



# FERMI NATIONAL ACCELERATOR LABORATORY

## FERMI NATIONAL ACCELERATOR LABORATORY SHIELDING POLICY

Revision 1 August 6, 2023

Appendix B of the Safety Assessment Document



## Revision History

| <b>Author</b>        | <b>Rev. No.</b> | <b>Date</b>    | <b>Description of Change</b>  |
|----------------------|-----------------|----------------|---|
| Maddie Schoell       | 1               | August 6, 2023 | Updated layout to match that of full SAD Layout update. No content updated. |
| John E. Anderson Jr. | 0               | July 21, 2010  | Initial release of Appendix B Fermilab Shielding Policy                     |
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## Section 1. Ionizing Radiation Shielding Policy

Shielding design shall limit exposure to ionizing radiation to values that are below the limits in the Fermilab Radiation Protection Program (RPP) Plan which implements 10 CFR 835 and are consistent with Fermilab's low hazard, non-nuclear facility designation. Shielding shall follow the general design requirements listed below, meet the requirements outlined in Fermilab Radiological Control Manual (FRCM), specifically FRCM Chapters 2 and 8, and implement the As Low As Reasonably Achievable (ALARA) principles to minimize worker and public exposure to ionizing radiation. Shielding shall be implemented as necessary to mitigate radiation exposure from the following.

1. Sources of prompt radiation generated by accelerator and experimental area operations, around test stands, around R&D experimental areas, and any other radiation generating devices at Fermilab.
2. Activated beamline or experimental area components.
3. Activated cooling water.
4. Radiation sources and any other radioactive material on site.

Ionizing radiation shielding design shall follow the following general design requirements.

1. Incorporate permanent shielding to the maximum extent practicable, limiting the use of removable/temporary shielding to instances where it is justified by operational circumstances.
2. Match shielding design to beam losses expected during normal operations as specified the FRCM.
3. Match shielding design to accidental beam losses as specified by the FRCM.
4. Build shielding using any combination of bulk shielding materials.
5. Design access labyrinths and utility penetrations to provide sufficient radiation protection.
6. Check shielding for proper configuration at regular intervals.
7. Document the design in as-built radiation shielding drawings in accordance with FRCM Chapter 8.
8. Improve the design or reduce the operating power limits whenever the Shielding Assessment Review Subcommittee determines that the shielding configuration provides less attenuation than the values defined in the area shielding assessment.
9. The Shielding Assessment Review Subcommittee shall review the shielding configuration at the discretion of the ESH Director.
10. Reference and summarize the design in the Safety Assessment Document (SAD), which is approved as described in FESHM 2010.
11. The Shielding Assessment Review Subcommittee shall review each shielding assessment for completeness, methodology, and compliance with the FRCM at the discretion of the ESH Director in accordance with the subcommittee charter.





## Section 2. Non-Ionizing Shielding Policy

Non-ionizing radiation shall be adequately contained or attenuated to values consistent with Fermilab's Environment, Safety, and Health Manual (FESHM). Systems that use or produce non-ionizing radiation shall be designed to limit radiation exposure to employees consistent with the ALARA principles and shall follow Fermilab's general non-ionizing radiation design criteria listed below. Shielding or containment shall be implemented as necessary to mitigate radiation exposure from the following sources.

1. Sources of radiofrequency (RF) radiation.
2. Sources of coherent light, e.g., lasers.
3. Other intense sources of light, e.g., excimer lamps and welding processes.

Non-ionizing radiation shielding design shall follow the following general design and review requirements.

1. Incorporate permanent shielding to the maximum extent practicable.
2. Check shielding for proper configuration at regular intervals.
3. Document the design in as-built shielding drawings or, if the shielding is temporary, in work hazard analysis documents.
4. Review the shielding configuration for a specific planned activity; and approve the design before power is applied to the device being shielded in accordance with the FESHM.