



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

ORDER

DOE O 420.2

Approved: 11-5-98
Review Date: 11-5-00
[Change 1: 5-26-99](#)

SUBJECT: SAFETY OF ACCELERATOR FACILITIES

1. OBJECTIVE. To establish accelerator-specific safety requirements which, when supplemented by other applicable safety and health requirements, will serve to prevent injuries and illnesses associated with Department of Energy (DOE) accelerator operations.
2. CANCELLATION. DOE 5480.25, SAFETY OF ACCELERATOR FACILITIES, dated 11-3-92.
3. APPLICABILITY.
 - a. DOE Elements. Except for the exclusions in Paragraph 3c, this Order applies to all DOE Elements involved with the operation of accelerators.
 - b. Contractors. Except for the exclusions in Paragraph 3c, the Contractor Requirements Document (CRD), Attachment 1, sets forth requirements that must be applied to all contractors awarded contracts and subcontracts for performing accelerator operations for DOE at DOE-owned or -leased facilities. Contractor compliance with the CRD must be required to the extent set forth in a contract. Contractors must be directed to continue to comply with the requirements of the Order canceled by this Order until their contracts are modified to delete the reference to the requirements of the canceled Order.
 - c. Exclusions.
 - (1) Unmodified commercially available units that are acceptable for industrial applications, including (but not limited to) electron microscopes, ion implant devices, and x-ray generators.
 - (2) Accelerator facilities not capable of creating a “radiological area” as defined in Title 10, Code of Federal Regulations (CFR), Part 835, “Occupational Radiation Protection; Final Rule.”
 - (3) Naval Nuclear Propulsion Program accelerators covered under Executive Order 12344 (42 United States Code 7158 Note).

DISTRIBUTION:
All Departmental Elements

INITIATED BY:
Office of Science

- (4) Non-medical x-ray devices with the capability of accelerating particles to energies not greater than 10 MeV, which are operated in accordance with American National Standards Institute (ANSI) N43.3-1993, *General Radiation Safety—Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies Up to 10 MeV*, or in accordance with another applicable consensus standard as directed by the cognizant Field Element manager.
- (5) Low-voltage neutron generators incapable of creating a “high-radiation area” as defined in 10 CFR 835, “Occupational Radiation Protection; Final Rule,” and which are operated in accordance with National Council on Radiation Protection (NCRP) Report 72-1983, *Radiation Protection and Measurements for Low-Voltage Neutron Generators*, or in accordance with another applicable consensus standard as directed by the cognizant Field Element manager. For the purpose of this Order, a low-voltage neutron generator is defined as a bench-top scale, single-purpose device generating neutrons by accelerating deuterons or tritons into targets through a maximum accelerating potential not greater than 600 kV.
- (6) Entire DOE facilities or portions thereof where DOE 5480.23, NUCLEAR SAFETY ANALYSIS REPORTS, is applied.

4. REQUIREMENTS. DOE Elements must require the following of the contractor:

a. Safety Assessment Document.

- (1) A Safety Assessment Document (SAD) must identify hazards and associated on-site and off-site impacts to workers, the public, and the environment from the facility for both normal operations and credible accidents.
- (2) The SAD must contain sufficient descriptive information and analytical results pertaining to specific hazards and risks identified during the safety analysis process to provide an understanding of risks presented by the proposed operations.
- (3) The SAD must provide appropriate documentation and detailed description of engineered controls (e.g., interlocks and physical barriers) and administrative measures (e.g., training) taken to eliminate, control, or mitigate hazards from operation.
- (4) The SAD must include or reference a description of facility function, location, and management organization in addition to details of major facility components and their operation.

| (5) The SAD must be prepared as a single document addressing the hazards of the entire accelerator facility or as separate SADs prepared for discrete modules of the facility such as injectors, targets, experiments, experimental halls, or **any** other type modules.

(6) The SAD must be maintained current and consistent with the administrative control measures and physical configuration of the facility and major safety equipment.

b. Accelerator Safety Envelope.

(1) A documented Accelerator Safety Envelope (ASE) must define the set of physical and administrative bounding conditions for safe operations based on the safety analysis documented in the SAD.

(2) Any activity violating the ASE must be terminated immediately; the activity must not recommence before DOE has been notified.

c. Unreviewed Safety Issue. Activities that involve an Unreviewed Safety Issue must not be performed if significant safety consequences could result from either an accident or a malfunction of equipment important to safety for which a safety analysis has not been performed. Activities involving an identified Unreviewed Safety Issue must not commence before DOE has provided written approval.

d. Accelerator Readiness Reviews. Accelerator Readiness Reviews (ARRs) must be performed prior to approval for commissioning and routine operation and as directed by the cognizant Secretarial Officer or a Field Element manager.

e. Training and Qualification.

(1) Training and qualification requirements must be established for each individual at an accelerator facility whose activities could affect safety and health conditions or whose safety and health could be affected by facility activities. Training and qualification must be documented and kept current.

(2) Only appropriately trained and qualified personnel, or trainees under the direct supervision of trained and qualified personnel, are permitted to perform tasks that may affect safety and health.

(3) All personnel assigned to or using the accelerator facility (including emergency response personnel) must be trained in the safety and health practices and emergency plans consistent with their involvement and the hazards present.

f. Written Procedures.

- (1) Written procedures that provide clear instructions for safely conducting activities must be maintained current and consistent with management systems and the configuration of the facility and equipment and must be approved by facility senior line manager in the contractor's organization who are actively involved in the day-to-day operation of the facility.
- (2) Written procedures must include a description of the tasks to be performed, appropriate safety and health precautions and controls, and where applicable, requirements for verifying initial conditions, operating conditions to be maintained, and data to be recorded.
- (3) At a minimum, the contractor must prepare procedures for operation startup, normal operation, emergency conditions, conduct of maintenance, approval and conduct of experiments, review and approval of facility modifications, management of safety-related changes, and control of facility access.

g. Internal Safety Review System.

- (1) An internal safety review system must be established and maintained to periodically assess and document the condition of the facility, equipment, and engineered safety systems.
- (2) Appropriateness and implementation of procedures, administrative controls, and personnel training and qualifications must be periodically reviewed and documented by the internal safety review system.

h. Shielding Policy. The contractor must approve and implement a written statement of the shielding policy for ionizing and non-ionizing radiation.5. RESPONSIBILITIES.a. Cognizant Secretarial Officer.

- (1) Approve for an accelerator facility or module thereof that has potential for more than minor on-site or more than negligible off-site impacts to workers, the public, or the environment:
 - (a) ASE,
 - (b) commencement of commissioning activities,
 - (c) commencement of routine operation activities, and
 - (d) exemptions from requirements of this Order.

- (2) Approve recommencement of an activity at an accelerator facility after a shutdown ordered by the DOE cognizant Secretarial Officer or Assistant Secretary for Environment, Safety and Health because of an Unreviewed Safety Issue, violation of an ASE, or other safety concern.
- (3) Provide written guidance to line organizations for implementing the requirements of this Order.

b. DOE Field Element Manager.

- (1) Approve the commencement of commissioning activities for an accelerator facility or module thereof that does not have potential for more than minor on-site or more than negligible off-site impacts to workers, the public, or the environment after—
 - (a) approving a specific ASE upon finding that it will appropriately bound commissioning activities;
 - (b) finding that an appropriate ARR was conducted; and
 - (c) finding that the risks as analyzed in the SAD are acceptable when commissioning activities are conducted within the specified ASE.
- (2) Approve the commencement of routine operation activities for an accelerator facility or module thereof that does not have potential for more than minor on-site or more than negligible off-site impacts to workers, the public, or the environment after—
 - (a) approving the ASE upon finding that it will appropriately bound routine operation activities;
 - (b) finding that an appropriate ARR was conducted; and
 - (c) finding that the risks as analyzed in the SAD are acceptable when routine operation activities are conducted within the specified ASE.
- (3) After performing the duties in Paragraph 5b(1)(b) and 5b(1)(c), recommend DOE cognizant Secretarial Officer approval for commencement of commissioning activities for an accelerator facility or module thereof that has the potential for more than minor on-site or more than negligible off-site impacts to workers, the public, or the environment.

- (4) After performing the duties in Paragraph 5b(2)(b) and 5b(2)(c), recommend DOE cognizant Secretarial Officer approval for commencement of initial routine operation activities for an accelerator facility or module thereof that has the potential for more than minor on-site or more than negligible off-site impacts to workers, the public, or the environment.
 - (5) Approve recommencement of an activity at an accelerator facility after shutdown ordered by a DOE Field Element manager because of an Unreviewed Safety Issue, violation of an ASE, or other safety concern.
 - (6) Approve exemptions from requirements of this Order for an accelerator facility or module thereof that does not have the potential for more than minor on-site or more than negligible off-site impacts to workers, the public, or the environment.
- c. For those activities designated as major or strategic systems, as defined in DOE N 430.1, ENERGY SYSTEM ACQUISITION ADVISORY BOARD PROCEDURES, the approvals as listed in Paragraphs 5a and 5b of this DOE Order must be secured prior to request for approval to start operations by the appropriate Acquisition Executive Authority.
6. CONTACT. Questions concerning this Order should be addressed to the Office of Science, 301-903-6800.

BY ORDER OF THE SECRETARY OF ENERGY:



RICK FARRELL
DIRECTOR OF HUMAN RESOURCES
AND ADMINISTRATION

CONTRACTOR REQUIREMENTS DOCUMENT
DOE O 420.2, SAFETY OF ACCELERATOR FACILITIES

The following items are required of the contractor organization:

a. Safety Assessment Document.

- (1) A Safety Assessment Document (SAD) must identify hazards and associated on-site and off-site impacts to workers, the public, and the environment from the facility for both normal operations and credible accidents.
- (2) The SAD must contain sufficient descriptive information and analytical results pertaining to specific hazards and risks identified during the safety analysis process to provide an understanding of risks presented by the proposed operations.
- (3) The SAD must provide appropriate documentation and detailed description of engineered controls (e.g., interlocks and physical barriers) and administrative measures (e.g., training) taken to eliminate, control, or mitigate risks of operation.
- (4) The SAD must include or reference a description of facility function, location, and management organization in addition to details of major facility components and their operation.
- (5) The SAD must be prepared as a single document addressing the hazards of the entire accelerator facility or as separate SADs prepared for discrete modules of the facility such as injectors, targets, experiments, experimental halls, and other type modules.
- (6) The SAD must be maintained current and consistent with the administrative control measures and physical configuration of the facility and major safety equipment.

b. Accelerator Safety Envelope.

- (1) A documented Accelerator Safety Envelope (ASE) must define the set of physical and administrative bounding conditions for safe operations, based on the safety analysis documented in the SAD.
- (2) Any activity violating the ASE must be terminated immediately; the activity must not recommence before the Department of Energy (DOE) has been notified.

- c. Unreviewed Safety Issue. Activities that involve an Unreviewed Safety Issue must not be performed if significant safety consequences could result from either an accident or a malfunction of equipment important to safety for which a safety analysis has not been performed. Activities involving an identified Unreviewed Safety Issue must not commence before DOE has provided written approval.
- d. Accelerator Readiness Reviews. Accelerator Readiness Reviews (ARRs) must be performed prior to approval for commissioning and routine operation and as directed by the cognizant Secretarial Officer or a Field Element manager.
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 - (1) Training and qualification requirements must be established for each individual at an accelerator facility whose activities could affect safety and health conditions or whose safety and health could be affected by facility activities. Training and qualification must be documented and kept current.
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 - (3) All personnel assigned to or using the accelerator facility (including emergency response personnel) must be trained in the safety and health practices and emergency plans consistent with their involvement and the hazards present.
- f. Written Procedures.
 - (1) Written procedures that provide clear instructions for safely conducting activities must be maintained current and consistent with management systems and the configuration of the facility and equipment and must be approved by facility senior line management in the contractor's organization who are actively involved in the day-to-day operation of the facility.
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 - (1) An internal safety review system must be established and maintained to periodically assess and document the condition of the facility, equipment, and engineered safety systems.
 - (2) Appropriateness and implementation of procedures, administrative controls, and personnel training and qualifications must be periodically reviewed and documented by the internal safety review system.
- h. Shielding Policy. The contractor must approve and implement a written statement of the shielding policy for ionizing and non-ionizing radiation.

5-26-99

SUBJECT: **SAFETY OF ACCELERATOR FACILITIES**

1. **PURPOSE.** To transmit revised pages to DOE O 420.2, SAFETY OF ACCELERATOR FACILITIES, of 11-5-98.
2. **EXPLANATION OF CHANGE.** In Paragraph 4a(5) change the word “and” to “any” and in Paragraph 5b(2)(a) change the acronym “ARR” (Accelerator Readiness Review) to “ASE” (Accelerator Safety Envelope).
3. **FILING INSTRUCTIONS.**
 - a.

<u>Remove Pages</u>	<u>Dated</u>	<u>Insert Page</u>	<u>Dated</u>
3	11-5-98	3	5-26-99
5	11-5-98	5	5-26-99
 - b. After filing the attached pages, this transmittal may be discarded.

BY ORDER OF THE SECRETARY OF ENERGY:



RICK FARRELL
DIRECTOR OF HUMAN RESOURCES
AND ADMINISTRATION