



Department of Energy

Fermi Site Office
Post Office Box 2000
Batavia, Illinois 60510

JAN 12 2009

Dr Bruce L. Chrisman
Chief Operating Officer
Fermilab
P. O. Box 500
Batavia, IL 60510

Dear Dr. Chrisman:

SUBJECT: Modification of Fermilab Work Smart Standards Set

Reference: Letter, B. Chrisman to J. Livengood, dated September 30, 2008, Subject:
Modification of Work Smart Standards

The Fermi Site Office has reviewed the referenced letter and your request to replace the June 2007 version of FESHM Chapter 2010, currently in the Fermilab Work Smart Set of Standards, with a revision of FESHM Chapter 2010 dated September 2008. The Fermi Site Office concurs with the addition of the revised FESHM Chapter 2010 to the Fermilab Work Smart Set. Fermi Site Office concurrence is documented in the enclosure.

The revision of FESHM 2010 done by Dr. Don Cossairt at Fermilab was done with the full participation of Dr. Dennis Parzyck of my organization. The revised chapter reflects best practices found in the DOE O 420.2B, Safety of Accelerator Facilities, and DOE Accelerator Facility Safety Implementation Guide, DOE G 420.2-1.

Please contact Dennie Parzyck at extension 2449 if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Joanna M. Livengood" with a stylized flourish at the end.

Dr. Joanna M. Livengood
Site Manager

Enclosure:
As Stated

cc: P.Oddone
Y.-K. Kim
J. R. Grant
N. Grossman



Bruce Chrisman
Director's Office
Directorate
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chrisman@fnal.gov

September 30, 2008

Dr. Joanna Livengood
Site Manager
Fermi Site Office
U.S. Department of Energy
P. O. Box 2000
Batavia, Illinois 60510

Dear Dr. Livengood:

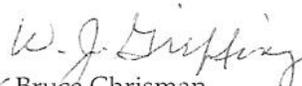
SUBJECT: Modification of Work Smart Standards

The following Fermilab ES&H manual chapter has been revised. Since this chapter is in the Worksmart Set of Standards, we are required to obtain your concurrence.

FESHM chapter 2010 – Planning and Review of Accelerator Facilities and Their Operations

This FESHM chapter has been revised to reflect current operations.

Sincerely,

for 
Bruce Chrisman
Chief Operating Officer

Encl.

cc: B. Grant, w/encl.
B. Griffing, w/o encl.
Y.-K. Kim, w/o encl.
P. Oddone, w/o encl.



DOE/FRMI Group Concurrence

11/9/08

Date

ES&H File: Work Smart Standards

Memorandum

September 12, 2008

To: Bruce Chrisman
From: William Griffing
Subject: Revised FESHM Chapter 2010 – Planning and Review of Accelerator Facilities and Their Operations

FESHM Chapter 2010, Planning and Review of Accelerator Facilities and Their Operations, has been revised due to the recent addition of DOE 420.2B, *Safety of Accelerator Facilities* to the Fermilab M&O contract. When finalized this revision will document the implementation of this Order as a Work Smart Standard. The present revision updates the Chapter to reflect recent organizational changes at Fermilab.

After final approval, please return this approval page to Elizabeth Bancroft at MS119 for posting on the web.

Encl.

Recommended for Approval:

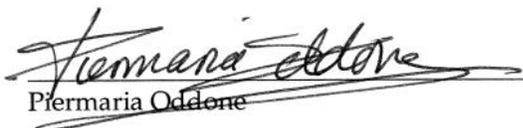


Bruce Chrisman

9/21/08

Date

Approved:



Piermaria Odone

9/23/08

Date

PLANNING AND REVIEW OF ACCELERATOR FACILITIES AND THEIR OPERATIONS

INTRODUCTION

This chapter describes the formal review procedures established by the Laboratory to assure that accelerator facilities and their operations comply with Fermilab ES&H standards and with DOE Order 420.2B, *Safety of Accelerator Facilities*. This review system shall be applied to new projects or when significant modifications, including decommissioning, occur. The level of detail required in the Safety Assessment Documents (PSAD/SAD) and the amount of resources expended in the accelerator readiness review (ARR) and its accompanying documentation should be commensurate with the programmatic importance and potential ES&H impact of the facility and its activities. The Fermilab Environment, Safety and Health Manual (FESHM), inclusive of the Fermilab Radiological Control Manual (FRCM), specifies a set of physical and administrative conditions that define the bounding conditions for safe operation of accelerator facilities or portions thereof.

In addition to the Safety Assessment Documents (SADs), Fermilab conducts other types of reviews of new projects to assure that environment, safety, and health requirements are met. Chapter 8060 describes, in detail, the Laboratory's program for reviewing its activities under the National Environmental Policy Act (NEPA). Likewise, planning for future decontamination and decommissioning (D&D) activities should be developed as specified in Chapter 8070.

The Fermilab Director, as advised by the ES&H Director, determines the PSAD/SAD applicability, notifies the responsible division/section/center and gives guidance on the level of details required. Divisions, sections, and centers are responsible for maintaining their SADs and associated Accelerator Safety Envelopes (ASEs) up-to-date by revising them when necessary. Revised SADs and ASEs shall be reviewed and approved in accordance with the procedures of this chapter. Portions of this FESHM Chapter are based on the content of DOE G 420.2-1, *Accelerator Facility Safety Implementation Guide for DOE O 420.2B, Safety of Accelerator Facilities* (7/2/05).

SADs commonly include a radiation shielding assessment or incorporate the results of a separate Shielding Assessment document. Requirements and guidance concerning radiation shielding and the preparation and approval of shielding assessments are described in Fermilab Radiological Control Manual (FRCM) Chapter 8. This FRCM

Chapter constitutes the shielding policy required by DOE Order 420.2B and conforms to the guidance on such policies provided by DOE G420.2-1.

SELECTED DEFINITIONS

- Accelerator: A device employing electrostatic or electromagnetic fields to impart kinetic energy to molecular, atomic or sub-atomic particles and, for the purposes of this Chapter, capable of creating a radiological area as defined by 10 CFR 835 and the FRCM. The following devices are not considered to be accelerators under DOE Order 420.2B and this FESHM Chapter but are otherwise subject to FRCM Article 362:
 - Unmodified commercially available units that are acceptable for industrial applications, including (but not limited to) electron microscopes, ion implant devices, and x-ray generators.
 - Nonmedical 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 N43.3-1993, *General Radiation Safety Standard for Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies Up to 10 MeV*, or in accordance with another consensus standard as directed by the Department of Energy Fermi Site Office (DOE-FSO).
 - Low-voltage neutron generators incapable of creating high radiation areas (as defined in the FRCM and in 10 CFR 835), which are operated in accordance with National Council on Radiation Protection and Measurements NCRP Report 72, *Radiation Protection and measurements for Low-Voltage Neutron Generators*, or in accordance with another applicable consensus standards as directed by DOE-FSO.
- Accelerator Facility: The accelerator and associated plant and equipment utilizing, or supporting the production of, accelerated particle beams to which access is controlled to protect the safety and health of persons. It includes injectors, targets, cryogenic systems, beam deflection devices, instrumentation, beam absorbers, radiological shielding, detectors, experimental enclosures and experimental apparatus utilizing the accelerator, regardless of where that apparatus may have been designed, fabricated, or constructed.
- Accelerator Readiness Review (ARR): A structured method for verifying that hardware, personnel, and procedures associated with commissioning and/or routine operation are ready to permit the activity to be undertaken safely. Upon

satisfactory completion of the review and close-out of significant issues, *approval to operate* is signified by signatures on the PSAD/SAD/ARR Documentation form attached to this chapter.

- Accelerator Safety Envelope (ASE): A set of physical and administrative conditions that defines the accelerator/storage ring beam bounding conditions for safe operations.
- Commissioning: The process of testing an accelerator facility, or portion thereof, to establish the performance characteristics. It starts with the first introduction of a particle beam into the system.
- Exclusion Area: An area that is locked and interlocked to prevent personnel access while the accelerator is in operational status.
- Experimenters: All persons directly involved in experimental efforts at the accelerator utilizing the accelerator or its beams, including visiting scientists, students and others who may not be employees of the DOE Management and Operating (M&O) contractor.
- Hazard: A source of danger (i.e., material, energy source, or operation) with the potential to cause illness, injury, or death to personnel or damage to a facility or to the environment.
- Hazard Analysis: A documented process to systematically identify the hazards of a given operation, to describe and analyze the adequacy of measures taken to mitigate the hazards of normal operation, and to identify and analyze potential accidents and their associated risks.
- Preliminary Safety Assessment Document (PSAD) (see SAD definition): A preliminary formal review document to analyze Laboratory projects, operations and experiments for possible hazards (see Work Smart Standards list, Chapter 1070) and possible ways to mitigate them. For a major project, Fermilab may choose to prepare a PSAD to support deliberations leading to *approval to initiate construction*.
- Radiation Protection Program (RPP): The documented program, approved by DOE, including but not limited to the plans, schedules, and other measures developed and implemented to achieve and ensure continuing compliance with 10 CFR 835 and to apply the as low as reasonably achievable (ALARA) process to occupational and environmental dose.

- Risk: A quantitative or qualitative expression of possible harm, which considers both the probability that a hazard will cause harm and the amount of harm.
- Routine Operation: This commences at the point where authorization has been granted either (1) because the commissioning effort is sufficiently complete to provide confidence that the risks are both understood and acceptable and the operation has appropriate safety bounds, or (2) to permit the re-introduction of a particle beam after being directed to cease operation by DOE because an environmental, safety, or health concern.
- Safety Analysis: A documented process to systematically identify the hazards of a given operation; describe and analyze the adequacy of measures taken to eliminate, control, or mitigate the hazards and risks of normal operation; and identify and analyze potential accidents and their associated risks.
- Safety Assessment Document (SAD): A formal review document describing the analysis of Fermilab projects, operations and experiments for hazards and their final method of mitigation.
- Unreviewed Safety Issue (USI): An issue that exists if a proposed change, modification, or experiment will either (1) Significantly increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety from that evaluated previously by safety analysis; or, (2) Introduce an accident or malfunction of a different type than any evaluated previously by safety analysis that could result in significant consequences. USIs are usually related to hazards and their consequences that may have been overlooked or underestimated in the safety assessment process.

PSAD/SAD PROCESS DESCRIPTION

The Accelerator PSAD/SAD and the associated ARR process is initiated with either a recommendation by the ES&H Director to the Fermilab Director concerning the applicability of PSAD/SAD for a proposed project, operation or experiment or a similar determination by the division/section/center head(s) responsible for the activity. Often, multiple divisions/sections/centers may share these responsibilities. For projects of limited scope, the PSAD step may not be required.

Following this determination of applicability, the responsible division/section/center will prepare a PSAD, the approval of which allows initiation of more detailed design and/or construction. A SAD may be prepared concurrently with the PSAD or, more commonly; it may be prepared at some later time prior to operations when detailed

hazard analyses and mitigation methodologies are better understood, e.g., a more advanced stage of design.

A completed PSAD or SAD shall be submitted to the ES&H Section for review. For new facilities or for those that have been significantly modified, this would initiate a documented ARR conducted by the ES&H Section. The ARR may conclude with a list of items that need to be completed (punch list) before the approval to operate is granted. Upon successful completion of the review by the ES&H Section and close-out of all significant issues, the ES&H Director then recommends approval of the final SAD/Accelerator Readiness Review to the Fermilab Director.

Experience has indicated that this process is greatly enhanced by timely, effective collaboration and communication between the responsible division/section/center(s) and the ES&H Section. Involvement of representatives of the DOE Fermi Site Manager at an early stage of project planning has also been found to be highly beneficial.

Each one of the above steps is described in detail below. These steps should be followed in sequential order.

1. Determination of Applicability

The ES&H Director regularly reviews projects, operations, and experiments for applicability of the provisions of this chapter and makes corresponding recommendations to the Fermilab Director concerning SAD/PSAD applicability. Also, division/section/center heads shall inform the ES&H Director of new projects, operations, and experiments that are candidates for SADs at the earliest reasonable stage. Fermilab authorized operations that require a project directive or that originate outside the Laboratory may also require a PSAD/SAD.

Following the determination of applicability, the ES&H Section notifies the responsible division(s)/section(s)/center(s) of the PSAD/SAD applicability. This formal notification is not needed if the responsible organization(s) have already determined that a SAD is to be revised or prepared. This determination and subsequent PSAD/SAD initiation must occur during the earliest phases of the activity to facilitate early hazard identification and mitigation. The documentation for the determination of applicability shall be inventoried and filed with the ES&H Section regardless of the conclusion. Performing the PSAD Hazard Analysis is a good method for documenting determination of applicability.

A new PSAD/SAD is not required for upgrades to an existing facility or operation that are within the scope of its existing SAD. Documentation

demonstrating that the upgrade is within the scope of the existing SAD shall be written by the responsible division(s)/section(s)/center(s) and be filed with the ES&H Section.

2. PSAD Hazard Analysis

The PSAD should follow the guidelines outlined in Chapter 2010TA. The hazards associated with construction, installation, operation, and decommissioning should be identified. In general, the hazard analysis in the PSAD should start with the Written Hazard Analysis Guideline found in FESHM 2060, Table 1. For large or complex projects, the Issues List generated as part of the Necessary & Sufficient (N&S) Process should be used. The N&S Issues list is the result of Fermilab's analyses of the hazards present on the Fermilab site.

Once the hazards associated with the project are identified, the initiating event, consequences of an incident associated with that hazard, and hazard mitigation should be identified.

For the most part, the hazards associated with a project which do not pose any additional hazard by virtue of their association with the project's construction, installation, commissioning, or operation are addressed by implementing the provisions of other FESHM chapters. For such hazards, it can simply be stated that the Work Smart Set of Standards (WSS) will be followed just as they would for other operations on site.

3. SAD Hazard Analysis

The SAD should follow the same guidelines as those given for PSAD, except when describing the mitigation of the unique hazards, the final method implemented by the project should be described. In general the conclusions of the SAD will support the parameters of the associated Accelerator Safety Envelope (ASE). Commonly, the ASE constitutes a chapter or a portion of a chapter of the SAD.

4. Review of PSAD/SAD

The divisions/sections/centers may review new projects or facilities. This review may be done through a safety review panel. The safety panel may consist of laboratory staff or experts from outside the Laboratory. The responsible division/section/center may request assistance from the Laboratory Safety Committee and its subcommittees to review projects, answer specific

safety questions, recommend solutions to ES&H problems, assist in setting ES&H policy, or evaluate requests for exemptions from existing policies. The reviewers assigned by the ES&H Director to review the PSAD/SAD shall be selected with due consideration given to maintaining a reasonable level of independence from the activity being assessed while optimizing the utilization of subject matter experts. The reviewers will commonly, but not necessarily exclusively, be members of the ES&H Section staff. For SADs/ Accelerator Readiness Reviews concerned with strategic or major system projects (as defined by DOE) or line item projects, one or more representatives of DOE-FSO may be included as observers on the assigned review team preparatory to the official transmittal for concurrence specified below. The list of reviewers of each SAD shall be documented along with any comments they may develop.

5. PSAD/SAD and ARR Approval

- a. It is the responsibility of the ES&H Director to determine if the PSAD/SAD and ARR approval chain shall include the Fermilab Director. The ES&H Director also determines if a copy should be transmitted to the DOE-FSO Manager for concurrence with the SAD based upon the scope of and level of hazards presented by the activity. Guidance is provided in Table 1 of DOE G420.2-1. All SADs so transmitted that result in a new or revised Accelerator Safety Envelope (ASE) require written concurrence with the SAD and written approval of the ASE by the DOE-FSO Manager. Informational transmittals are required for strategic or major system projects (as defined by DOE) and for line item projects. Normally, PSADs are not transmitted to the DOE-FSO Manager.

The final sign-off sheet to be used for PSAD/SAD and ARR approval appears as the last page of the Technical Appendix (2010TA). PSAD/SAD and ARR approval and approval to commence commissioning/operation requires the following signatures which shall be routed in the following order:

1. Project Leader
2. Fermilab Division/Section/Center Head(s)
3. Fermilab ES&H Director
5. Fermilab Director (if appropriate)

- b. If determined to be required (see Section 5.a.) by the Fermilab ES&H Director, the PSAD/SAD, along with any new or revised ASE, and documentation of the ARR process shall be sent to the DOE-FSO Manager for concurrence and approval of the ASE before commissioning or operations ensue. This formal transmittal should occur after completion of the internal review process documented by the above signatures. If no comments or replies are received within 30 calendar days, it will be assumed that the PSAD/SAD or ARR is sufficient. This comment period will normally be 15 calendar days provided a complete draft SAD, that has undergone preliminary review by the ES&H Section, is informally provided to the DOE-FSO Manager at least 30 calendar days prior to the formal submittal of the completed SAD. For projects determined sufficiently significant to have the corresponding SAD sent to the DOE-FSO Manager, the DOE-FSO Manager will be informed of the readiness review before its occurrence and be given the opportunity to participate informally in the review. Experience has shown that early involvement of representatives of the DOE-FSO Manager can enhance the effectiveness of this review process.

6. Documentation

The completed, original PSAD/SAD and specific supporting documentation related to the review shall be inventoried and filed with the ES&H Section in a manner consistent with applicable records retention requirements.

7. Unreviewed Safety Issue

Subsequent to the issue of a SAD, the discovery of a USI as defined by this chapter constitutes a candidate significant and reportable occurrence to be addressed and reported in accordance with FESHM Chapter 3010. Activities involving identified USIs shall not resume or commence without written approval of DOE-FSO. This requirement does not apply to issues not adequately addressed in PSADs due to the preliminary nature of such documents.

PSAD/SAD GUIDELINES

The PSAD/SAD documents may contain references to other PSADs/SADs, procedures and documents as appropriate rather than repeating large portions of an existing document.

Where commissioning is to be accomplished in discrete modules, the SAD and/or the ARR may be conducted incrementally also. Each module shall require separate authorization.

The PSAD/SAD should be written in accord with the following outline, as applicable:

I. Introduction/Project Description

Provides a brief description of the project:

- Location
- Purpose of Project
- Organizational Responsibilities
- Safety Design Criteria (i.e., the Fermilab Standards)

II. Inventory of Hazards and Mitigation

The PSAD/SAD may present the hazards and discuss their mitigation in a chronological order, i.e. hazards associated with the construction phase, installation, operations, and finally D&D.

Hazard mitigation often includes:

- Shielding analysis
- Engineering design
- Operational constraints
- Training requirements
- Procedural requirements
- Applicable administrative controls
- Accelerator Safety Envelope

The safety envelope may contain or reference other sections of the SAD that address the following issues as requirements for operation:

- * Power limits (particles, energy, duty factor, or equivalents)
- * Personnel specifications (e.g. operator training)
- * Environmental limits (e.g. potential air emissions, contamination of the groundwater)
- * Safety systems which must be operational (e.g. radiation safety interlocks, electrical interlocks, fire protection, etc.)

III. Accelerator Readiness for Commissioning and Operation

Defines the required readiness elements, including those identified in the SAD that are required to be in place during the commissioning and operation stages to ensure safe operation. Requirements from other documents should be included, as appropriate, for completeness. The elements that should be described are:

- Readiness of safety systems
- Qualification of personnel
- Shielding readiness and/or administrative procedures required
- Plan for commissioning/operation
- Environmental monitoring considerations.

IV. Conclusion

At this point it should be possible to briefly conclude that the construction, operation and the final D&D may be conducted in manner acceptable by safety and environmental standards.

SAFETY ASSESSMENT DOCUMENT
ACCELERATOR READINESS REVIEW
DOCUMENTATION FORM

This form records the PSAD/SAD/ARR review process required for operations at Fermi National Accelerator Laboratory.

PSAD/SAD/ARR TITLE AND DATE: _____

THIS DOCUMENT DESCRIBES:

New Facility	_____	New Experiment	_____
Existing Facility	_____	Major Modification	_____
Entire Program	_____	Decommissioning	_____
Readiness Review	_____		

FERMI NATIONAL ACCELERATOR LABORATORY

Safety Assessment Document Approval _____ Completion of Readiness Review _____
Authorization to Operate Facility _____

Project Leader/Date: _____

Fermilab Division/Section/Center Head(s)/Date: _____

Fermilab ES&H Director/Date: _____

Fermilab Director/Date: _____
(if appropriate)