

# Operational Readiness Clearance (ORC) Guidelines

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ESH&Q

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## ORC Guidelines

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## Guidance

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The full set of information that constitutes official guidelines is in the Fermilab ES&H Manual ([FESHM](#)). This document is a brief set of valuable pointers and handy tips for those seeking ORC approval.

The ORC inspection will be largely based on the Hazard Checklist of the [ORC form](#). As guidelines, the following issues will be a concern in the ORC review:

- Fire Safety, including Flammable Gases or Liquids
  - All proposed activities that will utilize any large combustible or flammable items such as large quantities of scintillator material or solvents will be of concern. This also includes limitation of egress.
  - On your Hazard Checklist, specify the total amount of each type of gas to be used, the flow rate, and the capacity of the device in which the gas will be used.
  - [FESHM Chapter 6020.3](#) outlines the requirements and necessary documentation for use of Flammable Gases.
  - Any flammable materials and/or systems need to be labeled.
  - As a general practice, the use of combustibles within buildings should be limited. If there are questions regarding the combustibility of building materials (cables, foam board, plastics, etc.), please obtain a sample of the material and contact the Division Safety Officer (DSO). There is a system in place to test these materials.
  - [Fire-Life Safety Guidelines](#)
- Gases
  - Example: Wire Chambers, GEMs, and other Gas Detectors
  - Every type of gas that will be used needs to be indicated so that ESH&Q personnel can determine if permitting is required.
  - On your Hazard Checklist, specify the total amount of each type of gas to be used, the flow rate, and the capacity of the device in which the gas will be used.
  - Greater than 0.1 pounds/hour of flow of air pollutant emissions may require an air permit. The need for an IEPA permit may delay installation for three months.
- Environmental Hazards
  - Proposed activities that utilize any chemicals (hazardous or otherwise) that could result in a release to the environment shall include an environmental review to address any potential environmental quality issues.
  - All new activities must submit an [Environmental Review Form](#).
  - [Environmental Safety ORC Review Tips](#)

- **Hazardous Chemicals**
  - Toxic, flammable, corrosive or reactive materials, when used in any quantity will be a concern. Examples include lithium, beryllium, mercury, lead, uranium, cyanide, PCBs
  - Any experiment using flammable, corrosive, reactive, or toxic materials will need to post the chemical's Safety Data Sheet at the experiment location.
  - Safety Data Sheets in the Fermilab database can be found [here](#).
  - Reviewers will want to know if safer alternatives were considered, and a reasoning as to why they were not chosen.
  - Refer to [FESHM 4110](#), [FESHM 4180 through 4200](#), [FESHM 8030](#), [FESHM 8031](#)
- **Radioactive Sources**
  - Are they being used as a calibration (temporary use) or do you need them in an enclosure while beam is being run (permanent installation)? Be certain to make this clear on your Hazard Checklist.
  - A list of sources available at the lab can be found [here](#).
  - Sources can be requested from the ESH&Q Source Manager.
    - Source Manager: [Kathy Graden](#)
    - Alternate: [Susan McGimpsey](#)
  - Anyone using sources will need [Source Training](#) (as well as Radiological Worker Training).
  - The official guidelines are in [FESHM 11001](#) and are detailed in the Fermilab Radiological Control Manual ([FRCM](#)).
- **Radiation Safety**
  - The ESH&Q Radiation Physics Engineering Group will inspect the area to look for any issues that may result in adverse radiological consequences, each time an experiment sets up to take beam.
  - [Rad Safety Checklist](#) for Test Beam Facility ORC Reviews
- **Target Materials**
  - Certain materials require additional training for handling
  - Targets may require additional safety reviews/inspections/approval
  - Any material put in the beam will need to be surveyed by a [Rad Control Tech \(RCT\)](#) upon removal from the beam enclosure
- **Nuclear Materials**
  - No [nuclear material](#) shall be shipped to Fermilab without notification and prior approval of the Fermilab Nuclear Materials Representative
    - NM Representative: [Kathy Graden](#)
    - Alternate: [Susan McGimpsey](#)
- **Lasers**
  - Use of a Class 3B or Class 4 laser at Fermilab must be approved by the Laser Safety Officer prior to operation. Class IIIR lasers do not need to be approved. If in doubt about any laser, please contact the Laser Safety Officer (LSO).
    - Laser Safety Officer: [Matt Quinn](#)
    - Alternate: [Dave Baird](#)
  - Anyone working with a Class 3B or Class 4 laser will need to complete the [Laser Safety Training](#) and a laser eye exam. The eye exam can be arranged through the Fermilab Medical Office (x3232) [medical\\_office@fnal.gov](mailto:medical_office@fnal.gov).
  - Ensure that proper enclosures, interlocks, and personal protective equipment (PPE) are in place.
  - Necessary Documentation:
    - [Registration form](#)

- Written [Standard Operating Procedures](#)
  - Fill out the above forms and send to the LSO. Upon approval, the LSO will issue laser registration labels.
  - Place laser registration labels on the laser after receipt from the LSO.
  - The laser will have a final review of the setup by the LSO as part of the ORC inspection.
  - *NOTE: The process of registering and properly configuring a Class 3B or Class 4 laser for use can take a significant amount of time and resources. Please consult with the LSO as soon as you identify a need for such a laser.*
- Ultra Violet (UV) Radiation Sources
  - Use of any UV radiation source operating within 180-400 nm requires notification to ESH&Q.
  - Contact the DSO for warning labels, enclosure requirements, and PPE determinations.
  - See [FESHM 4280](#) for further information.
- Electrical Equipment
  - Electrical systems which meet any of the following criteria are likely to be a concern in the ORC process:
    - 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 or inductor banks capable of storing 10 J or more of energy
    - Destructive testing of electronics
  - [Electrical Safety ORC Review Tips](#)
  - [Electrical Design Standards for Electronics to be used in Experiments at Fermilab](#)
  - Necessary Documentation:
    - Simplified (block) electrical diagram of entire installation, including commercial components, with special emphasis on power handling issues. These must be of sufficient detail that reviewers can verify the experimenters have observed good systems engineering practices and have used proper fusing, wire sizes, insulation, termination, etc.
    - Line diagrams of custom manufactured circuitry or modification of commercial components of similar detail.
- Mechanical Structures
  - Devices that meet the following criteria are likely to be a concern in the ORC process:
    - Weighs over 3 (short) tons and is supported above the floor;
    - Weighs over 10 (short) tons;
    - Moves at a speed greater than 5 feet/second;
    - Presents a pinch hazard;
    - Homemade or modified tools or equipment. See also [FESHM 2060](#).
  - Small test apparatuses are often placed on moveable tables. In this case, ensure the table is grounded and its motion stops are in place. Exercise the motion table to ensure cable slack and motion interlock stops are correctly positioned.
  - Lifting fixtures and fabricated structural elements must have a complete engineering note.
  - Modifications to structural elements of the building require a [FESS Design Review](#).
- Vacuum Vessels
  - Apparatuses containing vacuum vessels will need to be inspected by the ORC Committee. Vacuum vessels must comply with [FESHM 5033](#) or [FESHM 5033.1](#).

- **Pressure Vessels and Pressure Piping**
  - Apparatuses containing pressure vessels and piping will need to be inspected by the ORC Committee. Pressure vessels and piping must comply with [FESHM 5031](#) or [FESHM 5031.1](#).
- **Cryogenics**
  - Apparatuses containing cryogenics will need to be inspected by the Cryogenic Review Committee who will issue an engineering note upon approval. This note will be referenced by the ORC chairperson as part of the ORC inspection.
- **Other Safety Considerations:** Besides all the above items, reviewers will be on the lookout for the following:
  - Trip hazards (be sure cords are secured, taped down, or covered properly)
  - Falling hazards (be sure equipment is mounted in a secure way and cannot fall)
  - Strain relief (be sure your cables are not reaching too far, even if the table moves)
  - Daisy chained power strips

## ORC Approval Process

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The walkthrough is conducted with the experimental representative, but depending on the situation it may be helpful to have other experimenters present so that minor issues that arise can be addressed immediately without delaying the process.

After the walkthrough (and after any appropriate remediations are in place), there will be a sequence of sign-offs. The committee members will give their approval through the online form. Once all reviewers have approved, the ORC chairperson will give approval, which initiates the approval requests to the DSOs and Division/Section Heads.

If requesting beam, once all approvals are obtained, the Accelerator Division Operations Department Head will then authorize the MCR Crew Chief to deliver beam when requested by the experiment. The crew chief will also see to any steps necessary for operating the beamline.

## Renewing your ORC

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*Projects that have been previously approved but have been idle for greater than 60 days must contact the chairs of all review committees involved in the initial approval process to determine whether a new review is needed. The experiment will verify, in writing, the end date of the previous run and that the experiment has not changed.*

In any case, a renewal ORC will be generated.