-person concept to ensure no lone individual has unrestricted access to a nuclear explosive.		Deleted.
a. Basic Requirements. A two-person concept team must be in the nuclear explosive area (NEA) when a nuclear explosive is not protected by a dual-lock system or other NES-approved security system. Two-person concept coverage is also required in the Metrology Laboratory as specified in paragraph 2a(3) of this CRD. Contractors must also establish and implement two-person concept protection for other operations as required by the site office.		Deleted.
Contractors must ensure that each person on a two-person concept team—		Deleted.
(1) is certified in the Human Reliability Program,		Deleted.
(2) has authorized access to the NEA,		Deleted.
(3) has technical knowledge of the task being performed,		Deleted.
(4) is knowledgeable of pertinent safety and security requirements, and		Deleted.
(5) is in a position to detect incorrect or unauthorized acts and take appropriate action.		Deleted.
b. Implementation Options. Contractors must ensure appropriate implementation of the two-person concept using either zone coverage or person-to-person coverage.		Deleted.
(1) Zone Coverage. Zone coverage is a term used to identify two-person concept implementation that meets the basic requirements of paragraph 1a without the		Deleted.

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additional requirements specified to protect configurations that require person-to-person coverage.		
(2) Person-to-Person Coverage. Person-to-person coverage is the more stringent form of the two-person concept. Person-to-person coverage is designed to protect configurations that are particularly vulnerable to inadvertent acts (errors of omission or commission) or deliberate unauthorized acts.		Deleted.
(a) Configurations requiring person-to-person coverage must be based on specific system characteristics. The application of		Deleted.
person-to-person coverage allows recognition of the protection provided by design safety features [such as insensitive high explosive (IHE), coded-signal-controlled detonators, and unique-signal-operated strong-link devices] and physical protection (such as closed shipping and storage containers and specially designed covers).		Deleted.
(b) Configurations requiring person-to-person coverage include the following.		Deleted.
1 Exposed conventional high explosive (CHE) main charge in an NEA.		Deleted.
2 Main charge high explosives (both CHE and IHE) with accessible detonator cable assemblies in an NEA.		Deleted.
3 Nuclear explosives connected to Category 1 electrical equipment. (Category 1 electrical equipment is described in paragraph 2.a of this CRD.)		Deleted.
c. When to Apply Person-to-Person Coverage. Contractors must use the following guidance to		Deleted.

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determine when person-to-person coverage is needed.		
(1) Assembly/Disassembly Operations Involving Conventional High Explosive.		Deleted.
(a) For assembly operations involving CHE main charge, person-to-person coverage of the CHE components begins when the CHE container is opened in an NEA.		Deleted.
(b) Coverage must continue until the nuclear explosive is in a configuration in which the application of design-specific environmental stimuli or unique or coded signals is necessary for nuclear detonation or detonation of the main charge HE.		Deleted.
(c) For disassembly operations, this requirement applies in reverse.		Deleted.
(2) Assembly/Disassembly Operations Involving Insensitive High Explosive.		Deleted.
(a) For assembly operations involving IHE main charge, contractors must ensure person-to-person coverage for main charge components located in an NEA, and assemblies containing these components, that have accessible detonator cables attached.		Deleted.
(b) Coverage must continue until the nuclear explosive is in a configuration in which the application of design-specified environmental stimuli or unique or coded signals is necessary for nuclear detonation or detonation of the main charge HE.		Deleted.
(c) For disassembly operations, this requirement applies in reverse.		Deleted.

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(3) For purposes of person-to-person coverage, systems with installed and unactuated (safe/reset) mechanical safe and arm detonators are not considered to have accessible detonator cables. Configurations with physical protection that precludes immediate and unrestricted access to the configuration by a lone individual are not considered exposed. When such physical protection is in place, zone coverage provides adequate protection for configurations that would otherwise require person-to-person coverage.		Deleted.
d. How to Apply Person-to-Person Coverage. When a configuration requires person-to-person coverage, contractors must ensure a qualified two-person concept team is either working on or controlling access to the configuration so that the following coverage requirements are met.		Deleted.
(1) No lone individual is allowed within the immediate vicinity (approximately 6 feet) of a configuration that requires person-to-person coverage.		Deleted.
(2) The two people providing person-to-person coverage are each responsible for the safe conduct of the operations.		Deleted.
(3) During the performance of operations on a configuration requiring person-to-person coverage—		Deleted.
(a) the two-person concept team must be in the immediate vicinity of the configuration;		Deleted.
(b) each person on the two-person concept team must observe all operations, ensure that only authorized operations are performed, and ensure that operations are performed correctly; and		Deleted.
(c) a reader-worker process		Deleted.

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that includes the following must be incorporated.		
1 The procedure must be read aloud, the operation must be performed, and the completion of the operation must be documented in the stated sequence. 2 One of the two people performing the operation may read the procedure aloud to the other person provided that both people can move away from the immediate vicinity of the configuration while the reading is accomplished. 3 If both people cannot move away from the immediate vicinity of the configuration while the reading is accomplished, then a third person must read the procedure aloud to the other people.		Deleted.
(4) When operations are not being performed on a configuration requiring person-to-person coverage—		Deleted.
(a) the two-person concept team must be in the immediate vicinity of the configuration when another individual is in the immediate vicinity of the configuration and		Deleted.
(b) the team members must remain in a position to observe the approach of any individual to the configuration.		Deleted.
(5) Only one configuration requiring person-to-person coverage is allowed in a vacated bay or cell. This requirement does not apply to emergency evacuations.		Deleted.
2. ELECTRICAL EQUIPMENT.		Deleted.
Contractors responsible for NEOs and associated activities and facilities must establish and implement controls for electrical		Deleted.

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equipment used in NEAs commensurate with the various levels of potential electrical threat. For this purpose, NNSA recognizes three categories of electrical equipment used in NEAs.		
a. Category 1 Electrical Equipment. Electrical equipment intended for connection to an electrical circuit of a nuclear explosive or HE subassembly is referred to as "Category 1 electrical equipment." Contractors must ensure Category 1 electrical equipment is clearly identified and meets the following minimum requirements.		Deleted.
(1) General Requirements.		Deleted.
(a) Category 1 electrical equipment must have a safety requirements document that identifies the safety features.		Deleted.
(b) Category 1 electrical equipment must use the lowest practical values of internal and output currents and voltages.		Deleted.
(c) Category 1 electrical equipment must not apply unacceptable stimuli as a result of a single-point failure.		Deleted.
(d) Category 1 electrical equipment must have safety characteristics independent of the nuclear explosive's safety features.		Deleted.
(e) Each item of Category 1 electrical equipment and its interface with a nuclear explosive must have a comprehensive safety analysis, including consideration of relevant		Deleted.

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abnormal environments.		
(f) Each drawing issue of Category 1 electrical equipment and its interface with a nuclear explosive must have a NES evaluation.		Deleted.
(g) Procedures must be established to operate, control, calibrate, maintain, and store the Category 1 electrical equipment.		Deleted.
(h) A record of approved Category 1 electrical equipment must be established and maintained. The record must identify each item of Category 1 electrical equipment by its unique designation and/or part number and associate it with the nuclear explosives for which it is authorized and the NES evaluations that examined its specific applications.		Deleted.
(2) Computer-controlled Category 1 electrical equipment must be designed as follows:		Deleted.
(a) Software must not be relied upon to assure the safe state of the unit under test. If software is used to achieve a safe state then a separate means of verification must also be employed.		Deleted.

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(b) Testers must be designed such that software is incapable of causing safety feature bypass.		Deleted.
(c) Software failure must not compromise the safety attributes of the equipment or unit under test.		Deleted.
(3) Two-Person Concept. Contractors must ensure that Category 1 electrical equipment is protected by implementation of the TPC as delineated in paragraph 1 of this CRD.		Deleted.
(a) Person-to-person coverage is required during calibration and all operations that afford internal access to equipment and associated cables and adapters, and while Category 1 electrical equipment is connected to a nuclear explosive.		Deleted.
(b) Zone coverage is required for fully assembled Category 1 electrical equipment and associated cables and adapters when that equipment is not protected by a dual-lock system or other NES-approved security system.		Deleted.
		Deleted.
b. Category 2 Electrical Equipment. Electrical equipment that is not intended for connection to an electrical circuit of a nuclear explosive or HE subassembly but makes mechanical connection to, or could come in contact with, a nuclear explosive or HE subassembly is referred to as "Category 2 electrical equipment." Contractors must ensure Category 2 electrical equipment is clearly identified and meets the following minimum requirements.		Deleted.

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(1) General Requirements.		Deleted.
(a) Category 2 electrical equipment must not be connected to the electrical circuitry of a nuclear explosive.		Deleted.
(b) Category 2 electrical equipment must be positioned in a manner to preclude contact with a nuclear explosive except when a mechanical connection is required to perform its intended and authorized function.		Deleted.
(c) The potential for inadvertent connection between Category 2 electrical equipment and the nuclear explosive circuitry must be minimized.		Deleted.
(2) Positive Electrical Isolation. Contractors must ensure positive electrical isolation is established and demonstrated for Category 2 electrical equipment that makes a mechanical connection to a nuclear explosive. Electrical isolation must account for both normal and credible abnormal conditions (such as equipment faults or lightning strikes). Contractors must ensure the electrical isolation scheme used is clearly identified and documented using one of the following subcategories, listed in priority order.		Deleted.
(a) Path-on isolation reducing leakage or fault current from electrical energy sources associated with the equipment to a defined safe value. This must be verified annually.		Deleted.
(b) Path-off isolation reducing leakage or fault current from electrical energy sources associated with the equipment to a		Deleted.

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defined safe value. This must be verified annually.		
(c) An electrical isolation scheme requiring at least two independent failures before exposing the nuclear explosive to unacceptable leakage or fault current from electrical energy sources associated with the equipment. Each failure mechanism must be identified.		Deleted.
(3) Records. Contractors must establish and maintain a record of approved Category 2 electrical equipment. The record must identify each item of Category 2 electrical equipment by its unique designation and/or part number and associate it with the nuclear explosive operations for which it is authorized.		Deleted.
c. Category 3 Electrical Equipment. Moveable and facility electrical equipment used in an NEA that is not intended for connection to an electrical circuit of a nuclear explosive or HE subassembly and does not make mechanical connection to, and cannot come in contact with, a nuclear explosive or HE subassembly is referred to as "Category 3 electrical equipment." Contractors must ensure that Category 3 electrical equipment cannot make physical contact with a nuclear explosive.		Deleted.
d. NES Evaluations and Change Control. Contractors must ensure that all electrical equipment used in an NEA and proposed changes to electrical equipment, procedures, and its interfaces with a nuclear explosive are subject to the NES evaluation and NEO change control processes required by DOE O 452.2D and detailed in DOE M 452.2-2, or its successor directive.		Deleted.
3. NUCLEAR EXPLOSIVE-LIKE ASSEMBLY (NELA) REQUIREMENTS.		Deleted.
To support the NELA Standards in DOE O 452.2D, or its successor		Deleted.

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directive, contractors must ensure the following requirements are met.		
a. Nuclear Explosive-Like Assembly Definition. An assembly with components representing the main charge HE and pit that has the potential for component substitution resulting in accidental, inadvertent, or deliberate unauthorized assembly or transfer of a nuclear explosive may be considered a NELA.		Deleted.
(1) A NELA represents a nuclear explosive in the U.S. nuclear weapons program, including assemblies for development, testing, training, or other purposes.		Deleted.
(2) A NELA contains one of the following.		Deleted.
(a) Mock HE and high-fidelity dummy pit—referred to as an "Inert NELA."		Deleted.
(b) Live HE and high-fidelity dummy pit—referred to as a "High Explosive NELA."		Deleted.
(c) Mock HE and live pit—referred to as an "Inert-with-Live-Pit NELA."		Deleted.
b. Assembly/Disassembly of Nuclear Explosive-Like Assemblies. Contractors must ensure NELAs are not assembled or disassembled in close proximity to nuclear explosives where components may be interchanged. Contractors must ensure a two-person concept team performs all assembly/disassembly operations on Inert-with-Live-Pit NELAs.		Deleted.
c. Verification of Nuclear Explosive-Like Assembly Components before Assembly. Contractors must verify major NELA components before NELA assembly as specified below.		Deleted.
(1) Inert Nuclear Explosive-Like Assemblies. Repetition of the verification requirements of this section is not necessary for repeated disassembly and reassembly training operations provided the mock HE and		Deleted.

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high-fidelity dummy pit remain in a training area where main charge HE and live pits are not authorized.		
(a) Mock High Explosive Verification Requirements		Deleted.
1 All mock HE used in place of live main charge HE must be nondetonable and clear or colored pink. Where possible, preference must be given to noncombustible formulations. Live main charge HE must not be colored pink.		Deleted.
2 Pink mock HE used in place of live main charge HE must be chemically verified before assembling the NELA. Clear mock HE refers to LEXAN or similar inert substance and does not require chemical verification.		Deleted.
3 An auditable record of chemical verification of the pink mock HE must be available.		Deleted.
(b) High-Fidelity Dummy Pit Verification Requirements.		Deleted.
1 Before assembly into an Inert NELA, the pit must be verified by radiation detection means to verify the absence of radioactive material. If radiation is detected, the pit must be assayed using gamma		Deleted.

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spectrometry/multi-channel analyzer to verify the absence of fissile material. This verification must be either performed or observed using person-to-person coverage.		
2 After dummy pit verification, the pit must be controlled until it is assembled into the NELA configuration or until it is delivered into an assembly area where live pits are not authorized. This control must be achieved by a two-person concept team or a dual-lock or other NES-approved security system.		Deleted.
3 An auditable record of radiation detection verification of the high-fidelity dummy pit must be available.		Deleted.
(2) High Explosive Nuclear Explosive-Like Assemblies. Contractors must ensure High Explosive NELAs and Inert-with-Live-Pit NELAs are not assembled or disassembled in close proximity where components may be interchanged.		Deleted.
(a) High-Fidelity Dummy Pit Verification Requirements.		Deleted.
1 Before assembly into a High Explosive NELA, the pit must be verified by radiation detection means to verify the absence of radioactive material. If radiation is		Deleted.

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detected, the pit must be assayed using a gamma spectrometry/multi-channel analyzer to verify the absence of fissile material. This verification must be either performed or observed using person-to-person coverage.		
2 After dummy pit verification, the pit must be controlled until it is assembled into the basic NELA configuration. This control must be achieved by a two-person concept team or a dual-lock or other NES-approved security system.		Deleted.
3 An auditable record of radiation detection verification of the high-fidelity dummy pit must be available.		Deleted.
		Deleted.
(b) Main Charge High Explosive Introduction Sequence. The high-fidelity dummy pit verification must be accomplished before introduction of the main charge HE and dummy pit into the same immediate assembly area of the High Explosive NELA.		Deleted.
(3) Inert-with-Live-Pit Nuclear Explosive-Like Assemblies. Contractors must ensure Inert-with-Live-Pit NELAs and High Explosive NELAs are not assembled or disassembled in close proximity where		Deleted.

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components may be interchanged.		
(a) Mock High Explosive Verification Requirements.		Deleted.
1 All mock HE used in place of live main charge HE must be nondetonable and must be clear or colored pink. Where possible, preference must be given to noncombustible formulations. Live main charge HE must not be colored pink.		Deleted.
2 Pink mock HE used in place of live main charge HE must be chemically verified before assembling the NELA. Clear mock HE refers to LEXAN or similar inert substance and does not require chemical verification.		Deleted.
3 An auditable record of chemical verification of the mock HE must be available.		Deleted.
(b) Mock High Explosive Two-Person Concept Verification Requirements.		Deleted.
1 In addition to the mock HE verification requirements, another chemical verification of all mock HE used in place of live main charge HE must be accomplished before assembly into an Inert-with-Live-Pit NELA.		Deleted.

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This verification must be either performed or observed using person-to-person coverage.		
2 After the mock HE two-person concept verification, the mock HE must be controlled until it is assembled into the basic NELA configuration. This control must be achieved by a two-person concept team or a dual-lock or other NES-approved security system.		Deleted.
3 An auditable record of two-person concept chemical verification of the mock HE must be available.		Deleted.
(c) Live Pit Introduction Sequence. The mock HE and mock HE two-person verifications must be accomplished before introduction of the live pit and mock HE into the same immediate assembly area of the Inert-with-Live-Pit NELA.		Deleted.
d. Offsite Transportation of Nuclear Explosive-Like Assemblies.		Deleted.
(1) Inert-with-Live-Pit NELA Transfer Restriction. Contractors must ensure a configuration assembled as an Inert-with-Live-Pit NELA is not transferred to the custody of the Department of Defense.		Deleted.
(2) Identification Requirements. Contractors must ensure NELAs that are shipped between DOE sites are identified externally (e.g., stencil or tag) with the following information.		Deleted.

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(a) NELA contents identified as one of the following.		Deleted.
1 Inert NELA.		Deleted.
2 High Explosive NELA.		Deleted.
3 Inert-with-Live-Pit NELA.		Deleted.
(b) Name and agency of responsible person at the shipping location.		Deleted.
(c) Name and agency of person who authorized the shipment at the receiving location.		Deleted.
(3) Permission to Ship between DOE Agencies. Contractors must ensure the shipping agency obtains permission from the receiving agency to ship before shipment of a NELA.		Deleted.
(4) Nuclear-Explosive-Like Assembly Survey before Transfer.		Deleted.
(a) Before offsite transfer of a NELA, contractors must ensure the NELA is surveyed in its shipping configuration using radiation detection means to verify the absence or presence of fissile material. Anomalies or ambiguities detected by radiation detection means must be resolved before shipment.		Deleted.
(b) Contractors must ensure an auditable record of this survey is available.		Deleted.
(5) Nuclear Explosive-Like Assembly Survey upon Receipt.		Deleted.
(a) Upon receipt of a NELA, contractors must ensure the NELA is surveyed in its shipping configuration by a radiation detection means to verify the		Deleted.

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absence or presence of fissile material. Anomalies or ambiguities detected by radiation detection means must be resolved before release.		
(b) Contractors must ensure an auditable record of this survey is available.		Deleted.
4. MARKING REQUIREMENTS.		Deleted.
Nuclear explosives and NELAs must be marked to distinguish configurations capable of a nuclear detonation from those that are not. Contractors responsible for NEOs or NELA operations must permanently mark nuclear explosives and NELAs in accordance with the following instructions.		Deleted.
a. Permanent Marking Legends.		Deleted.
(1) Nuclear Explosives. Contractors must ensure a "NUCLEAR" permanent marking legend is applied to nuclear explosives (i.e., units containing a live pit and an HE main charge).		Deleted.
(2) Nuclear Explosive-Like Assemblies.		Deleted.
(a) Inert Nuclear Explosive-Like Assemblies. Contractors must ensure the "INERT" permanent marking is applied to a NELA containing mock HE or void in place of the live main charge HE and a dummy pit or void.		Deleted.
(b) High Explosive Nuclear Explosive-Like Assemblies. Contractors must ensure the "HIGH EXPLOSIVE" permanent marking is applied to a NELA containing live main charge HE and a dummy pit or void.		Deleted.

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(c) Inert-with-Live-Pit Nuclear Explosive-Like Assemblies. Contractors must ensure the "INERT-WITH-LIVE-PIT" permanent marking is applied to a NELA containing mock HE, in place of the live main charge HE, and a live pit.		
b. Permanent Marking Location. Contractors must ensure nuclear explosives and NELAs are permanently marked on an external surface.		Deleted.
(1) The permanent marking must be on a part that encloses the live main charge or mock HE.		Deleted.
(2) The marking location must be specified by the applicable design agency.		Deleted.
c. Permanent Markings. Contractors must ensure nuclear explosives and NELAs are marked in accordance with the following requirements. The particular marking method must be specified by the applicable design agency.		Deleted.
(1) Contractors must ensure the permanent marking method produces the most durable mark possible consistent with acceptable deleterious effect on the material to which the marking is applied.		Deleted.
(a) The preferred marking methods are mechanical engraving (with or without fill) and impression-die stamping.		Deleted.
(b) Other acceptable methods are impression freehand, impression sandblast, and surface conversion.		Deleted.
(2) Contractors should use the preferred marking size, ¼-inch characters with ¼-inch spacing between lines, if space permits.		Deleted.
d. Permanent Marking Obliteration. When a nuclear explosive or NELA is altered or disassembled to the point that its permanent marking is no longer		Deleted.

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valid, contractors must ensure the permanent marking is obliterated in accordance with the following requirements.		
(1) Methodology.		Deleted.
(a) The preferred method of obliteration is overprinting the letter "X" on each letter of the permanent marking legend using the same permanent marking method as that used to apply the original marking.		Deleted.
(b) If obliteration by overprinting is not feasible for technical reasons, contractors must remove the permanent marking using a method specified by the applicable design agency.		Deleted.
(2) Components That Will Be Reassembled. Permanent marking need not be obliterated on marked components that will be reassembled into the same configuration in accordance with the following requirements.		Deleted.
(a) General Requirements.		Deleted.
1 After the marked component is removed, contractors must control the disassembled components until the disassembled components and marked component are reassembled into the same configuration.		Deleted.
2 Contractors must ensure control is achieved by a two-person concept team or a dual-lock or other NES-approved security		Deleted.

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system.		
(b) Nuclear Explosives. Contractors must ensure nuclear explosive components are not assembled or disassembled in close proximity to NELAs, where components may be interchanged.		Deleted.
(c) Nuclear Explosive-Like Assemblies. Contractors must ensure NELAs are not assembled or disassembled in close proximity to nuclear explosives, where components may be interchanged.		Deleted.
1 Inert Nuclear Explosive-Like Assemblies. Contractors must ensure Inert NELAs are not assembled or disassembled in close proximity to High Explosive or Inert-with-Live-Pit NELAs, where components may be interchanged.		Deleted.
2 High Explosive Nuclear Explosive-Like Assemblies. Contractors must ensure High Explosive NELAs are not assembled or disassembled in close proximity to Inert or Inert-with-Live-Pit NELAs, where components may be interchanged.		Deleted.
3 Inert-with-Live-Pit Nuclear Explosive-Like Assemblies. Contractors must ensure Inert-with-Live-Pit NELAs are not		Deleted.

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assembled or disassembled in close proximity to High Explosive or Inert NELAs, where components may be interchanged.		