

Radioactive Material Inspection Follow-up

With respect to the 2/01/2018 DOE Data Call

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Introduction

Fermilab is an accelerator facility that operates under 10 CFR 835 Occupational Radiation Protection and 10 CFR 851 Worker Safety and Health. There are no nuclear facilities on the Fermilab site. The hazards at Fermilab, including pyrophoric, nuclear and radioactive materials, are well controlled. There are many controls in place that are described below. The operations at Fermilab are continually monitored to promptly detect deviations from normal conditions.

In response to the incident at Argonne and subsequent data calls (11/30/2017), Fermilab conducted a self-assessment of its reactive materials inventory to ensure the materials are properly labeled, stored, accounted for and to review the disposition pathways.

Below is a list of program elements that describe the reactive materials inventory and controls for radiological and pyrophoric materials as well as radioactive materials.

Material Inventories & Management Programs

Fermilab maintains a list of facilities that are approved to contain (i.e. store or use) radioactive materials and radioactive sources. This list can be made available upon request.

- **Radioactive materials** are primarily large materials or equipment, either metal or concrete, that were volume-activated during accelerator operations and are not dispersible to the air. These materials and equipment are stored only in approved and appropriately posted Radioactive Material Areas and/or Controlled Areas and secured inside buildings or fences with locked gates.
- **Radioactive sources** are purchased sealed sources (not manufactured at Fermilab). Fermilab's Sealed Source Control & Accountability Program requires an inventory of all radioactive sealed sources at Fermilab, not only those required by 10 CFR 835 Appendix E.

Fermilab also maintains a list of facilities containing nuclear materials and a Nuclear Material inventory. The vast majority of Fermilab's potentially pyrophoric material inventory (~90%) is the Depleted Uranium (DU) in the DZero calorimeter, which is captured in the Nuclear Material inventory. Large plates of DU make up the calorimeter and are provided with environmental controls to prevent corrosion. It is approximately 525,000 lbs.

Other very small quantities of pyrophoric materials are used in scintillation detector development.

The materials described above are managed through Fermilab's ES&H management system. We have many program elements in place to mitigate the risks associated with the use of radioactive, nuclear, pyrophoric and other hazardous materials used at Fermilab. These program elements are described below.

- Fermilab's Radiation Protection Program describes the approach to compliance with 10 CFR 835 requirements and includes processes to ensure radiological materials are highly controlled. Examples include:
 - Radiation Surveys of all buildings on site where radiological work may be performed by Radiological Workers
 - Periodic radiological surveys in these buildings – a graded approach is used to determine survey frequencies
 - Dumpster (non-regulated waste) surveys
 - 100% of dumpsters are surveyed immediately prior to vendor pick up to ensure no radioactive materials are inadvertently disposed of in the non-regulated waste stream
 - Radiological Worker surveys
 - Radiological Workers are trained and required to immediately survey and label radioactive materials removed from beamline enclosures as noted on the Radiological Work Permit
 - Material Move Requests (MMRs)–
 - MMRs require a radiation survey to determine and document activation of materials prior to movement on site and track radioactive materials moved between Divisions/Sections using our Shipping/Receiving vehicles
 - Fermilab Radiological Control Manual Chapter 2, Article 242 *Maintenance of List of Facilities Containing Radioactive Material* –
 - A list of facilities at Fermilab that are approved to contain radioactive material
 - This list can be made available upon request
 - The list is reviewed and updated annually
 - FRCM Ch 2 Part 4 Article 241 *Release Procedures* details the process for releasing facilities from the List of Facilities Containing Radioactive Materials
 - Radiological posting audit
 - Semiannually an assessment of all radiological postings on buildings, areas and fences is performed and documented
- The Nuclear Material Management Plan details the controls in place for nuclear materials at the lab. An annual inventory inspection is required.
- The Sealed Radioactive Source Control and Accountability Program lays out the requirements for the use of sealed sources at Fermilab from purchase through disposition. Sealed sources are inspected and leak checked monthly.

- Fermilab's Industrial Hygiene (IH) program is designed to protect the health and well-being of working people and the public from chemical, microbiological and physical health hazards present at, or emanating from, the workplace.
- The Fermilab Self-Assessment Program describes both the laboratory and functional level assessments, Tripartite Assessments, Management Field Observations, and ES&H Inspections and Walkthroughs. All assessments are documented and non-conformances and opportunities for improvement are tracked to completion utilizing the lab's issues tracking system, iTrack.
- Fermilab's ES&H program has been developed to identify and address program and performance deficiencies and opportunities for improvement.
- The Comprehensive Emergency Management Plan outlines the procedures and conditions under which management and emergency response personnel function during abnormal events. It relies on the execution of both laboratory and local procedures in order to mitigate, respond and recover from abnormal situations.
- The Fire Protection Program provides a level of fire protection and fire suppression capability sufficient to minimize losses from fire and related hazards consistent with the best protected class of industrial risks, that is, Highly Protected Risk (HPR). The HPR inspections are executed by the Fire Protection Authority Having Jurisdiction (AHJ) and the Electrical Safety AHJ.

Actions to Date

Fermilab developed a phased approach to address the risks associated with pyrophoric materials and to confirm that the radiological and pyrophoric materials on site are properly managed. The inventories were reviewed and a self-assessment was completed. No non-conformances were identified during the self-assessment, however several OFIs were identified and plans for addressing the OFIs are either complete or being developed.

FNAL Extent of Condition Table

Attached please find the spreadsheet that was requested by email, on February 1, 2018 with the subject line "Radioactive material inspection follow up direction."