

**RADIATION PROTECTION PROGRAM INTERNAL ASSESSMENT SUMMARY FOR THE CY 2011 -
CY 2013 TRIENNIUM
FERMILAB RADIATION PROTECTION GROUP RADIATION PHYSICS TEAM
APRIL 2014**

SUMMARY

During this triennium, the physics research program at Fermilab underwent a significant transition. The program of operations associated with the Tevatron Collider operating at the high energy physics energy frontier was concluded while new projects exploiting somewhat lower particle energies having larger beam powers continued to be developed to explore an emergent intensity frontier. This evolution of the Fermilab research program is now well underway and will continue for the foreseeable future. This programmatic change motivated the submission of a complete revision of the Fermilab Radiation Protection Program (RPP). The changes are largely in the narrative Scope of the RPP that has been modified to better describe the radiological activities found at Fermilab. The most recent amendments to 10 CFR Part 835 issued on April 13, 2011, are incorporated into the Fermilab RPP and the Fermilab Radiological Control Manual (FRCM). Upon receipt of the revised RPP, the DOE Fermi Site Office (FSO) approved of it on October 21, 2013. The current RPP is posted at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=88>. No exemptions to the requirements of 10 CFR Part 835 have been requested by Fermilab and none are anticipated to be needed in the foreseeable future.

There was one submittal to the DOE Noncompliance Tracking System during this period, NTS—FSO-FNAL-FERMILAB-2013-0001, “Unbadged Radiological Worker”. In the course of the resultant investigation, it was found that the worker was wearing the required supplementary dosimetry throughout the period in which the individual was involved with radiological work, but not his dosimetry badge of record. A dose of 30 mrem for an eight-month period during which the individual was present was assigned based upon the individual’s dosimetry badge records and also those of co-workers nearby. The corrective actions pertaining to that NTS submission are now complete.

During the CY2011-CY2013 triennium, the internal audits of all elements of the Radiation Protection Program (RPP) implemented at Fermilab were conducted as required by 10 CFR 835.102. The implementation of radiation protection requirements continues to be effective as judged by the radiation exposures received, reported annually on time and as required to the DOE Radiation Exposure Monitoring System (REMS), the ALARA efforts documented, and the limited number of noncompliances that warranted submission to the DOE NTS system.

SPECIALIZED EFFORTS CARRIED OUT DURING THIS TRIENNIUM

This section of the report summarizes many of the labwide efforts initiated, and mostly completed, during this triennium to improve the radiological protection program performance of the Laboratory. Some of these efforts are intrinsically ongoing by their nature. While some of these initiatives are restricted to the management of occupational radiation exposures ALARA under the auspices of the Radiation Protection Program, others are more general and also

implement important aspects of the Laboratory's Environment, Safety and Health Management System under the Fermilab Contractor Assurance System (CAS) program.

1. Long Term Storage of Highly Activated Components

As part of the transition of the Fermilab scientific research toward the intensity frontier, it was recognized that new arrangements are needed to manage the very high activity beam line components. In planning for future beam lines and experiments, during 2011 engineers in the Accelerator Division (AD) began to assess the adequacy of present storage and handling facilities with respect to future needs based upon present knowledge of the plans for development of the operational program of the Laboratory. It was clearly recognized that the existing facilities presently used for such purposes are inadequate in terms of physical space, waste minimization, ALARA capabilities, and waste management considerations. This led the Fermilab Chief Operating Officer to charter a task force consisting of personnel from throughout the Laboratory to assess this problem and recommend solutions to the Director. During 2012 and the first half of 2013, this group met regularly and developed a detailed assessment of this situation. A report was issued on June 21, 2013. Since that time, the content has been presented to the senior Fermilab management. The task force recommended a two-stage solution, the first applicable to approximately the next decade of Fermilab operation while the second stage should be implemented on the longer term. Cost estimates are included in the product of the task force. The documentation related to this work is posted at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1872>.

2. Coordinated Effort to Implement DOE Order 458.1

DOE Order 458.1, "Radiation Protection of the Public and the Environment" was issued in February 11, 2011. The implementation of the Order required the coordinated effort of the ESH&Q Section Environmental Protection and Radiation Protection Groups. While this effort is not strictly related to the subject of occupational radiation protection addressed by the requirements of the DOE-approved Fermilab Radiation Protection Program, it is closely related since the radioactive materials of concern for occupational radiation protection are also those that may become environmental effluents. To complete the implementation of this Order, a cross-walk of the requirements of the Order with the existing radiation protection and environmental protection programs was conducted jointly by the two ESH&Q Groups and the results transmitted to DOE. The results were approved by DOE-FSO on April 20, 2012. Fermilab Environment, Safety, and Health Manual (FESHM) and FRCM Chapters were revised as a result of this effort and new procedures have been instituted. The result has led to an improved understanding of the radiological aspects of both the environmental and radiological programs. All corrective actions are now complete and the revamped environmental radiological protection plan is now fully implemented. The documentation of this process is found at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1937>.

3. Assessment of Site Boundary and Wilson Hall Radiological Dose Limits

As the Laboratory's program for developing the intensity frontier high energy physics research program was advancing during this period, it was becoming evident that several of the proposed

new projects will have radiation fields that are calculable, if not measurable, near the site boundary and nearby residences. Some of these radiation fields will overlap with each other. Both a clear understanding of the upper limit of dose permitted at these locations as specified by Regulations, DOE Orders, or Laboratory policy and how this limit is to be allocated among the projects for their use in design efforts is needed for radiation protection purposes. It is also needed because radiation shielding is a significant component of project costs. The maintenance of good relationships with neighboring communities and their citizens is also an important consideration. Motivated in part by the implementation of DOE Order 458.1 and also by the relatively large number of new accelerator-based projects, in June 2013, the Chief Operating Officer established a working group to assess site boundary and Wilson Hall radiological dose limits. This working group conducted its work and developed a set of recommendations. These recommendations set forth a clear pathway toward assessing and monitoring the radiation doses and allocating them among different experiments and beam lines in a manner that will serve to assure compliance with requirements while achieving the goals of the Fermilab scientific program. Responsibilities are assigned to the ESH&Q Section, the Accelerator Division, and the Directorate. The effort to implement these recommendations is an ongoing one that has just commenced. The documents related to this effort are found at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2422>.

4. Tritium Working Group

During this triennium, measurable concentrations of tritiated water (HTO) were identified in the discharges to the Batavia sanitary sewer through the routine monitoring program conducted by the ESH&Q Section Environmental Protection Group in cooperation with the ES&HQ Section Radiation Protection Group. While this is a largely environmental radiation protection concern, it is included here because it deals with tritiated water that also constitutes a potential source of occupational radiation exposures as the tritium is also present in the Industrial Cooling Water used throughout the Laboratory as secondary cooling water. The HTO results from the high intensity operations of the Fermilab accelerators, most notably in support of the Neutrinos at the Main Injector (NuMI) Beamline. In view of the fact that DOE Order 458.1 (see above) imposes new requirements on the discharges of HTO to public sanitary sewers (see above) and also in recognition of potential public relations concerns, the Fermilab Director appointed a Tritium Working Group on July 15, 2012 to better understand this problem. The working group commenced its work and issued a Phase 1 Report in accordance with its charter on February 10, 2013. While reductions of the tritium concentrations have in general been achieved and effective communications with surrounding communities have been established, the work of this committee continues as it seeks to unravel the technical issues that have been identified and resolve them. The documentation related to this endeavor is posted in <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2146>.

5. Machine Beam Loss Scenarios Panel

At all large particle accelerators, it has long been recognized that while beam losses have radiological impacts that are measurably and generally reproducible, the determination of “worst case” beam accidents is difficult. Past practice at Fermilab and at many other large accelerators has been to assume that without intervening credited controls such as interlocked radiation

detectors, the maximum dose to be considered would be that present if the entire beam were to be lost for a period of one hour duration at a given location. This approach matches the definitions of posting standards in 10 CFR 835 and constitutes Laboratory policy as expressed in Chapter 2 of the FRCM. While this approach is conservative, with high power beam lines it is demonstrably unrealistic in that beam line components, notably vacuum systems, are unlikely to survive more than a few pulses of high intensity beam loss. To avoid the disruptions to operations of the repairs needed to fix such failed beam lines, accelerator laboratories such as Fermilab have invested in a sophisticated array of beam loss controls. The proper functioning of these controls thus inhibits sustained beam losses of major duration. In December of 2011, the Heads of Accelerator Division and the ES&H Section (now the ESH&Q Section) chartered the Machine Beam Loss Scenarios Panel to study this problem and make recommendations to the Director. The panel met over a period of many months working with many of the subject matter experts on each component of the Fermilab accelerator. The result was a methodology proposed to the aforementioned division and section heads with a resulting recommendation to the Director based upon a defense-in-depth approach reflecting a qualitative assessment of risk. This approach was approved by the Fermilab Director on July 16, 2012. The documentation related to this endeavor is found at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1935>. The approved approach has now been incorporated into FRCM Chapter 2, Appendix 2C. The shielding assessment for the Main Injector and the Recycler, approved in accordance with standard practices for all shielding assessments (see elsewhere in this report) now incorporates this methodology.

6. Improvements in the Program for Managing Radiation-Generating Devices

As a part of the process of fully implementing DOE O420.2C, “Safety of Accelerator Facilities”, it was recognized that the Laboratory’s program for managing Radiation-Generating Devices (RGDs) in accordance with 10 CFR 835 merited improvement. Although there were no compliance issues identified in this area, FRCM Article 362 was revised in March 2013, to more clearly specify the inventory requirements, the assignments of responsibilities, provisions for written authorizations, radiological controls and monitoring, posting requirements, and interlocks associated with such devices. A new form to document management of RGDs has now been instituted as RP Form No. 108 found at <http://esh.fnal.gov/xms/ESHQ-Manuals/FRCM>.

7. Improvements in Radiological Training

During this triennium, the content of the principal radiological training programs provided to a large number of Fermilab employees, subcontractors, and visitors as well as DOE-FSO personnel, General Employee Radiological Training (GERT) (TRAIN Course No. FN000241) and Radiological Worker Training (RW) (TRAIN Courses No. FN000470 and FN000471, for classroom and practical factors training, respectively) were completely revamped and brought up-to-date. Points of emphasis were modified based upon operational experience encountered in recent years. The training content for these two classes was updated on the TRAIN database where the ESH&Q training system is managed. Training of all radiological control technicians (RCTs) continues on an ongoing basis. Specialized radiological training is provided as needed to affected work groups such as Radioactive Source Training (TRAIN Course No. FN000048) for all those who work with sealed sources and controlled access training for all those who are

approved to make controlled accesses into accelerator/beam line enclosures (TRAIN Course No. FN000311).

STATUS OF EXTERNAL ASSESSMENTS

In June of 2012, a DOELAP onsite assessment was conducted of the external dosimetry program to assure routine practices comply with criteria contained in DOE/EH-0026, "Department of Energy Laboratory Accreditation Program (DOELAP) Handbook." All of the Fermilab staff involved in the assessment process were viewed as competent, conscientious and cooperative. The assessment team reviewed progress towards resolving the findings identified in the previous DOELAP assessment conducted in February 2010, and evaluated the current compliance of the program with DOELAP requirements. Closure was verified for the three findings from the 2010 assessment. On the present assessment, six findings were identified, including zero deficiencies, one concern and five observations. Two of the observations constituted commendations to the Fermilab dosimetry program and are noted as noteworthy practices. A corrective action plan was submitted and approved by DOE. The renewed DOELAP accreditation was awarded with no gap in accreditation. The full report is available at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2130>

During FY2011, the Fermi Site Office carried out a comprehensive series of assessments of Fermilab's Radiation Protection Program that encompassed most topics covered in the RPP and in 10 CFR 835. The assessments are found at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1991> and also in Fermilab's tracking system now known as iTrack (formerly known as frESHTRK) as Review No. 36299 at: https://www-esh.fnal.gov/pls/cert/eshtrk_common.audit_details?rid=36299 and as Review No. 35195 at: https://www-esh.fnal.gov/pls/cert/eshtrk_common.audit_details?rid=35195. As correctly identified by the DOE-FSO assessments, Fermilab's system of technical basis documents called Radiation Physics Notes (RP Notes), related to many facets of its radiation protection program, was in need of updating to assure current relevance, correct technical information, and connection with the latest radiation protection standards required by the current version of 10 CFR 835. This has been completed with the complete set of new, revised, or annotated RP Notes and an explanatory summary spreadsheet posted on the ESH&Q website at: <http://esh.fnal.gov/xms/Audience-Pages/RSO/Radiation-Physics-Notes>. All corrective actions related to this series of DOE-FSO assessments are now complete.

In April 2011, as an assist visit to FSO, the DOE Office of Science (SC) conducted an assessment of the Radiation Control and Materials Release Program. A return visit in November 2012 confirmed the successful completion of all corrective actions. Related documents are found at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1648> and in iTrack Review No. 33718 at https://www-esh.fnal.gov/pls/cert/eshtrk_common.audit_details?rid=33718. The results have been improved management of radioactive materials, better control of movements and shipments of radioactive materials, improvements in management of metals recycling, and an important contribution to environmental sustainability.

In March 2009 the Office of Science and Fermi Site Office conducted a Management Assessment of Accelerator Safety Order Implementation at Fermilab, covering the

implementation of DOE Order 420.2C, “Safety of Accelerator Facilities”. While the topics covered by this Order are far broader than but inclusive of radiation safety concerns addressed in the implementation of 10 CFR 835, at a large particle accelerator such as that at Fermilab, the radiation protection program is very closely tied to many of the topics covered in O420.2C and constitutes a topical area of high importance in the protection of workers and the environment from accelerator-produced radiation. This assessment has been recorded as iTrack Review No. 31033 at https://www-esh.fnal.gov/pls/cert/eshtrk_common.audit_details?rid=31033 and the corrective actions are being addressed in accordance with the DOE-FSO approved implementation plan posted along with other documents related to this assessment at <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=14>. The implementation plan is extensive, stretching over a five year period.

INTERNAL ASSESSMENTS CONDUCTED DURING THIS TRIENNium

1. Conduct of Comprehensive Shielding Assessments to Match Upgrades in Accelerator Operations and Delivery of Beam to New Facilities (Ongoing)

The review of shielding assessments is an ongoing task assigned to the Shielding Assessment Review Subcommittee and is connected to the requirements of FRCM Chapter 8. The charter, membership, etc. of this relatively new subcommittee is found on <http://esh.fnal.gov/xms/Resources/FESHCom>. In particular, this subcommittee maintains a Sharepoint™ Site containing all of the shielding assessments reviewed and recommended for approval since April 2011. All shielding assessments are currently up-to-date consistent with the approved Fermilab Accelerator Safety Assessment Document (SAD) that, in turn supports the current version of the DOE-FSO approved Fermilab Accelerator Safety Envelope (ASE). The SAD and ASE are found at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1066>.

2. Completion of Accelerator Readiness Review (October 2013)

The migration of the accelerator-based Fermilab scientific program from the Tevatron colliding beam era to the intensity frontier motivated the conduct of a comprehensive accelerator readiness review in October 2013. An external Accelerator Readiness Review (ARR) team was assembled to review the readiness of the Main Injector, Recycler, and NuMI to begin beam operations up to 700 kW, an upgrade of the previously approved ASE of 400 kW in the Main Injector. Radiation protection measures constituted a very important, though not exclusive, part of the scope of this review. The review committee’s report can be found at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2647> and have been tracked in iTrack Review No. 38222 at: https://www-esh.fnal.gov/pls/cert/eshtrk_rpt.report15?rid=38222. This comprehensive assessment generated 20 recommendations. Of these 4 were designated as “pre-start” and required closure prior to operations at the higher beam powers. The pre-start recommendations were closed by November 23, 2013 while the post-start recommendations were closed by April 23, 2014.

3. Assessment of Radiation-Generating Devices in Technical Division (February 2013)

An assessment of radiation-generating devices (RGDs), and their use, was conducted within the Technical Division (TD), February 11 through February 13, 2013. There are currently three radiation-generating devices in the Technical Division. These are the Bruker XRF Materials Analyzer, the JEOL 5900 LV Scanning Electron Microscope (SEM), and the Vertical Cavity Test Facility (VCTF). Although there are some common threads emerging from this assessment, the compliance status with the Fermilab Radiological Control Manual (FRCM) and the Fermilab ES&H Manual (FESHM) requirements were assessed individually for each RGD. This assessment was conducted in part to help develop the revisions to FRCM Article 362 mentioned above. The results of the assessment are posted as iTrack Review No. 37421 at https://www-esh.fnal.gov/pls/cert/eshtrk_common.audit_details?rid=37241. All corrective actions resulting from this assessment were closed by April 29, 2013. The assessment report is posted in ESH&Q Docdb at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2397>.

4. Internal Review of Sealed Source Use and Storage (February 2013)

In February of 2013, an internal review of sealed source use and storage in PPD areas was conducted. PPD was chosen because this organization, by far, is the location where most of the sealed sources used by scientific researchers are employed. A total of ten locations in PPD were reviewed. The conclusion of this review is that the sealed source program being implemented for the most part as designed. Some discrepancies in the completion of source access logs were identified with a follow-up reminder issued by the Source Physicist. Otherwise there were no findings issued in this assessment. The full report is posted as iTrack Review No. 36920 at: https://www-esh.fnal.gov/pls/cert/eshtrk_rpt.report15?rid=36920. The detailed report is also posted on the ESH&Q Docdb along with other assessments related to sealed source usage at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2241>.

5. Internal Assessment of Sealed Source Contamination Incident (September 2012)

On September 24, 2012, a routine monthly leak test was conducted on sealed sources stored in source boxes at Fermilab. An alpha wipe result showed levels of contamination that were indicative of a leaking source. It was determined that the leaking Americium-241 alpha source was located at Proton Assembly Building (PAB). No contamination was found in any buildings or on personnel who handled the radioactive source. Personnel were able to resume use of both buildings late in the day on September 24, 2012. No violations of 10 CFR Part 835 or the Fermilab Sealed Source Control and Accountability Program resulted from this event. However, this event motivated the conduct of a self-assessment of this event. The results were documented in a report that identified a number of significant opportunities for improvement that have now been implemented. The report was completed on October 15, 2012 and is documented in ESH&Q Docdb, along with other self-assessments of the sealed source program at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2241>.

6. Follow-up Review of the Linac RF Waveguide Switch Incident (May 2012)

On April 14, 2012, a Fermilab radio frequency (RF) engineer and a project physicist informed the Main Control Room Crew Chief that they would be operating the Linac Klystron Station 8 (LK8) in the Muon Test Mode sending RF power to a cavity in the Muon Test Area (MTA) to continue investigating RF stability problems encountered from the previous day's operations. The RF output of LK8 was recently connected to a 3-port waveguide switch. The switch was installed to allow the LK8 Radiation Safety System to automatically select the controls necessary to operate the station based on the position of the switch for each of the two operating modes. While investigating the RF stability problems, it was suspected that the switch may have failed internally or the klystron itself may have failed since the problems persisted when the switch was in either the dummy load or MTA positions. The switch would be removed and the LK8 station would be connected directly via waveguide to the dummy load. During testing it was discovered that a component monitored by the Radiation Safety System had been removed without authorization, potentially allowing for an incorrect operating configuration for LK8. At no time during the sequence of events was LK8 allowed to operate in an incorrect configuration. The station was locked out by the Radiation Safety Officer. This event was reported in the DOE ORPS system as SC--FSO-FNAL-FERMILAB-2012-0001. As part of the corrective actions for this ORPS submittal, an internal review was conducted. The results were documented in iTrack Review No. 35095 with corrective actions completed as of 5/12/2014 as posted at: https://www-esh.fnal.gov/pls/cert/eshtrk_common.audit_details?rid=35095. The results of the internal review are found at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2074>. The internal review concluded that the actual event never resulted in an incorrect configuration of the safety system. Thus there was never the possibility of exposure to radiation.

7. Internal Review of Dosimetry Program (June 2011)

In June of 2011, an internal review of the dosimetry program was conducted jointly by the ESH&Q Section and the Particle Physics Division. This assessment is iTrack Review No. 32415 and can be found at https://www-esh.fnal.gov/pls/cert/eshtrk_common.audit_details?rid=35214. Corrective actions to all six findings were completed by June 21, 2012.

8. Self-Assessment of Control of High Activity Sealed Sources (April 2011)

An incident at the Idaho National Laboratory (INL) involving an unplanned radiation exposure involving the use of a high-activity ^{137}Cs gamma-ray source motivated a self-assessment of the use of such calibration sources in the Radiation Physics Calibration Facility and at the Neutron Therapy Facility. While no specific findings or recommendations were issued, this assessment resulted in several improvements. The results of this assessment are documented in a report at <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1657>. The report is listed among other assessments pertaining to sealed source usage.

ONGOING PROGRAM STRENGTHS

1. FESHCom and Its Subcommittees

The Fermilab Environment, Safety, and Health Committee (FESHCom) and its subcommittees provide an integrated committee structure for coordinating the Laboratory's program in environment, safety, and quality. The monthly FESHCom meetings, with periodic presentations by the Chair of each of its subcommittees, are a venue for sharing information in a multidisciplinary manner. The Radiation Safety Subcommittee of this body continues to serve as a valuable forum for both technical experts and citizen members in promoting improvements to the Laboratory's program in radiation protection and thus comprises part of this internal assessment program. The monthly meetings of the Radiation Safety Subcommittee constitute an important part of program implementation, provide a forum for ongoing identification and resolution of problem areas, and give a connection to the overall Fermilab ES&H program. During this triennium, the Shielding Assessment Review Subcommittee and Safety Assessment Document Review subcommittees have contributed directly to the radiation protection program. Also, many members of the Radiation Safety Subcommittee and the Environmental Protection Subcommittees continue to work together to identify and mitigate radiological problems at the Laboratory. FESHCom minutes, including the reports of its subcommittees are available at: <http://esh.fnal.gov/xms/Resources/FESHCom>. All subcommittee minutes are available to the entire Fermilab community. Those of the Radiation Safety Subcommittee are distributed to division/section/center heads.

2. Effectiveness of ALARA Efforts

The implementation of radiation protection requirements continues to be effective as judged by the radiation exposures received, reported annually on time and as required to the DOE REMS system, and the lack of significant noncompliances, or potential noncompliances with radiation protection requirements or radiation-related environmental protection requirements. The efforts to maintain radiation doses ALARA is one that is carried out by many people at Fermilab as it cannot be accomplished by the radiation protection personnel alone. Annually, these efforts are documented in an ALARA summary document. Those documents were completed for each of the three years of this triennium and are posted, along with those for other years, at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=125>. In addition, in January of 2014, members of the Fermilab staff were invited to present descriptions of their ALARA efforts at a special meeting organized by DOE-FSO that included members of the DOE-SC Chicago Staff, the Argonne Site Office, and Argonne National Laboratory. The agenda and talks presented on that occasion are posted at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=2698>. These presentations, with minor updates and revisions, were also made to the Fermi Research Alliance Board of Directors ESH& Committee in April 2014. These later versions are also posted along with other presentations to this committee, at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1554>.

3. Laboratory Status Meeting Handouts

It is commonly necessary to transmit information on ESH&Q topics, including those related to radiation protection, to the senior management of the Laboratory. This is done on an as needed basis informally at the weekly meetings of the senior Laboratory management commonly held on Tuesday. These meetings are presently called the Laboratory Status Meeting (formerly named the Laboratory Scheduling Meeting). Regularly, the ESH&Q Director provides handouts providing information appropriate for overall coordination throughout the institution. During this triennium, two specifically related to radiation protection topics were provided; one on the topic of radiation control of materials and their release in advance of a DOE Office of Science assist visit on that topic and the other described the roles and qualification program for radiological control technicians. These supplements, along with other supplements provided by the ESH&Q Section, are posted at: <https://esh-docdb.fnal.gov:440/cgi-bin/ShowDocument?docid=1572>.

Radiological training constitutes an important part of the radiation protection program. All Fermilab employees are required to have an individual training needs assessment (ITNA) that covers all required training, including radiological training. Summary information on training completion is provided weekly to all Division/Section/Center Heads and verifies substantial compliance with the training requirements. This is done as part of integrated ESH&Q information provided to the attendees of the Laboratory Status Meeting. These are posted weekly on ESH&Q Docdb as Document No. 13. The latest version of this Docdb document contains the current document. Older documents are maintained in older versions.

ONGOING VULNERABILITIES

1. Accessibility to Radiological Areas and Radioactive Materials

Given the open nature of the Fermilab it is clearly possible for members of the public to access certain work spaces that contain radioactive materials without verification of having had GERT or Radiological Worker training despite postings as Controlled or Radioactive Materials Areas. The most prominent example is the Accelerator Division's Footprint Area, posted in compliance with 10 CFR 835.602 as a Controlled Area that also contains many posted Radioactive Materials Areas. This remains a vulnerability well-known to senior Laboratory management that is largely a legacy of design of the facility. It is also not possible to always keep all the doors locked due to temporary conditions that arise in the course of facility operation. The risk is mitigated, but not eliminated by several considerations. First, a very high percentage, approaching 100 %, of the Laboratory population including employees, users, and subcontractors have current GERT training, the minimum level of training by policy required to enter such areas. Second, the hazards in question pose only very small radiological risks that are well-understood. Finally, as verified by the Accelerator Division Radiation Safety Officer the accessible areas in Accelerator Footprint Area do not contain any radiation areas, contamination areas, or airborne radioactivity areas (as defined by 10 CFR 835) so that the radiological hazards are limited to low level radioactive materials.

2. Succession Planning Issues

The cadre of experts in the Fermilab Radiological Control Organization remains small. While important improvements have been made during this triennium, vigilance is needed to assure proper continuity of program over the long term. In particular, proper backup of key functions needs to be maintained.