FERMILAB-TM-1776

Environmental, Safety and Health

Review Procedures for Experiments

Version 1.0
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Fermilab

Since its founding in 1967, Fermilab's mission has remained the same—to provide unequaled resources for scientists from around the world as they seek to understand the fundamental particles and forces of the universe.

Preface

For accepted experiments, Fermilab provides particle beams, high-resolution detectors, low-cost parallel computation, and engineers and technical specialists so that collaborators from more than a hundred universities and dozens of foreign institutions can carry out research at the frontiers of high-energy physics.

A series of particle accelerators culminates in the Tevatron, the first synchrotron made with superconducting magnets. Fermilab provides beam for experiments in three ways. In the fixed-target mode, the Tevatron accelerates protons to 800 GeV, then extracts and transports them to the experimental areas. The Tevatron can simultaneously supply about 12 experiments with beam. A second mode, which can run concurrently with fixed-target programs, uses antiprotons stored and cooled in the Pbar source for experiments with a gas jet target. In the third mode, the collider mode, the Tevatron accepts and accelerates protons and antiprotons to 900 GeV, in opposite directions, and brings the circulating beams into collision. To exploit the resulting 1.8 TeV center-of-mass energy, two large collider detectors, CDF and D0, operate at two sites around the Tevatron ring.

Fermilab's policy is to conduct research so that the environment and people's health and safety receive the highest consideration, while at the same time making the best use of laboratory resources. Fermilab holds the strong conviction that high standards of environmental protection, safety and health are fully compatible with accomplishing critical research. ◆

Review Procedures for Experiments

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Introduction

To carry out high-energy physics experiments takes many people working together; no one can do it alone. Thus, we must all depend on each other to hold to the highest standards of scientific research—and of safety, health and regard for the environment. Environmental, safety and health (ES&H) reviews provide the formal means to make sure that each successive stage of every experiment takes place safely and without harm to the environment. Reviews also document each experiment's compliance with applicable Fermilab policies and Department of Energy (DOE) orders.

Review Procedures for Experiments describes for both experimenters and Fermilab staff how to conduct ES&H reviews of Fermilab experiments. In doing so, it also defines and assigns responsibilities for the proper conduct of experiments. Comprehensive reviews cover all six stages of an experiment's "life cycle:" proposal; design and construction; installation; commissioning and operating; standby; and decommissioning.

Fermilab's Research Division and Director's Office have collaborated to produce *Review Procedures for Experiments.* It becomes Fermilab policy on March 1, 1992. The Director's Office updates *Review Procedures* annually to keep it current and relevant to Fermilab's changing research program. ◆

Glossary

This brief list of terms comes at the beginning of the document, because it helps make clear the material that follows. Several definitions refer the reader to the publication PFX: Procedures for Experimenters, *a handbook for Fermilab users, given to all experimenters and available to all from the Users' Office or division offices.*

Accelerator Safety Order. A document published by DOE that establishes safety program requirements specific to accelerator facilities.

Beamline physicist. Each fixed target beamline within the Research Division has an assigned beamline physicist whose duties include beamline design, coordinating beamline installation and modification, and commissioning the beamline. (A beamline physicist may have responsibility for more than one beamline.) The needs of the experiment using the beam dictate the beamline design. The experiment and the liaison physicist convey these needs to the beamline physicist. The beamline physicist works with the radiation safety officer to evaluate the shielding and interlock needs for the beamline.

Conduct of Operations. The Fermilab document each experiment uses to evaluate and document compliance with DOE Order 5480.19. The Conduct of Operations addresses an experiment's policy, procedures and documentation.

ES&H review coordinator. For an approved experiment, the host division head assigns a member of the division staff to serve as the experiment's ES&H review coordinator, whose duties include going through the Hazard Identification Checklist and determining the elements of the experiment that will require special review. (One person may serve as ES&H review coordinator for several experiments.) The ES&H review coordinator works with the host division head to set up appropriate review committees and works with the experiment's spokesperson, liaison physicist and review committees to resolve any problems arising during the review process. If the experiment has special hazards that require preparation of a Safety Assessment Document (SAD), the review coordinator helps the spokesperson and the liaison prepare the SAD.

Experiment. Fermilab experiments begin with the submission of a proposal to the Director's Office, followed by review by the Physics Advisory Committee (PAC). Experiments must be approved by the Director. *PFX* gives details on proposal submission.

Liaison physicist. The host division assigns a liaison physicist to each Fermilab experiment, to provide a direct path of communication between the experiment, the division and support groups. The liaison helps prepare budget requests and helps prepare the memorandum of understanding, coordinates experiment installation and magnet measurements. In ES&H matters, the liaison physicist works with the experimental hall building manager to ensure the safe installation and operation of the experiment. The liaison physicist works with the ES&H review coordinator to help the experiment comply with review procedures.

Memorandum of understanding (MOU). The MOU is an agreement between a group of experimenters and the Fermilab director that sets forth the commitments of all parties involved in all phases of the experiment. *PFX* provides information about the MOU in more detail.

Radiation safety officer. Each experiment and beamline has an assigned radiation safety officer (RSO); one RSO serves several beams and experiments. For fixed target experiments, the RSO works with the beamline physicist to determine the shielding and interlocks required to operate the beamline safely. For both fixed target and collider experiments, the RSO evaluates the radiation environment in areas people occupy during beam operation. The RSO works with experimenters to determine necessary and permissible modes of access to the experimental hall.

Safety Analysis. A Safety Analysis is a systematic study that identifies the hazards of operation of an accelerator, an experimental program or both. At Fermilab the Safety Analysis for each experiment begins with a Hazard Identification Checklist and an ES&H Impact Statement.

Safety Assessment Document. A Safety Assessment Document (SAD) describes identified hazards of an experiment or an accelerator and evaluates the measures taken to eliminate, control or mitigate them; a SAD analyzes and evaluates conditions that may pose special safety problems. It includes the Safety Analysis and Safety Envelope.

Safety Envelope. A Safety Envelope is the set of operating conditions of a detector or accelerator that may not be violated because to do so might endanger public health or safety; might endanger the environment; might endanger site personnel; and/or might violate regulatory compliance or external confidence. Once established, the safety envelope cannot be changed without permission of DOE, and Fermilab must report any violation of the safety envelope to DOE.

Spokesperson. Proponents of a physics experiment or a test beam request must designate a spokesperson to act as coordinator and leader of the group's activities. The spokesperson bears many responsibilities related to both scientific and ES&H aspects of the experiment. The documents *Review Procedures for Experiments, PFX* and *Fermilab ES&H Manual* all describe these responsibilities.

Test beam. Requests for use of Fermilab beams for detector R&D go through a less formal process of consideration than do experiments. *PFX* tells how to request test beam.

Written notification. For communication between experimenters and the host division, the divisions accept and encourage the use of electronic mail (e-mail). E-mail serves particularly well for scheduling reviews and notification of completion of reviews. ◆

Responsibilities

The Fermilab handbook *PFX: Procedures for Experimenters* explains each experiment's requirement to identify a spokesperson, who oversees all aspects of the experiment, including ES&H. In particular, the experiment spokesperson has the responsibility to ensure the satisfactory completion of each phase of the review process as described in this manual before the next phase of the experiment begins. For its part, Fermilab has the simultaneous responsibility to monitor the review process and take appropriate action to assure that all experiments follow it.

For each Fermilab experiment, either the Research Division or the Accelerator Division serves as the host division, depending on where the experiment operates most of the time. The Research Division serves as the host division for most experiments. Some experiments, such as collider experiments, take place in different divisions during different phases of their life cycles—assembly in a Research Division area, for example, and operation in an area managed by the Accelerator Division. In this document, the term "division" means whichever division has the responsibility for the particular phase of the experiment under consideration. In cases that involve both divisions, their respective responsibilities are explicitly identified. On occasion, the Computing Division may participate in an electronics review.

All Fermilab experiments must meet the requirements described in *Review Procedures for Experiments*. However, because experiments range from major collider detectors to small test beam initiatives, the extent and detail of ES&H experimental review vary to suit the level of risk and complexity. For large experiments, such as CDF, D0 and others, Fermilab assumes some ES&H responsibility, with lines of responsibility clearly delineated in the MOU and in both the experiment's and the division's operating procedures. In all situations the host division head has the responsibility to ensure that both the experimenters and Fermilab support staff understand the assignment of respective responsibility. ◆

A Note to Existing Experiments

Review procedures apply to all Fermilab experiments, according to their current stage when this review policy takes effect. Thus, experiments in the proposal phase will follow the full scope of reviews, while experiments in later phases will follow only the procedures beginning with the current phase of the experiment. Collaborators with experiments currently installed but not yet operating will bring their experiments into compliance in a graded manner, depending on the approval of future runs.

Experiment Proposal

At the very earliest phase of the experiment, proponents should investigate and list items that may have an ES&H impact. The Fermilab ES&H staff can provide several Fermilab documents that offer help in determining whether a piece of equipment, an operating condition or a procedure will have an ES&H impact.

Collaborators submit proposals for experiments or requests for test beam to the Director's Office, as explained in *PFX*. The Physics Advisory Committee (PAC) reviews experiment proposals. As part of the experiment proposal process, Fermilab and the proponents prepare an ES&H impact statement. Knowledgeable staff members of the proposed host division work with the proponents to prepare the impact statement. (When the experiment would affect both divisions, the director requests both to prepare impact statements.)

For a test beam request, the host division prepares an ES&H impact statement for the laboratory to review in responding to the request.

For both proposals and test beam requests, the Fermilab Director's Office notifies the spokesperson of the imminent preparation of an ES&H impact statement. Fermilab strongly encourages experiment proponents to contribute as much information as possible for the preparation of the impact statement, by including the information in the proposal itself or, if necessary, in supplementary communications.

ES&H Information To Include in an Experiment Proposal

- Description of any hazardous material to be used as part of or to support the detector
- A completed "Hazard Identification Checklist" (See Appendix B.)
- A floor plan of the experiment
- A description of any of the following systems the experiment plans to use: cryogenic magnets or targets, pressure vessels, vacuum vessels, lasers, flammable gas, high voltage, and low-voltage/high-current electronics
- Required beam conditions including intensity, particle type and duty cycle
- The experiment's geographic location, if known

An ES&H impact statement includes a "Preliminary Safety Analysis" (PSA) prepared following the guidelines of DOE Accelerator Safety Order, Draft Four. (An Accelerator Safety Order establishes safety program requirements specific to accelerator facilities.) The PSA:

- Identifies all potentially hazardous experimental apparatus or operating procedures.

- Lists all elements of the detector that will require review during design, construction, installation, commissioning, operation and decommissioning phases of the experiment.

- Presents an analysis of the radiation shielding and required interlock protection.

The host division uses the PSA to determine whether construction and operation of the proposed experiment fall within the laboratory's established Safety Envelope and Safety Analyses (see Glossary) for the accelerator, beamlines and existing experiments. Hazards unique to the experiment and not described and mitigated by existing analyses require written mitigation plans. For an approved experiment, these plans form the basis of the experiment's formal "Safety Analysis Document," which the Director's Office must approve before the experiment may start construction or installation of the hazardous components. (The PSA must address potentially hazardous equipment built offsite, with written mitigation plans for installation and operation at Fermilab.)

Upon approval of an experiment or granting of a test beam request, the appropriate division appoints an ES&H review coordinator for the experiment. The coordinator reviews the ES&H impact statement and, through the division head, appoints reviewers for each item that requires review. The laboratory then notifies the experiment's spokesperson, in writing, of the names of the review coordinator and the reviewers.

Each approved experiment has a liaison physicist from the host division. The liaison physicist helps the spokesperson communicate and conduct business with Fermilab throughout the course of the experiment. The liaison physicist has the responsibility to keep a record of the the complete ES&H review process for the experiment. Appendix C contains a sample record-keeping document.

If the experiment adds or changes equipment at any time over the course of the experiment, the spokesperson must notify the division head of the change, in writing. Such changes might include changing from inert to flammable gas mixtures, for example, changing from a non-hazardous to a hazardous target material, or introducing high-power laser calibration systems. Division staff determine whether the change requires a revision of the experiment's initial ES&H impact statement or a change in the schedule of reviews. ◆

Detailed Design and Construction

As detailed design of the experiment begins, the spokesperson must establish with the ES&H review coordinator the schedule for conducting all ES&H reviews of apparatus required at the design or construction phase. For equipment designed and built at Fermilab or at a collaborating institution and that requires review, the review team and the builders of the equipment must establish a review schedule. Experimenters must maintain the schedule for all reviews during design and construction and furnish them to the host division on request.

The experiment spokesperson has the responsibility to ensure that all collaborators and support personnel conform to all relevant engineering codes in the design and construction of equipment for the experiment. ◆

Installation

Before beginning an experiment's installation, the spokesperson must establish with the ES&H review coordinator the schedule of reviews for the installation phase. Equipment built outside the laboratory must have a final acceptance review, at Fermilab or at the construction site, before its installation at the experiment. The spokesperson and the ES&H review coordinator jointly establish the time and place of these reviews.

For equipment built in its operating location, the experiment spokesperson, the ES&H review coordinator and the equipment's builders establish a review schedule. Construction work must comply with all applicable safety standards and regulations at all times.

Before beginning installation of equipment, the spokesperson or a designee must produce all written installation procedures at the request of the ES&H review coordinator or members of the review team. The ES&H review coordinator must approve these procedures, and the spokesperson or a designee must distribute them to everyone who participates in the installation. People to whom these procedures apply must have ready access to them throughout the installation of the experiment. ◆

Commissioning and Operating

Depending on its complexity, commissioning an experiment can take several days—or several months. It starts with the completion of installation of all or part of the apparatus and ends when the division head declares the experiment operational. Commissioning can require a high level of activity involving many people from myriad institutions. During commissioning, the spokesperson bears two major ES&H responsibilities. First, the spokesperson must make sure that all experimenters—physicists, students and technical support personnel—from collaborating institutions have properly registered as users and have received all the current training that their tasks at Fermilab require. Both *PFX* and Fermilab ES&H staff offer guidance in this area. Second, the spokesperson must ensure that no one operates any piece of equipment or apparatus before it has received the requisite approval for operation. Except for the items listed in the box, this approval is granted at the time of the experiment's approval.

Equipment or Apparatus that May Not Be Operated without Explicit Written Approval from the Host Division Head in the Form of Acceptance of the ES&H Review

- Any detector elements cited in the ES&H impact statement as requiring a safety review for operation
- Any detector elements or systems introduced into the experiment after preparation of the ES&H impact statement, unless explicitly exempted from review by the division head or ES&H review coordinator
- Any detector using any amount of flammable gas
- Any low-voltage/high-current (greater than 10 amps) electrical distribution systems
- Any AC power distribution system other than the building's premises wiring
- Any laser system of class III or higher

During commissioning, the ES&H review coordinator arranges with the spokesperson or a designee to perform one or more conventional safety walkthroughs of an experimental area. These walkthroughs concentrate on identifying problems in compliance with Occupational Safety and Health Administration (OSHA), American Society of Mechanical Engineers (ASME) and National Electrical Code (NEC) standards; they also look for all potential safety problems. The observation of any serious noncompliance halts all operations related to the problem until the experiment has corrected the problem.

The host division office maintains records of all safety review approvals. When all the required reviews have been satisfactorily completed, and no more than two months before the scheduled start of the experiment, the spokesperson asks the host division office to grant the experiment Operational Readiness Clearance (ORC). For CDF, D0 and other large experiments, the Research Division coordinates preparation of ORC documentation; however, both Research and Acceleration Division heads must approve the final ORC.

(Sometimes, when an experiment implements a staged installation, the division office grants a partial ORC that applies only to the elements with completed safety reviews. Amendments or addenda to the ORC document then permit operation of additional elements later on, when their reviews are complete. The spokesperson must inform the appropriate division office of any significant modification to operating apparatus.) ◆

An Important Note for Experimenters

Whenever experimenters have any question whether operation of a system or a piece of apparatus requires explicit approval, the experiment spokesperson has the mandated responsibility to find the answer, typically by communicating with the liaison physicist. Any unauthorized operation of a system or piece of apparatus will require an experiment to cease operation of that equipment until obtaining approval for startup.

Obtaining the ORC

To be declared operational and to request the delivery of beam, an experiment must obtain a final ORC. To obtain the ORC, an experiment must complete all relevant safety reviews and satisfactorily fulfill five requirements:

- Submit an experiment run plan, giving operating conditions of beam, to the host division office, which forwards a copy to the Director's Office.
- Obtain approval for a completed "Conduct of Operations for Fermilab Experiments" document, included in Appendix D.
- Submit an "Emergency Information Form" (Appendix E) to the host division's Operations Group.
- Verify current general radiation safety training and controlled access training for three quarters of the experiment's members present at Fermilab.
- Make a final conventional safety walkthrough.

The experiment must document the satisfactory completion of these five requirements and the equipment ES&H reviews on the ORC form in Appendix F. Appendix F also includes an ORC Amendment Document.

Standby

In the event of a prolonged hiatus in the operation of an experiment—between two running periods, for example, or between sub-periods of fixed-target or collider operations—the host division requests the experiment to submit a "Conduct of Operations" document telling how the experiment will operate during standby. During such a hiatus, the experiment spokesperson has the responsibility to maintain in safe condition all equipment left installed in an experimental hall or associated areas, such as counting rooms. Research Division policy calls for the experiment to suspend operation of all high-voltage, low-voltage/high-current, and flammable-gas systems. If an experiment needs to continue operating any such pieces of its apparatus, the spokesperson must spell out in the "Conduct of Operations" how the experiment will maintain and monitor the equipment. The division head must approve the operation in writing.

After the hiatus, the experiment must renew its ORC before resuming operations. When the experiment has made no significant changes, ORC renewal may require only an update of the experiment run plan, a conventional safety walkthrough arranged by the spokesperson and the ES&H review coordinator, and written certification by the spokesperson to the division office that nothing has changed to affect the safety review status of the experiment. If an experiment plans to make significant changes in equipment or operating procedures during standby, the spokesperson must notify the division office and the ES&H review coordinator before operating the equipment. ◆

Decommissioning

When an experiment finishes taking data, the spokesperson has the responsibility to work with the liaison physicist to plan for removing the experiment. Unless explicitly stated in the experiment's memorandum of understanding, each collaborating institution has the responsibility for removing its own equipment.

The spokesperson has the further responsibility to inform members of the collaboration and support staff of ES&H issues related to removing equipment. They need to understand and follow laboratory policies and procedures for handling and transporting radioactive materials such as targets and sources and any equipment from an experiment hall where beam has been present. For other questions about decommissioning, experimenters have the responsibility to seek advice from division ES&H groups or the Fermilab ES&H Section. ◆

APPENDIX A Document Revision Record

This page gives a history of all revisions made to this document, *Review Procedures for Experiments,* so that both users and Fermilab personnel can stay informed of current procedures for experiment review. When the document's version number changes by a fraction (Version 1.0 becomes Version 1.1, for example), only minor changes, such as spelling or grammar, have occurred. An integer change in the version number (Version 1.3 to Version 2.0) indicates changes in the intent, interpretation or actions required by the document. The Director's Office notifies spokespersons of proposed, active or standby experiments of significant changes to the document. The Director's Office reviews and approves all such changes before release of the revised document. ◆

Revision Record for Environmental, Safety and Health (ES&H) Review Procedures for Experiments

Version Number	Release Date	Revision By:	Approved By:	Comments
1.0	March 1992	R. Rameika		first release

APPENDIX B Hazard Identification Checklist

The experiment spokesperson or designee must complete the Hazard Identification Checklist on the next page; the experiment should include the Hazard Identification Checklist with the experiment proposal. The experiment also sends both pages of the Hazard Identification Checklist to the Research Division Office, M.S. 208. The Research Division forwards the Checklists of Accelerator Division experiments to the Accelerator Division Office. The experiment's host division uses this checklist as a starting point for the Preliminary Safety Analysis. The checklist helps experimenters review the components of their experiment for potential ES&H hazards and systems that require special review. Identifying such hazards early gives the host division adequate time and resources to address each issue. The experiment must submit this form before preparation of the ES&H impact statement begins. ◆

Hazard Identification Checklist for Experiment _____

To be completed by experiment:

Check any items for which there is anticipated need.

☐ **Cryogenics**

- ____ beamline magnets
- ____ analysis magnets
- ____ target
- ____ bubble chamber

☐ **Pressure Vessels**

- _____ inside diameter
- _____ operating pressure
- _____ window material
- _____ window thickness

☐ **Vacuum Vessels**

- _____ inside diameter
- _____ operating pressure
- _____ window material
- _____ window thickness

☐ **Lasers**

- ____ permanent installation
- ____ temporary installation
- ____ calibration
- ____ alignment

type: _____

wattage: _____

class: _____

☐ **Electrical Equipment**

- ____ Cryo/Elect. devices
- ____ capacitor banks
- ____ high voltage (> 5 kV)
- ____ exposed equipment over 50 V

☐ **Flammable Gas or Liquids**

type: _____

flow rate: _____

capacity: _____

☐ **Radioactive Sources**

- ____ permanent installation
- ____ temporary use

type: _____

strength: _____

☐ **Hazardous Chemicals**

- ____ Cyanide plating materials
- ____ Scintillation Oil
- ____ PCBs
- ____ Methane
- ____ TMAE
- ____ TEA
- ____ photographic developers
- ____ other

☐ **Radioactive/Hazardous Materials**

List any hazardous/toxic materials planned for use in a beamline or experimental enclosure:

_____

_____

_____

☐ **Target Materials**

- ____ Beryllium (BE)
- ____ Lithium (LI)
- ____ Mercury (HG)
- ____ Lead (PB)
- ____ Tungsten (W)
- ____ Uranium (U)
- ____ other

☐ **Large Mechanical Structures/System:**

- ____ lifting devices
- ____ motion controllers
- ____ scaffolding or elevated platforms

Hazard Identification Checklist for Experiment _____

To be completed by division office:

Item #	Review Committees Required	Committee Chairperson

APPENDIX C ES&H Review Record

The ES&H REVIEW RECORD on the next page provides an example that experiments may wish to use in establishing the formal process for documenting each aspect of the experiment review process. Experimenters are free to use this format or develop and maintain their own. ◆

ES&H Review Record for Experiment _____

To be completed by experiment:

Safety review coordinator: _____

Review phase: _____

Equipment being reviewed: _____

Brief description of the review required: _____

To be completed by review coordinator:

Item #	Date	Reviewers	Status of review

APPENDIX D Conduct of Operations for Fermilab Experiments

The next two pages contain the cover page and introduction to the document "Conduct of Operations for Fermilab Experiments," (COO). The Research Division furnishes copies of the complete document. All experiments—including Accelerator Division experiments—must complete and obtain approval for the entire COO document before they can receive Operational Readiness Clearance. The Research Division reviews COO documents and forwards them to the directorate for final acceptance. Any experiment in standby phase must also complete a COO. ◆

Conduct of Operations for Fermilab Experiments

Completed for experiment _____

by: _____
Date

Experiment location: _____

Experiment status: ☐ commissioning & operating ☐ standby

Accepted by: _____
Research Division Office Date

Accepted by: _____
Directorate Date

Preface

The mission of Fermilab is to provide the resources necessary to conduct basic research at the frontiers of the field of high-energy physics and related disciplines. The conduct of this research must be performed in such a manner that environmental, safety and health concerns receive the highest consideration. At the same time the programmatic goals of the laboratory must be met by efficiently producing the highest quality physics results. The Fermilab management firmly supports the concept that quality physics is compatible with safe operation of the Fermilab facilities. Requirements for assuring this compatibility are set forth by the Department of Energy in the form of DOE Orders. Compliance with these orders is mandatory. Implementation of the orders requires guidance. This guidance comes from both the DOE and the Fermilab Director's office.

Introduction

The purpose of this document is to provide the format by which each experiment performed at Fermilab evaluates and documents its compliance with the Department of Energy Order 5480.19, "Conduct of Operations". Fermilab requires that this document be completed by the experiment spokesperson and accepted by the Director's office as part of the procedure for obtaining Operational Readiness Clearance, a requirement which must be satisfied before the experiment can be declared operational. An updated copy of this document must be submitted when an experiment goes into a standby phase. The format of this document is a questionnaire which has been designed to cover each of the major chapter headings of Order 5480.19, Attachment I. For each chapter heading there is a brief introduction describing the basic intent of the guideline and the questions which follow. Occasionally reference is made directly to the guidance given in Attachment I, which is included as Appendix A to this document. During a standby phase some chapters do not apply. For each question there are a number of potential an-

swers. One of the answers, "not documented but understood by ", is to be completed by entering the percentage of collaboration members who are sufficiently versed in the item that no written documentation is required. More than one answer may be applicable. Most questions deal with the existence of policy, procedures and documentation. Where the documentation exists, reference numbers (REF_____) must be given. These numbers refer to an entry in Appendix 1 which is a list of all referenced documentation and its location. In cases where the documentation is being developed an expected completion date (ECD_____) is required. It is important to recognize that each experiment will develop its own methods for conducting operations and ensuring that these are safe and efficient. Methods include training, written operating procedures, alarm response procedures, posted information, checklists, etc. Separate chapters of this document address each of these. In most cases it is not necessary to address operations by each of these methods, but rather by the one that is the most appropriate.

Conduct of Operations as applied to experiments at Fermilab is implemented using a graded approach based on factors such as cost and complexity. Implementation at each experiment may also be applied using a graded approach whereby components and systems may also be categorized according to cost, complexity and programmatic importance. Guidance in how to apply the graded approach is given in Appendix B of this document. ◆

APPENDIX E Emergency Information List

The experiment spokesperson or a designee must complete the Emergency Information List on the next page before the division grants partial or final Operational Readiness Clearance. Fixed-target experiments should send completed forms to the Research Division Experimental Areas Operations Center (M.S. 355). Accelerator Division experiments should send the form to the Main Control Room (M.S. 306). CDF and D0 experiments should submit the form to both operations groups. The form gives immediate, up-to-date information to the Operations crew chief in the event of an emergency at an experiment. ◆

Emergency Information List for Experiment _____

To be completed by experiment:

	Name	On-Site Phone	E-Mail	Mail Station
Spokesperson				
Deputy Spokesperson				
Physicist-in-charge				
Liaison Physicist				
Beamline Physicist				

Special Hazards at your experiment:

_____

_____

_____

_____

To be completed by host division Operations Group:

Received by: _____

Date

APPENDIX F Operational Readiness Clearance

The following pages present the summary document that grants an experiment Operational Readiness Clearance (ORC). When the experiment is ready to request its ORC, the experiment spokesperson or a designee completes the upper part of the form and submits it, along with documentation, to the Research Division Office (M.S. 208). The experiment's liaison physicist serves as the communication link between the spokesperson, the experiment's ES&H review coordinator and the host division in all matters regarding the completion of the safety reviews required by the ORC. For fixed target experiments, the experiment's beam line physicist and radiation safety officer take responsibility for the requirement of "run conditions". However, the final ORC includes this requirement to ensure that the experiment spokesperson understands the run conditions that have been generated for the experiment's beamline operations. Research Division policy governs all changes to run conditions. ◆

Operational Readiness Clearance for Experiment _____

To be completed by experiment:

Spokesperson: _____

Liaison Physicist: _____

ES&H Review Coordinator: _____

Date: _____

To be completed by ES&H review coordinator:

ES&H Equipment Reviews	Check if Required	Reviewed & Approved by	Date
Mechanical systems			
Cryogenic magnets			
Oxygen deficiency hazards			
Cryogenic targets			
Flammable gas			
Pressure vessels			
Vacuum vessels			
Electrical safety			

To be completed by host division office:

	Date Completed	Signature
Training		
Run conditions (Fixed Target)		
Emergency Information Form		
Conventional Safety Walkthru		

To be completed by host division head:

☐ Research Division ☐ Accelerator Division

Operational Readiness Clearance Granted ☐ partial ☐ complete

Approval _____
Name Date

Approval _____
Name Date

Ammendment to: Operational Readiness Clearance for Experiment _____

To be completed by experiment:

Spokesperson: _____

Liaison Physicist: _____

ES&H Review Coordinator: _____

Date: _____

To be completed by ES&H review coordinator:

ES&H Equipment Reviewed	Reviewed & Approved	Date