Revision 10

THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY
CEBAF-LERF
ACCELERATOR SAFETY ENVELOPE

April 2025

U.S. DEPARTMENT OF ENERGY
JSA
Prepared for the U.S. Department of Energy under Contract DE-AC05-06OR23177

Approval Page
for the
Thomas Jefferson National Accelerator Facility
CEBAF-LERF Accelerator Safety Envelope
Revision 10

Jefferson Lab Director

Print Kimberly C Sawyer **Date** 05/01/25

Kimberly Sawyer

Associate Director,
Accelerator Operations,
Research and Development
Division

Print Andrei Seryi **Date** 05/01/25

Andrei Seryi (May 1, 2025 17:11 EDT)

Andrei Seryi

Associate Director,
Experimental Nuclear Physics

Douglas Higinbotham acting AD

Print **Date** 2 May 2025

Cynthia "Thia" Keppel

Director,
Environment, Safety, and
Health

Print Paul Gubanc **Date** 05/01/25

Paul Gubanc (May 1, 2025 12:10 EDT)

Paul Gubanc

Director, Facilities
Management and Logistics

Print Kent Hammack **Date** 05/02/25

Kent Hammack (May 2, 2025 07:39 EDT)

Kent Hammack

DOCUMENT REVISIONS

Approvals

All revisions to this document require approval from the Thomas Jefferson Site Office (TJSO).

Major revisions require approvals on a new signature page that includes the Laboratory Director, and Associate Directors of Physics, Accelerator, Environment, Safety, and Health (ES&H) Division, and Facilities Management and Logistics Manager (FM&L). Major revisions are uniquely identified as Revision 7, 8, etc. (the next positive integer). Changes are summarized in the revision history table below.

Interim revisions incorporating minor changes such as clarifications, minor corrections that do not change the intent of the document, and typographical corrections require Jefferson Lab approval by the Associate Director(s) of the affected division(s) and Associate Director, ES&H Division. Minor changes are summarized, and approval indicated in the revision history table below. Interim revisions are identified by adding a letter suffix, e.g. Revision 7a, 7b, 7c, etc.

Revision History

Rev.	Reason for Revision	Approval	Date
10	Revision for implementation of 420.2D: removal of references to 420.2C and replacement with 420.2D, updated FSAD to SAD Rev9, removed and replaced all footnotes regarding "1 Gun high voltage processing and/or cathode re-Cesiation and gun operation (producing electrons at energy up to the applied bias voltage on the gun) is not beam delivery." Added non-beam mode.	See signature Page	4/2025
9	Updated signature requirements to add Facilities Management and Logistics Manager. Removed Moller Polarimeter Vent as Credited Control – no longer required, see USI-2021-0318, and Updated Table 1 for Injector Beam destinations, see SC-2020-1208. Added Acceptable Compensatory Measures to 3.2.1, 3.2.2, and 3.3.7. Clarified Credited Control 3.1.4 Nitrogen Gas Supply Orifices are required for nitrogen service gas distribution system.	See signature Page	05/05/22
8a	Format update and change references to *ES&H Manual Chapter 3130* from *Low Energy Recirculator Facility (LERF) Experiment Safety Review Process* to *Accelerator Experiment Safety Review Process*.	See signature page	10/2019
8	Clarify Applicability Statement to reflect beam delivery to affected segment. Update FEL to LERF. Clarify staffing requirements. Add CEBAF injector modes. Removed Permanent Magnet – no longer required since Hall D Tagger and Hall D share PSS states. Removed language in Section 1.2 on radiation surveys before access – this is only a defense-in-depth control in the FSAD (Rev 7 and 7a). Removed references to Operational Envelopes; these are in the Operational Restrictions database. Added end notes and reference section. Defined the states of the accelerator segments for the condition: "when beam is possible". Refined ODH System Controls.	See signature page	09/2018

Rev.	Reason for Revision	Approval	Date
7	CEBAF Upgrade to 12 GeV and FSAD and ASE revised comply with DOE-O-420.2C.	See signature page	11/2012

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 ASE VIOLATION 1
3.0 CREDITED CONTROLS 2
3.1 Credited Passive Engineered Controls 3
3.1.1 Permanent Shielding 3
3.1.2 Movable Shielding 4
3.1.3 Beam Dump Cooling Building Design 5
3.1.4 Nitrogen Gas Supply Orifices 5
3.1.5 ODH Vents, Lintels, and Facility Configuration 5
3.2 Credited Active Engineered Controls 6
3.2.1 PSS Access Controls 6
3.2.2 CEBAF PSS Beam Containment Controls Addressing Adjacent Segments 7
3.2.3 ODH System Controls 7
3.3 Credited Administrative Controls 8
3.3.1 Doors, Gates, Fences, and Other Barriers 8
3.3.2 Jefferson Lab Experimental Review Processes 9
3.3.3 CEBAF and LERF Minimum Operations Staffing – Sweep and Controlled Access 9
3.3.4 RF Only Operations 10
3.3.5 CEBAF Operations Staffing – Beam up to 1D Spectrometer 10
3.3.6 CEBAF Operations Staffing – Beam up to Faraday Cup #2 11
3.3.7 CEBAF Operations Staffing – Beam to In-line Dump 11
3.3.8 CEBAF Operations Staffing – Beam Beyond Inline Dump 11
3.3.9 LERF Operations Staffing - Beam Operations 11
Document List (In Alphabetical Order) 13
Acronyms 14

1.0 INTRODUCTION

The *Department of Energy (DOE) Order 420.2D Safety of Accelerators* establishes accelerator-specific safety requirements and approval authorities. The ASO requires Thomas Jefferson National Accelerator Facility (Jefferson Lab) to conduct a hazard analysis for accelerator-specific safety risks and identify the controls necessary to mitigate those risks. The accelerator-specific hazard analysis and necessary controls associated with Continuous Electron Beam Accelerator Facility (CEBAF) and Low Energy Recirculator Facility (LERF) operation are provided in the *Jefferson Lab Safety Assessment Document* (SAD) Revision 9a. The set of accelerator-specific controls identified in the safety analysis that are essential for safe accelerator operations are referred to as Credited Controls. These Credited Controls collectively form the bounding conditions for the *Accelerator Safety Envelope* (ASE).

The ASE is approved by the Thomas Jefferson Site Office (TJSO) and is contractually binding for operation of the Jefferson Lab accelerators referenced herein.

2.0 ASE VIOLATION

Operation of the accelerators without the specified credited controls in place and functional is a violation of the ASE. If a Credited Control is inoperable or ineffective, compensatory measures may be used. Acceptable compensatory measures are listed with each Credited Control. Other compensatory measures may be used if those measures are evaluated by the Safety Configuration Management Board (SCMB) and approved by the TJSO. When an ASE violation occurs, beam delivery in the affected segment shall stop and not resume until:

- The situation is investigated and documented in accordance with the Critical Event Response section of the relevant *Accelerator Operations Directives* (AOD) or *Low Energy Recirculator Facility Operations Directives* (LOD), the cause(s) identified, corrective actions or approved compensatory measures implemented, and,
- If conditions are discovered that introduce accelerator specific hazards that are not adequately addressed by the current SAD and this approved ASE, impacted/affected operations must be suspended immediately and put in a safe and stable configuration. Discovered conditions must be addressed using DOE approved measures, as appropriate. DOE must provide written approval for resumption of impacted/affected operations.

If a Credited Control proves to be inoperative or ineffective, and that Credited Control serves more than one segment of the accelerator, operations in all affected segments – up to and including the entire accelerator – shall stop until the actions specified above are taken.

A violation of the ASE is typically very clear. However, there may be minor failures of controls that are less obvious but still constitute a violation of the ASE. Determining whether a condition is a violation or a (less severe) safety concern can be subjective. The following examples of ASE violations are intended to serve as guidance to facilitate such determinations. Judgment may be necessary to evaluate specific situations, and the list below is not comprehensive:

- Surveillance of Credited Controls in an actively used accelerator segment is not conducted in the time frame specified in the ASE.

- Shielding identified as a Credited Control is not in place when beam is delivered in that segment of the accelerator or experimental halls.
- Both independent Personal Safety System (PSS) channels for the same Credited Control are inoperable during beam delivery in the affected segment of the accelerator or experimental halls.
- A locked access (door or gate) serving as a Credited Control (such as the gate to the beam dump cooling building shielding labyrinth) remains unlocked when beam is delivered in the segment of the accelerator or experimental halls that affects the unlocked area.
- Beam is delivered to an experiment without completing the required experimental review process.
- Beam is delivered to an affected segment with less than the minimum specified qualified operations staffing.
- Non-beam operations requiring Credited Controls are undertaken without the required Credited Controls.

The Jefferson Lab Director charters the SCMB to evaluate safety concerns and determine if they represent an ASE violation and/or an Unreviewed Safety Issue (USI). A USI is a condition that may require an update to an existing hazards analysis in the SAD or may require the addition of a new SAD hazard along with new Credited Controls. The SCMB membership incorporates a TJSO Observer.

3.0 CREDITED CONTROLS

Credited Controls mitigate hazards that pose unacceptable risk and reduce that risk to acceptable levels. The Credited Controls identified in the SAD are listed below. These Credited Controls must be in place and functional when required by the state of accelerator operations.

The ASE also specifies the management and surveillance practices that must be performed to assure the continued effectiveness of the Credited Controls. Management and surveillance practices are part of an approved configuration management process that helps to ensure the physical configuration and functionality of Credited Controls remain accurate and in accordance with the analysis and requirements in the SAD. The management and surveillance practices may have a specified frequency. Occasionally, a management and surveillance interval for a Credited Control will expire during a period when an accelerator is operational. Prior to this, the SCMB shall evaluate the condition as a safety concern that represents a USI or a potential ASE violation.

The surveillance interval may be extended with approval of DOE depending on the outcome of the evaluation. If a required management and surveillance interval exceeds one year, the due date for the next required management and surveillance verification will be listed on the current beam authorization.

The same configuration management process is applied to temporary changes during maintenance to ensure that the integrity and performance of Credited Controls is restored before beam delivery. Configuration control is accomplished through Safety Systems Group Procedures, Radiation Control Department (RCD) Procedures, the SCMB, or by the relevant Quality Assurance Program Procedures/Processes. For example, Accelerator Safety is assessed as part of a triennial Assessment cycle incorporated into the Annual Assessment Plan. The management and effectiveness of Credited Controls is evaluated during the triennial cycle.

The application of Credited Controls follows "hierarchy of controls" principles – the controls that are most effective and least prone to failure are applied first. Certain Credited Passive Engineered Controls are listed in the SAD as initial assumptions, that is, they are assumed to be in place and functional prior to the start of accelerator operations - the concrete accelerator enclosure, for example. Administrative controls are either programmatic in nature or are embodied in specific operational procedures. Sections 3.1 – 3.3 below list the Credited Controls applied to the CEBAF and LERF accelerators. These are typically passive engineered controls – physical safety features that are built into the accelerator design. Active engineered controls are used when the control requirements are more complex, interactive, or interdependent. Administrative controls, which are typically programmatic in nature or are embodied in specific processes and procedures, are used last and often in conjunction with engineered controls.

3.1 Credited Passive Engineered Controls

Credited Passive Engineered Controls include physical design features including shielding, physical barriers, flow limiting devices, and vents.

3.1.1 Permanent Shielding

Applicability:

- When beam delivery into the affected CEBAF segment is possible.
- When beam delivery is possible in the LERF and LERF is in Beam Permit.
- When SRF operations are possible in the affected CEBAF segment or the LERF.

Controls:

Permanent shielding:

- Structural shielding, typically reinforced concrete that defines the accelerator enclosure,
- Built in shielding design features: labyrinths and penetration routing,
- Earthen berms and overburden.

Management and Surveillance:

- In accordance with *HPP-OPS-002 Performance of Periodic Routines* and *HPP-OPS-015, Shielding Package Determination and Tracking*, earthen berms and overburden for an accelerator (or a segment of an accelerator) shall be visually inspected prior to operation and the results of the visual inspection shall be recorded in the Jefferson Lab Authorization Manager (JAM) before facility operation.
- Structural shielding shall be inspected as specified by Facilities Management and Logistics (FM&L) Procedures and recorded in the Condition Assessment Information System (CAIS) at least every five years. Inspection results shall be communicated to the RCM or designee. The RCM or designee shall evaluate the data and document the evaluation in an RCD Note.
- Permanent shielding shall be subject to the *Shielding Policy for Ionizing Radiation (RCD-POL-14-001)*. Shielding design and changes shall be reviewed in accordance with the *ASE Violation/USI Review Procedure* and approved by the RCM or designee.

- The Dig/Blind Penetration Permit specified in *ES&H Manual Chapter 3320 Temporary Work Permits* shall be used to manage configuration during excavation activities in overburden used as shielding.

Acceptable compensatory measures:

If RCD evaluation determines the condition of permanent shielding associated with an accelerator enclosure does not meet requirements specified in the SAD or is otherwise unacceptable, the Radiation Control Manager will recommend compensatory measures (such as additional access control, installation of temporary shielding, etc.), if necessary, to maintain performance specified in the *Shielding Policy for Ionizing Radiation (RCD-POL-14-001)* until the shielding is restored to the values specified in the SAD or the SAD is amended. The SCMB shall review and evaluate RCM recommendations using the *ASE Violation/USI Review Process*. The design, approval, and use of compensatory measures for permanent shielding shall be subject to the *Shielding Policy for Ionizing Radiation (RCD-POL-14-001).*

3.1.2 Movable Shielding

Applicability:

- When beam delivery into the affected CEBAF segment is possible.
- When beam delivery is possible in the LERF and LERF is in Beam Permit.
- When SRF operations are possible in the affected CEBAF segment or the LERF.

Controls:

Movable Shielding[1]

Management and Surveillance:

- Movable shielding shall be subject to the *Shielding Policy for Ionizing Radiation (RCD-POL-14-001)*.
- Movable shielding design and changes shall be reviewed in accordance with the *ASE Violation/USI Review Process* and approved by the RCM or designee.
- Movable shielding shall be visibly labeled or tagged consistent with *ENG-AD-01-001 Conduct of Engineering Manual Section 5.2.6.1 Implementing Item Identification.*
- Correct placement of movable shielding shall be verified in accordance with the Jefferson Lab Radiation Control Department Procedures specified in *HPP-OPS-002, Performance of Periodic Routines* and *HPP-OPS-015, Shielding Package Determination and Tracking.*
- The RCM or designee shall record the Movable Shielding status, along with the expiration date for the status determination, in the JAM before facility operation.

Acceptable compensatory measures:

Fences or barriers with informational signs or postings consistent with the hazard

[1] Discrete shielding materials or an assembly of material that can be moved and/or disassembled and is determined to be a Credited Control in the SAD hazard analysis. This discrete shielding includes but may not be limited to the shield block walls at the Hall D Tagger and LERF truck ramp doors and certain shielded penetrations.

prevent inadvertent access to the affected area and mitigate the radiation hazard consistent with the requirements of the *Shielding Policy for Ionizing Radiation (RCD-POL-14-001)*.

3.1.3 Beam Dump Cooling Building Design

Applicability:

When beam delivery into the affected CEBAF segment is possible, specifically to Hall A and Hall C.

Controls:

The structural strength of Buildings 91 and 95 protects the cooling systems from damage and the containment features capture cooling water in the event of leakage.

Management and Surveillance:

- The structural integrity of the Beam Dump Cooling Buildings and their sump pits shall be recorded in the JAM by FM&L before facility operation.
- Buildings shall be visually inspected as specified by FM&L Procedures and recorded in the CAIS at least every five years.

3.1.4 Nitrogen Gas Supply Orifices

Applicability:

When affected system is charged with gas and personnel are in the affected area within the accelerator enclosures and a flow limited orifice is required by an Oxygen Deficiency Hazard (ODH) Analysis.

Controls:

Orifices in the nitrogen service gas distribution supply lines restrict the flow rate to levels that would be dispersed through passive area ventilation without significantly reducing the oxygen concentration.

Management and Surveillance:

- The orifice is in place and labeled in accordance with *ENG-AD-01-001 Conduct of Engineering Manual Section 5.2.6.1 Implementing Item Identification*.
- The orifice shall be function tested no less than every two years to verify requirements of the ODH Analysis are met. The status of the nitrogen gas supply orifice shall be recorded in the JAM.

Acceptable Compensatory Measures:

Work control procedures for work in affected areas shall specify ODH mitigation as required by *ES&H Manual Chapter 6540, Oxygen Deficiency Hazard (ODH) Control Program*.

3.1.5 ODH Vents, Lintels, and Facility Configuration

Applicability:

When cryogens are supplied to the accelerator enclosure for CEBAF or LERF.

Controls:

- CEBAF and LERF passive ceiling vents.
- CEBAF door configuration slows helium gas entry into stairwells and lintels slow helium migration from Linacs.
- LERF door configuration slows helium gas entry into stairwells.

Management and Surveillance:

Structural features shall be inspected as specified by FM&L Procedures and recorded in the CAIS at least every five years. Inspection results shall be recorded in the JAM by FM&L before facility operation. Design changes shall be reviewed in accordance with the *ASE Violation/USI Review Procedure*.

Acceptable Compensatory Measures:

Work control procedures for work in the affected area shall specify ODH mitigation as required by *ES&H Manual Chapter 6540, Oxygen Deficiency Hazard (ODH) Control Program*.

3.2 Credited Active Engineered Controls

Active Engineered Controls include the PSS and the ODH Monitoring systems. The PSS provides monitoring of the perimeter and segment access points of the accelerator and halls in order to keep people away from accelerator hazards and provides monitoring of Critical Devices that prevent beam transport to any segment of the accelerator and halls that are open for any type of personnel access. The ODH System provides monitoring of oxygen levels in the accelerator and halls in order to protect people from ODH caused by the release of oxygen displacing gases.

3.2.1 PSS Access Controls

Applicability:

- When beam delivery into the affected CEBAF segment is possible.
- When beam delivery is possible in the LERF and LERF is in Beam Permit.
- When SRF operations are possible in the affected CEBAF segment or the LERF.

Controls:

The CEBAF PSS and the LERF PSS shall have no loss of safety function in any segment during facility operation in that segment.[2]

Management and Surveillance:

- PSS components shall be visibly labeled or tagged consistent with *ENG-AD-01-001 Conduct of Engineering Manual Section 5.2.6.1 Implementing Item Identification.*
- Changes to the PSS are reviewed and approved in accordance with the *PSS Configuration Management Procedure* and the *ASE Violation/USI Review Process*. PSS functional requirements are established in the *Beam Containment and Access Control Policy*.
- The CEBAF PSS and the LERF PSS shall be certified annually.
- The Safety Systems Group shall verify the status of the CEBAF PSS and the LERF

[2] Loss of safety function is considered to be failure of both independent interlock chains.

PSS, along with the expiration date for the status determination, in the JAM.

Acceptable Compensatory Measures:

Use of locked doors, gates, or fences consistent with 3.3.1 Doors, Gates, Fences, and other Barriers, below.

3.2.2 CEBAF PSS Beam Containment Controls Addressing Adjacent Segments

Applicability:

When beam delivery is possible into CEBAF segments adjacent to the affected segment.
When SRF operations are possible in the CEBAF segment adjacent to the affected segment.

Controls:

The CEBAF PSS shall have no loss of safety function in any segment during facility operation in that segment.[3]

Management and Surveillance:

- PSS components shall be visibly labeled or tagged consistent with *ENG-AD-01-001 Conduct of Engineering Manual Section 5.2.6.1 Implementing Item Identification.*
- Changes to the PSS are reviewed and approved in accordance with the *PSS Configuration Management Procedure* and the *ASE Violation/USI Review Process*. PSS functional requirements are established in the *Beam Containment and Access Control Policy*.
- The CEBAF PSS shall be certified annually.

Acceptable Compensatory Measures:

Use of locked doors, gates, or fences consistent with 3.3.1 Doors, Gates, Fences, and other Barriers, below.

3.2.3 ODH System Controls

Applicability:

When required by the *ES&H Manual Chapter 6540 Oxygen Deficiency Hazard (ODH) Control Program* and an ODH Analysis document, a fixed ODH monitoring system shall be installed and maintained functional in CEBAF and LERF areas.

Controls:

An ODH system shall be installed according to the requirements in an ODH Analysis.

Management and Surveillance:

- ODH system components shall be visibly labeled or tagged consistent with *ENG-AD-01-001 Conduct of Engineering Manual Section 5.2.6.1 Implementing Item Identification*.

[3] Loss of safety function is defined as failure to provide at least three safety system control measures employing at least two different technologies to prevent unintended beam transport to a CEBAF PSS segment or failure of both independent interlock chains.

- The system shall be maintained such that it is operational when required by the ODH assessment for the location.
- ODH-sensing devices shall be tested every two years and the status shall be recorded in the JAM.

Acceptable Compensatory Measures:

- Entry only by authorized personnel in accordance with *ES&H Manual Chapter 6540, Oxygen Deficiency Hazard (ODH) Control Program*.
- Procedures for entry into a reduced oxygen atmosphere.
- Exclusion of personnel from the areas in which the ODH system performance is inadequate.

3.3 Credited Administrative Controls

Credited Administrative Controls include processes, limits, and conditions necessary for safe accelerator operation as described.

3.3.1 Doors, Gates, Fences, and Other Barriers

Applicability:

- When beam delivery into the affected CEBAF segment is possible.
- The associated Beam Dump Cooling Building is included if beam delivery segments include Hall A or C. Applies to the Injector, North and/or South Linac PSS segments in Beam or Power Permit independent of other segments.
- When the LERF is in Beam or Power Permit.

Controls:

Entrances to the accelerator enclosure and other designated spaces[4] shall be interlocked via the PSS Interlocks or shall be locked in accordance with *ES&H Manual Chapter 6111, Administrative Control Using Locks and Tags*, barred, or bolted into place to prevent unauthorized access.

Management and Surveillance:

- Doors, gates, fences, and other barriers serving as Credited Controls shall be clearly identified by visible labels or tags consistent with *ENG-AD-01-001 Conduct of Engineering Manual Section 5.2.6.1 Implementing Item Identification.*
- The RCM or designee shall verify the locked, barred, or bolted entrances in accordance with the Radiation Protection Department Procedures specified in *HPP-OPS-002, Performance of Periodic Routines* and *HPP-OPS-015, Shielding Package Determination and Tracking*. The status, along with the expiration date for the status determination, shall be recorded in the JAM.

[4] Designated spaces in the SAD include but may not be limited to entry to the shielding labyrinth for Buildings 91 and 95, the shielded area around Building E1/21, and the manway in Building 200. Building 91 is linked to the Hall A affected segment and Building 95 is linked to the Hall C affected segment. Building E1/21 is linked to the NL affected segment. Building 200 is linked to the Hall D affected segment.

3.3.2 Jefferson Lab Experimental Review Processes

Applicability:

- When beam delivery is possible into the affected CEBAF segment containing an approved nuclear physics experiment.
- When beam delivery is possible in the LERF and LERF is in Beam Permit.

Controls:

- Any experiment that has completed the Proposal Phase described in *ES&H Manual Chapter 3120 The CEBAF Experiment Review Process (ERR)*, that is, the experiment has a decision by the Lab Director to grant beam-time formally communicated by a letter from the Lab Director accompanying the Program Advisory Committee Report (PAC) report, will undergo the remaining steps in the experimental review process before the experiment is run at the CEBAF and LERF accelerator.
- A proposal that has not completed the Proposal Phase described in *ES&H Manual Chapter 3120, The CEBAF Experiment Review Process*, i.e. has not been granted beam time but has been evaluated by laboratory leadership and found to have sufficient merit to pursue that proposal using laboratory resources, shall be reviewed according to the requirements in *ES&H Manual Chapter 3130, Accelerator Experiment Safety Review Process*, before the experiment is run at the CEBAF or LERF accelerator.
- If the experiment is not addressed by either Chapters 3120 or 3130, it shall undergo a USI review.

3.3.3 CEBAF and LERF Operations Staffing – Sweep and Controlled Access

Applicability:

When a segment of the CEBAF Accelerator or the LERF is being made ready for Power Permit or Beam Permit.

Controls:

CEBAF or LERF

- One Security Guard on the Jefferson Lab Campus.
- Crew Chief on-call.
- Safety System Operator (SSO).

Management and Surveillance:

The Crew Chief can simultaneously serve as the SSO. The SSO must be in the MCC. Sweeps follow the steps defined in *MCC-PR-17-001 PSS Sweep Procedure*. Controlled Accesses follow the steps defined in *MCC-PR-17-004 PSS Controlled Access Procedures*. These procedures are carried out by a qualified SSO using the Safety Systems Console in the MCC. The Safety Systems Group certifies SSOs and maintains the PSS console and procedures.

3.3.4 RF Only Operations

Applicability:

CEBAF

- When the Injector is in Power Permit or lower PSS State.
- When the North Linac is in either Power Permit or Beam Permit.
- When the South Linac is in either Power Permit or Beam Permit.

LERF

When the LERF is in Power Permit or when the LERF is in Beam Permit AND consistent with *ES&H Manual Chapter 6111, Administrative Control Using Locks and Tags*, either vacuum valve VBV0F01 is locked in the beamline downstream of the Injector OR the gun high-voltage power supply is locked out.

Controls:

CEBAF

- One Security Guard on the Jefferson Lab Campus.
- Crew Chief on-call.
- One Operator.

LERF

- One Security Guard on the Jefferson Lab Campus.
- Crew Chief on-call.
- One LERF Operator or LERF Hot-Standby Operator or non-LERF Control Room staff (e.g. RF Operator).

Management and Surveillance:

CEBAF

The Crew Chief can simultaneously serve as the Operator. Either the Operator or the Crew Chief must be on the accelerator site.

LERF

The Crew Chief can simultaneously serve as the LERF Operator, or LERF Hot-Standby Operator, or non-LERF Control Room staff. Either this staff member or the Crew Chief must be on the accelerator site.

3.3.5 CEBAF Operations Staffing – Beam up to 1D Spectrometer

Applicability:

When beam delivery is possible up to the 1D Spectrometer Dump. Injector PSS Segment is in Beam Permit.

Controls:

- One Security Guard on the Jefferson Lab Campus.
- Crew Chief on-call.
- One Operator.

Management and Surveillance:

The Crew Chief can simultaneously serve as the Operator. Either the Operator or the

Crew Chief must be in the MCC.

3.3.6 CEBAF Operations Staffing – Beam up to Faraday Cup #2

Applicability:

When beam delivery is possible up to Faraday Cup #2. Injector and North Linac PSS Segments are in Beam Permit.

Controls:

- One Security Guard on the Jefferson Lab Campus.
- Crew Chief on-call.
- One Operator.

Management and Surveillance:

The Crew Chief can simultaneously serve as the Operator. Either the Operator or the Crew Chief must be in the MCC.

3.3.7 CEBAF Operations Staffing – Beam up to In-line Dump

Applicability:

When beam delivery up to the Inline Dump possible. Injector and North Linac PSS Segments are in Beam Permit.

Controls:

- One Security Guard on the Jefferson Lab Campus.
- Crew Chief on the accelerator site.
- One Operator.

Management and Surveillance:

The Crew Chief can simultaneously serve as the Operator. Either the Operator or the Crew Chief must be in the MCC.

3.3.8 CEBAF Operations Staffing – Beam Beyond Inline Dump

Applicability:

When beam delivery beyond the Inline Dump is possible.

Controls:

- One Security Guard on the Jefferson Lab Campus.
- Crew Chief on the accelerator site.
- One Operator.

Management and Surveillance:

Either the Crew Chief or the Operator must be in the MCC. The other must be on the accelerator site.

3.3.9 LERF Operations Staffing with Beam

Applicability:

When beam delivery is possible in the LERF. LERF is in Beam Permit.

Controls:

- One Security Guard on the Jefferson Lab Campus.
- Crew Chief on the accelerator site.
- One LERF Operator.

Management and Surveillance:

The LERF Operator must operate from the designated control room, as determined by the Crew Chief.

Document List (In Alphabetical Order)

Accelerator Operations Directives (AOD)
Accelerator Safety Envelope (ASE)
Accelerator Safety Envelope Violation/Unreviewed Safety Issue Review Process
Beam Containment and Access Control Policy
Conduct of Engineering Manual ENG-AD-01-001 Implementing Item Identification
DOE Order 420.2D Safety of Accelerators
ES&H Manual Chapter 3120, The CEBAF Experiment Review Process
ES&H Manual Chapter 3130, Accelerator Experiment Safety Review Process
ES&H Manual Chapter 3320, Temporary Work Permits
ES&H Manual Chapter 6111, Administrative Control using Locks and Tags
ES&H Manual Chapter 6540, Oxygen Deficiency Hazard Control Program
Low Energy Recirculator Facility Operations Directives (LOD)
PSS Configuration Management Procedure
Radiation Control Department Document – HPP-OPS-002, Performance of Periodic Routines
Radiation Control Department Document - HPP-OPS-015, Shielding Package Determination and Tracking
Safety Assessment Document
Shielding Policy for Ionizing Radiation (RCD-POL-14-001)

ACRONYMS

Acronym	Definition	Page
FM&L	Facilities Management and Logistics	II
TJSO	Thomas Jefferson Site Office	II
ES&H	Environment, Safety, and Health	II
ASE	Accelerator Safety Envelope	1
CEBAF	Continuous Electron Beam Accelerator Facility	1
LERF	Low Energy Recirculator Facility	1
CAIS	Condition Assessment Information System	3
CMTF	Cryomodule Test Facility	1
DOE	Department of Energy	1
Jefferson Lab	Thomas Jefferson National Accelerator Facility	1
SAD	Safety Assessment Document	1
SCMB	Safety Configuration Management Board	1
AOD	Accelerator Operations Directives	1
LOD	*Low Energy Recirculator Facility Operations Directives*	1
PSS	Personnel Safety System	2
USI	Unreviewed Safety Issue	2
RCD	Radiation Control Department	2
RCM	Radiation Control Manager	3
JAM	Jefferson Lab Authorization Manager	4
ODH	Oxygen Deficiency Hazard	5