

PARTICLE PHYSICS DIVISION/CMS/FCPA ES&H MANUAL

REVIEW AND APPROVAL RECORD

OPERATIONAL READINESS CLEARANCE

ES&H REVIEW OF EXPERIMENTS, PROJECTS AND RESEARCH AND DEVELOPMENT

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Distribution: All Department Heads

REVIEW/REVISION HISTORY

Version	Date	Section No.	Specifics
Pre-1.0			All previous versions of PPD ESH 006 followed formatting that did not allow for inclusion in the Review/Revision History.
1.0	5.05.2011	All 1.0 2.0 3.0 4.0 4.1 4.3 4.4 4.5 4.6 5.0 6.0 7.0 Appendix	Rewrite of previous ORC Procedure, ES&H Review of Experiments. All sections rewritten, reformatted. Significant changes: Added foot notes 1 and 2 Added Subject Matter Experts (SME) Added Work Smart Set(WSS) Removed Laboratory Safety Committee(LSC) Added Scope Section Added Policy Section Changed formatting of this section Added Project/ Experiment Lead and the responsibilities Updated responsibilities Changed LSC committee to FESHcom Added Cryogenic Safety Review Panel and responsibilities Added Fire Hazards Committee and responsibilities Changed ES&H Review Criteria for Experiments and R&D Projects to ORC Process for Projects Added FESHM Links to all hazards Removed Operational Approvals Title Added ORC Procedure and the outline of the ORC Process(1-7) Added Added Appendix A(Flow Chart)& B (ES&H Review Documentation Checklist)
1.1	7.20.2012	4.6	Removed Fire Hazards Committee and responsibilities Organized headings to be consistent with ES&H manual format.
1.2	7.7.2014	4.6 5.0 5.1.1	Title revised to include projects and R&D. Added Fire Hazards Committee and responsibilities. Change idle days for review to 60 days to be consistent with all panels. Added clarification and reference to the Fermilab Engineering Manual Repaired and generalized links in preparation for FESHM chapter reorganization.

1.0 INTRODUCTION

Prior to operation, experiments, projects (including Work for Others), and R&D¹ efforts require an ES&H review. The ES&H review may consist of multiple reviews by subject matter experts (SME's) from a variety of committees depending upon the hazards involved. The ES&H review procedure is designed to review these projects and to ensure proper documentation and reviews have been conducted. The Operational Readiness Clearance (ORC) process is used to capture the recommendations, findings, and ultimate recommendation to operate from these various committees.

2.0 SCOPE

The policies and procedures described within this document apply to all work done within the division and may apply offsite when work is being done by division personnel. Offsite work procedures can be found in PPD ESH 017 Offsite Work and Travel Procedures.

3.0 POLICY

It is the policy of the Particle Physics Division to review all projects involving significant risk to users, the laboratory, public and the project before commencing operations. Refer to section 5.2 for guidance.

4.0 RESPONSIBILITIES

4.1 The PPD Division Head or designee is responsible for:

- Developing the charge to the each of the division specific ES&H review committees.
- Establishing the level of review needed for the division specific ES&H review committee.
- Appointing PPD ES&H review committee members in consultation with Division/Section/Center heads, Department Heads, and Fermilab Environmental, Safety, and Health Committee (FESHcom) chairs, as appropriate.
- Grant and communicate final approval for operation of an experiment, project, or R&D to project management.

4.2 The Project Management/Project Point of Contact is responsible for:

- Compiling the documents needed for the ES&H review. (See Appendix B for the ES&H Review document checklist)
- Contacting the appropriate ES&H review committee or panel in a timely fashion to conduct reviews of the project as appropriate.
- Addressing findings of the ES&H review.
- Project Management can also function as the ES&H Coordinator depending on the organizational structure of the project.

4.3 The ES&H Coordinators/Project Point of Contact (POC) are assigned by the PPD Head and are appointed to work with individual projects. The ES&H Coordinator is intimately involved with

¹ Experiments, projects, and R&D efforts will be referred to as "projects" for the remainder of the document.

the experiment and is usually a member of the collaboration. ES&H Coordinators are expected to:

- Work with the PPD Head, PPD ES&H group, the experiment spokesperson, the Project Engineer, ES&H Review Committee, Cryogenic Safety Panel, project manager or designee, and liaison physicist as appropriate.
- Lead the preparation of Preliminary Safety Assessment Document (pSAD) or Safety Assessment Document (SAD) if they are required. [FESHM 2010](#)
- Assist and guide the experimenters to the completion of the ES&H review and ORC documentation. This includes working with the experimenters to determine the elements of the experiment that require special review, and to set-up the appropriate review committees to accomplish this review.
- Obtain signatures or compile documentation to complete the ORC process.

4.4 The ES&H Review/ORC Committee is charged to:

- Complete a timely and accurate safety review and provide a written ORC report describing its conclusions to one or more of the following: the Division Head, the Project Engineer, the Review Committee Chairperson, project management, the experiment spokesperson.
- The ES&H Review Chairperson communicates and coordinates reviews directly with the ES&H Coordinator of the experiment being reviewed.

4.5 The Cryogenic Safety Review Panel is charged to:

- Complete a timely and accurate safety review regarding all aspects involving cryogenics and provide a written report describing its conclusions to one or more of the following: the Division Head, the Project Engineer, the Review Committee Chairperson, project management, the experiment spokesperson.
- Chairs of each Cryogenic Safety Review Panel are appointed by the Cryogenic Safety Subcommittee Chair. Members of each specific panel are nominated by the Cryogenic Safety Subcommittee and are then appointed by the PPD Head. The panel chair communicates and coordinates reviews with the ES&H Coordinator of the experiment being reviewed.

4.6 Fire Hazard Subcommittee

- Complete a timely and accurate safety review regarding all aspects involving fire hazards, flammable liquids and gases, and provide a written report describing its conclusions to one or more of the following: the Division Head, the Project Engineer, the Review Committee Chairperson, project management, the experiment spokesperson.

Chairpersons and members for active committees and panels are listed here: [Review Committees](#).

5.0 PROCEDURE

All projects having systems or operations that meet the guidelines of section 5.2 shall be subjected to an ES&H review by the appropriate committee or panel. These committees review projects against standards in the DOE Work Smart Set and Fermi lab Environmental, Safety, and Health Manual (FESHM). Specific ES&H Review Committees have been established for larger projects and functional area committees for smaller projects. In some cases, specific parts of an apparatus may be covered by a “partial” Operational Readiness Clearance (pORC) which is procedurally the same as a “full” ORC. The pORC will allow testing or commissioning of a subsystem. The extent of an ES&H review is commensurate with the complexity and level of hazard presented by the construction and operation of the project.

1. The analysis and review will look at all aspects of the system which could present a hazard to personnel, equipment, or property.
2. The analysis shall demonstrate that the system is designed and constructed in accordance with applicable codes and standards.
3. The relevant analysis and review shall be completed before initial testing/operation of any part of the system. An analysis should be completed for all operations, attended or unattended.

The committees and panel will be available for the life of the experiment to review new additions to the experiment. All new proposals, including significant modification to existing equipment, must be reviewed and approved for operation through the ORC process. Projects that have been previously approved but have been idle for greater than 60 days, must contact the ES&H Review Chair or Cryogenic Safety Panel Chair to determine whether another review is needed. The project will indicate, in writing, the end date of the previous run and any changes to the project. The respective chair will then communicate any findings or recommendation to operate to all signatories of the ORC document. The ES&H Review Coordinator/Project POC will collect all signatures or electronic forms of approval for the ORC document. A copy of the ORC document is retained with the division office and with the experiment.

At a minimum, ORC signatures must include the requestor, the ES&H Review Chair and the division head. For projects that are placed in the path of a beam, the Accelerator Division (AD) Head and the PPD Head (or designees) are both required to sign the ORC document before a project is allowed to receive beam. This is a positive means to ensure that both divisions are aware of operating conditions and parameters for each experiment and have agreed that the appropriate procedures, safety equipment, and run conditions are in place and functional before the start of the experiment. If no beam is required, only the PPD Head is required to sign. Other signatures may be added if the experiment affects other divisions, projects/experiments or personnel.

5.1 ORC Process (See flow chart in Appendix A)

This section outlines the ORC process:

1. A project is proposed and designed. An independent engineering review of the design(s) must be conducted and documented. Refer to the [Fermilab Engineering Manual](#) for design and review requirements that are commensurate with the magnitude, complexity and hazards of the project.
2. Project management, in consultation with the PPD Division Management and ES&H group, must determine if the project meets the criteria of this document, section 5.2. If the design does not meet any of the requirements or conditions, the project documents can be filed in the department database. If the design does meet any of the requirements, Project Management must contact the chair(s) of the applicable committee(s) ([ES&H Review Committee](#) and/or [Cryogenic Review Panel, Fire Hazard Subcommittee](#)).
3. The ES&H Coordinator/Project POC will communicate with the review committees/panels to schedule a review.
4. Each committee or panel will review the project and make recommendations based on their findings. All findings will be justified by the relevant FESHM chapter or recognized standard. Findings and recommendations will be communicated to the review ES&H Coordinator/Project POC and other review committees as appropriate and must be addressed to the satisfaction of the committees. The reviewed documents may include the following (if applicable):
 - A description of the project and hazards (pSAD or SAD)
 - Any NEPA or environmental permitting documentation
 - Shielding Assessment (beam-on only)
 - Engineering Risk Assessment
 - Electrical and engineering drawings, notes, and documentation
 - Specific training and procedures (access procedures, special hazard awareness, other)
 - Operational procedures
 - Emergency procedures
 - Other relevant documentation
5. After all findings and recommendations are adequately addressed, the committee or panel chair will communicate the completion of the review and recommend operation to the Division Head. The Project Management must also assure the PPD Head that the hazards in the experiment have been identified to all its participants, and that all participants have received appropriate training and instruction.
6. The PPD Head will review the project and recommendation from the committee(s) and provide feedback or written approval to operate to the project. PPD Head acknowledges acceptance of the recommendations and mitigation strategy for any safety issues by formally approving the project for operation.
7. Once approval to operate is communicated, the Project Management can then commence operations.

All approvals are documented, either on the ES&H Review/ORC template sign off sheet or collected via electronic media. The collection of signatures and associated paperwork is then stored in both the project and division document database.

5.2 Guidelines for Establishing an ES&H Review

All projects should be reviewed for ES&H impacts, but may not require a formal ES&H review. Lower risk projects may require only an internal review/walkthrough, which may include hazard analyses, work plans or procedures. The main challenge with this process is to determine when and of what level a formal review is required. The *guidelines* provided here are to serve as an aid to project management and division management in determining the level of review required. **All systems must meet all Fermilab safety standards.** The [FESHM Quality Assurance Manual](#) and the [Engineering Manual – Engineering Risk Assessment](#) shall also be used to determine the level of documentation and review required for projects. The following significant items require a formal ES&H review.

Computers or Programmable Logic Controller (PLC) use: Detector or apparatus control systems that rely solely on dedicated computers or PLC's for safety, environment, or property protection functions must comply with [Director's Policy #21](#).

Cryogenic Hazards: See [FESHM Cryogenic Safety Chapters](#)

Electrical Hazards: [FESHM Electrical Safety Chapters](#) Electrical systems which meet any of the following criteria:

- Uses non-commercial or modified commercial equipment.
- Uses non-PREP or modified PREP equipment.
- Any non-commercial low voltage high current or high voltage distribution systems.
- Any equipment with large capacitor banks or inductors capable of storing 10 joules or more of energy.
- Destructive testing of electronics.

Note: Electrical systems that meet any of the mentioned criteria require a simplified (block) electrical diagram of the entire installation, including commercial components, with special emphasis on power handling issues. These diagrams must be of sufficient detail that reviewers can verify that you have observed good systems engineering practices and have used proper fusing, wire sizes and insulation, termination etc. Line diagrams of custom manufactured circuitry or modifications of commercial components should contain similar detail.

Environmental Hazards ([FESHM Environmental Protection Chapters](#)): All proposed activities that will utilize any chemicals (hazardous or otherwise) or process that would result in a release to the environment shall include an environmental review. An environmental review, to address any potential air quality issues associated with a proposed activity, shall be conducted early in the

activity planning process. This shall be done to ensure that preconstruction permits are secured prior to commencement of any permit required activities. Permits can take a month or more to secure.

Fire Hazards ([FESHM Fire and Life Safety Chapters](#)): All proposed activities that will utilize any large combustible or flammable items such as large quantities of scintillator material, or solvents. This could also include limitation of egress due to the set up and space of the experiment.

Flammable Gas Systems: ([FESHM Storage and Usage of Flammable Gas Chapter](#)): Any use (i.e. targets) of flammable gas and flammable gas mixtures.

Homemade or Modified Tools or Equipment: A review may be required for homemade or modified tools and equipment. This is determined by looking at the process and use of the tool to determine if it will increase the hazards. Guidance can be found in [FESHM Work Planning Hazard Analysis Chapter](#).

Laser Hazards ([FESHM Lasers Chapter](#)): Lasers of class IIIB or higher (note does not include class IIIR).

Mechanical Hazards: Devices which meet any of the following criteria:

- Weighs over 3 tons and is supported above the floor
- Exceeds 10 tons in total weight
- Moves at a speed greater than 5 ft/sec
- Costs more than \$100,000 to replace

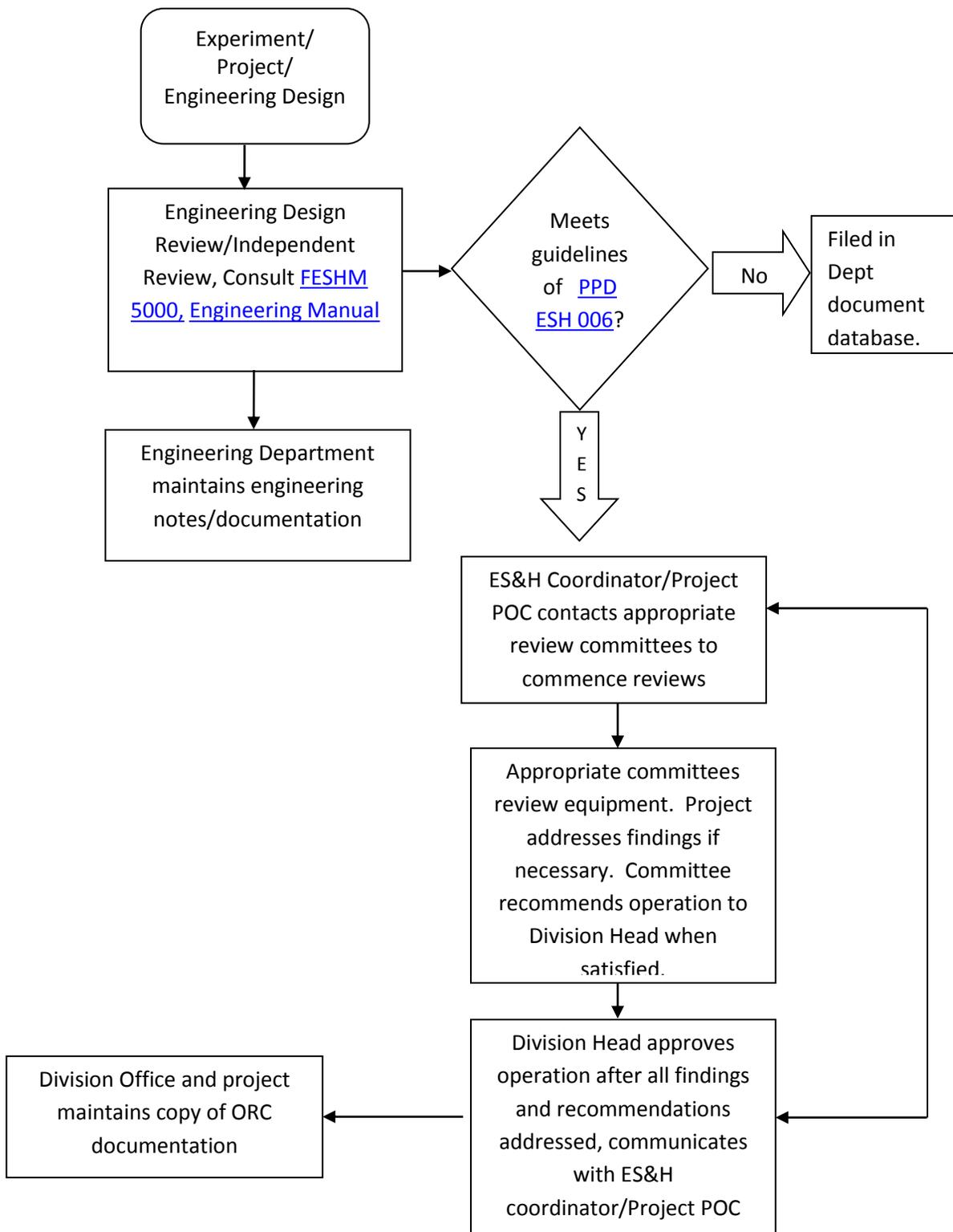
Oxygen Deficiency Hazards ([FESHM ODH Chapter](#)): Use of any oxygen displacing gases such as chamber gas systems, helium bag systems, argon systems, dry nitrogen, liquid nitrogen, etc.

Pressure/Vacuum Vessels and Systems ([FESHM Pressure and Vacuum Systems Chapters](#)): all pressure and vacuum vessels and piping require an engineering review as defined by the relevant chapter.

Radiation Hazards ([FRCM Chapter 4](#)): Radioactive sources/materials which will be used. Specify if embedded in detectors.

Toxic Materials: Toxic/hazardous materials used in any quantity. Examples include: lithium, beryllium, mercury, lead, uranium, cyanide, PCB's, refrigerant gasses, and others. Safety Data Sheet is required. Contact your local ES&H representative to determine the toxicity of a material.

Appendix A – ORC Process



Appendix B

ES&H Review Documentation Checklist

Documentation	Yes	N/A
Safety Assessment Documentation (pSAD or SAD)		
NEPA Determination and Environmental Permitting		
Shielding Assessment		
Engineering Documentation and Electrical Drawings ²		
Engineering Risk Assessment ²		
Specific Access Procedures/Training/Hazard Awareness Documentation		
Operational Procedures		
Emergency Procedures		
Other relevant documentation:		

² Engineering Documents must follow the Fermilab Engineering Manual.

http://www.fnal.gov/directorate/documents/FNAL_Engineering_Manual.pdf

http://www.fnal.gov/directorate/documents/FNAL_Engineering_Manual_Appendices.pdf