Section Four

ALARA Activities at DOE

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This section on ALARA activities is a vehicle to document successes and to point all DOE sites to those programs whose managers have confronted radiation protection issues and used innovative techniques to solve problems common to most DOE sites. DOE program and site offices and contractors who are interested in benchmarks of success and continuous improvement in the context of Integrated Safety Management and quality are encouraged to provide input to be included in future reports.

4.1. ALARA Activities at the Fermi National Accelerator Laboratory

At the Fermi National Accelerator Laboratory (Fermilab), a policy consistent with integrated safety management (ISM) and in accordance with 10 CFR Part 835 requirements is to conduct activities in such a manner that worker and public safety, and protection of the environment are given the highest priority. Fermilab is committed, in all its activities, to maintain any safety, health, or environmental risks associated with ionizing radiation or radioactive materials at levels that are As Low as Reasonably Achievable (ALARA). Likewise, Fermilab management supports related work planning and review activities in support of the Fermilab ALARA program.

During 2013, work continued in support of the 2012-2013 Accelerator and Neutrinos at the Main Injector (NuMI) Upgrade shutdown. This shutdown ran from May of 2012 through June of 2013. Nearly all radiation doses to personnel were due to exposures to items activated by the accelerated beams. Upgrades were performed in Linac, Booster, Recycler, Main Injector, and NuMI areas. This shutdown prepared the accelerator and associated facilities for new experiments at much larger beam powers to support research at the Intensity Frontier.

The 2012-2013 shutdown accomplished improvements to the Fermilab accelerator and facilities by replacing the 750 KeV Cockcroft-Walton electrostatic accelerator at the beginning of the chain of accelerators with a modern radiofrequency quadrupole (RFQ). Many improvements in the entire chain of accelerators achieved an increase in proton beam power at 120 GeV from 400 kilowatts to 700 kilowatts, and accommodated construction of the onsite near detector experimental hall for the very large NuMI Off-axis Appearance (NOvA) project. The NOvA project searches for evidence of muon-to-electron neutrino oscillation by comparing the composition of the NuMI beamline at the source and in an underground laboratory in Minnesota. This work was conducted concurrently with the completion of the far detector of the NOvA long baseline neutrino oscillation experiment in northern Minnesota. As part of the NOvA project, the accelerator complex infrastructure and the NuMI beamline were upgraded to provide higher neutrino intensities than were possible in the former configuration. These upgrades focused mainly on converting the Recycler Ring (RR) from an antiproton storage machine to a pre-injector for the Main Injector. In the fall of 2013, Fermilab celebrated the restart of the accelerator complex and marked the beginning of a new era of research at Fermilab. The Laboratory will continue to make upgrades to the Booster over the next two to three years. This work is part of the Fermilab Proton Improvement Plan.

4.1.1. Overview of Completed Main Injector, Accelerator, and NuMI Upgrade Work

The Recycler was decommissioned which included electron cooling and stochastic cooling. Installation of new transfer lines included an 8 GeV injection line into the Recycler and a new transfer line out of the Recycler Ring into the Main Injector extraction line. More than 1.3 million feet of cable was pulled to support the new transfer lines and instrumentation upgrades.

The Recycler RR30 straight section was reworked which involved removing 45 quadrupole magnets and removal and reworking of approximately 900 feet of beam pipe. The Recycler beam abort system was reworked to allow full-turn proton aborts along with gap clearing. Radiation-sensitive equipment was relocated from the MI/RR 30 straight section to minimize future radiation dose to workers and equipment.

Installation of a new 53 MHz radiofrequency (RF) cavity system in the Recycler, including two new RF cavities, with a placeholder for the third was conducted. The three existing Recycler wideband RF cavities were relocated and repurposed into a damper system.

Other activities included removal of all antiproton beam handling equipment from the Main Injector. Approximately 1,800 feet of beamline components were removed. Gap clearing kickers and new full turn kickers were relocated from the Main Injector to the Recycler. Additionally, new ring-wide beam position monitor (BPM) cabling was installed.

NOvA horn 2 was relocated and NuMI horn 1 was changed to NOvA horn 1. Many other components in NuMI were replaced and upgraded including radioactive water system upgrades, hadron monitor replacement, NuMI chase prefilters replacement, NuMI horn piping removal for the NOvA upgrade, NuMI air duct work, and NuMI beryllium window replacement.

During this shutdown, approximately 70% of the instrumentation, 30% of the vacuum components, and 85% of the magnets were reused. About 590 tons of materials were removed.

4.1.2. Optimal Beam Intensity Reduction and Cool Down Planning Prior to Shutdown

Various cool down (radioactive decay) scenarios were estimated using residual radiation decay for common activation products such as ^{52}Mn, ^{54}Mn, ^{56}Mn, and ^{59}Fe. The scenarios were based on providing optimal beam intensity to support the high energy physics program while balancing the need to decrease radiation doses to personnel as much as possible for the upcoming shutdown. Data models were analyzed by proposing several beam intensity levels at intervals of either 1 or 2 weeks prior to turning the beam off. The first scenario analyzed was to run the accelerator with no reduction in beam intensity prior to shutdown. The second scenario analyzed was to implement a 50% reduction in beam intensity either 1 or 2 weeks before shutdown. The next scenario was to implement a 75% reduction in beam intensity for either 1 or 2 weeks prior to shutdown. The final scenario proposed was to completely shut off the accelerator for 1 or 2 weeks prior to the beginning of shutdown work. It was determined that the optimal balance between beam intensity and personnel dose reduction due to cool down was achieved by implementing a 50% reduction in beam intensity during the last 2 weeks prior to shutdown. This beam intensity reduction during the 2 weeks prior to shutdown allowed workers to begin jobs about 30 days after the beginning of the shutdown. Lead blankets and other shielding devices were used to reduce exposure rates to less than 75 mR/hr. After about 40 days, workers began work in lower dose rate areas, and after 60 days, the bulk of shutdown work commenced. *Exhibit 4-1* illustrates this analysis.

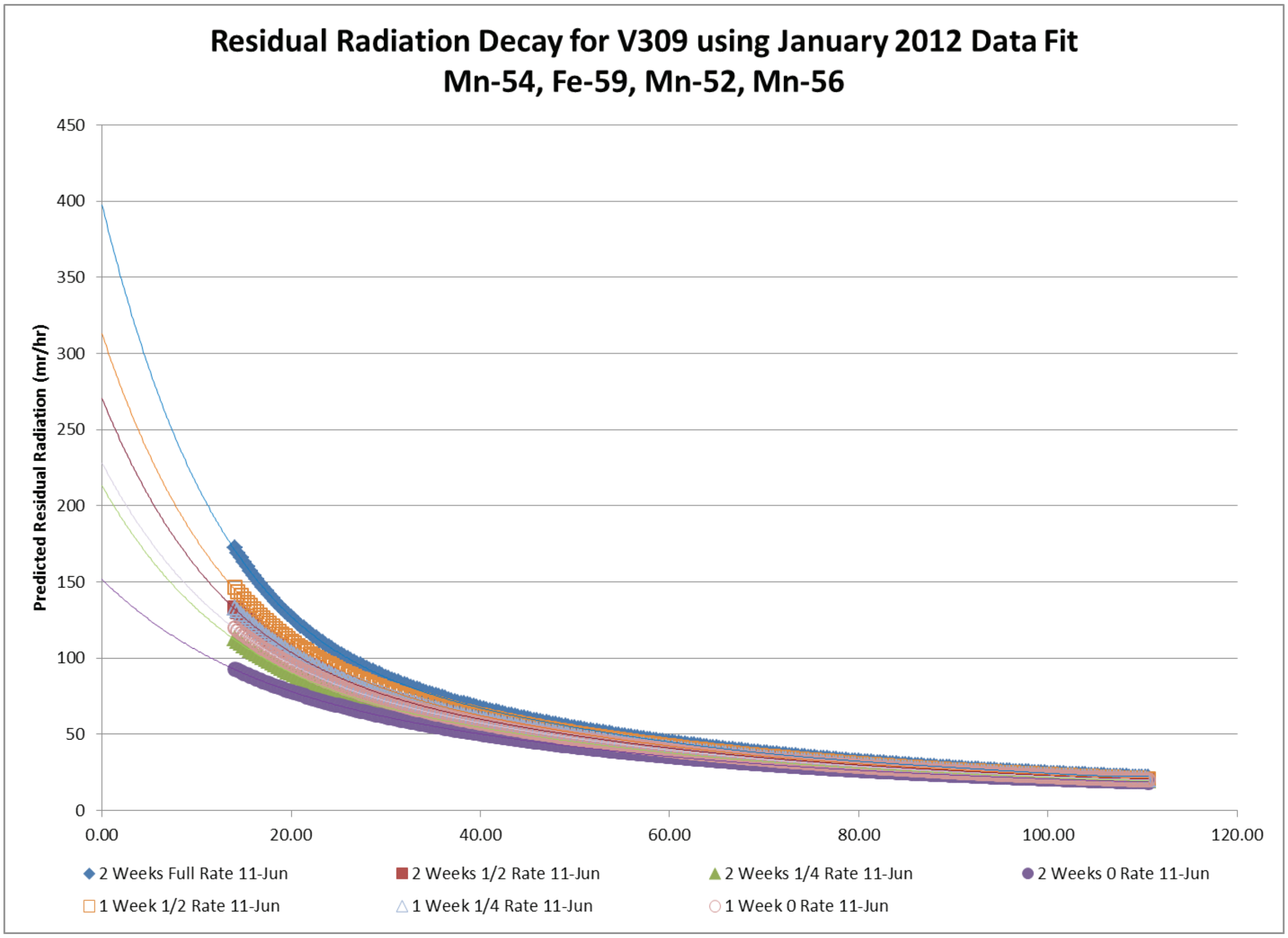
4.1.3. ALARA Job Planning Prior to Shutdown

As with all recent maintenance and development shutdowns, it is recognized that many of the tasks to be performed must be conducted in intense radiation fields dominated by gamma rays due to induced radioactivity from years of operation at high intensities. The Fermilab Accelerator Division (AD) has established a task review process that requires all jobs to be performed in the accelerator to be entered into a database for review by all of the support departments. This initiative improves efficiency by preventing scheduling conflicts and also affords the AD Environment, Safety, and Health (ESH) Department the opportunity to identify those radiological tasks that require special attention or might represent other environment, safety, and health issues needing mitigation. Over 300 shutdown jobs were reviewed for radiological concerns. Ten ALARA plans were developed for collective doses expected to exceed 100 person-mrem. These ALARA plans resulted in slightly less collective dose per job than estimated.

4.1.4. ALARA Innovations Developed and Implemented During the 2012–2013 Shutdown

A failed component in the Main Injector prior to shutdown afforded radiological control personnel the opportunity to conduct a radiation survey and to more closely estimate dose rates in this area. Radiation levels in the region ranged from 20 mR/hr to 600 mR/hr and the highest hot spot found was 1,500 mR/hr at

Exhibit 4-1:
Estimation of Residual Radiation Over Various Beam Intensities and Time Scenarios
Exhibit Provided by: C. Gattuso, Accelerator Division, Engineering, Engineering Support



1 foot. To reduce personnel exposures, lead blankets were used as shielding for hot spots. Approximately 30 to 40 tons of lead blankets and rolling shield walls were employed. The addition of this shielding reduced dose rates between a factor of 5 to 10. A portable shield wall was constructed and used in areas that still proved to have high dose rates even after lead blankets were deployed.

4.1.4.1. Magnet Girder System

To reduce radiation exposure to workers, a magnet girder system was developed and implemented to install more beamline components per unit time (See *Exhibits 4-2, 4-3* and *4-4*). Components were tested outside the beamline areas prior to installation to correct element and magnet polarity and also assure proper alignment with the components. Several components were installed at once instead of one at a time. Powered elements were pre-wired and quick disconnect plugs were installed to save dose. Elements on girders were pre-aligned. Also, 6 of the 10 welds required for installation were performed outside of beamline areas to eliminate personnel exposures. Magnetic shielding was added and preliminary leak checks were conducted outside of beamline areas. Significant dose savings was achieved as a result of this innovation. For example, traditional installation of a girder with 2 permanent magnets, 2 power trims, and a beam position monitor would have taken about 28 hours to complete in beamline areas. The total collective dose per installation would have been about 280 person-mrem based on a dose rate of 10 mR/hr. Installation of the same magnet components with implementation of the girder process reduces the amount of work in beamline areas with similar dose rates to about 10 hours. This corresponds to a

Exhibit 4-2:
Girder Fabrication in MI-60 Service Building

Exhibit 4-3:
Girder Pre-Staged in MI-62 Section of the Tunnel

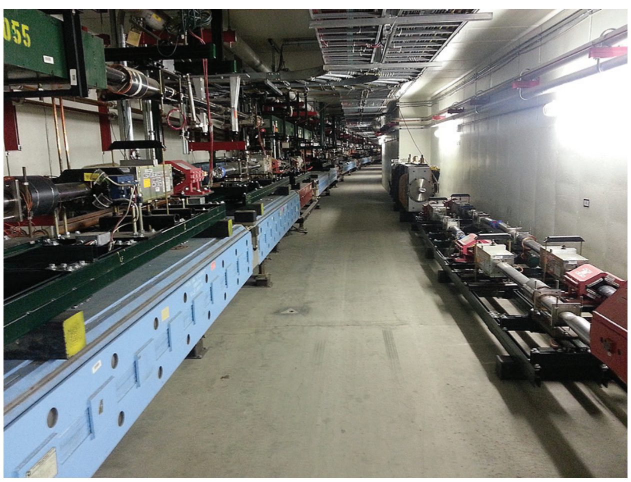


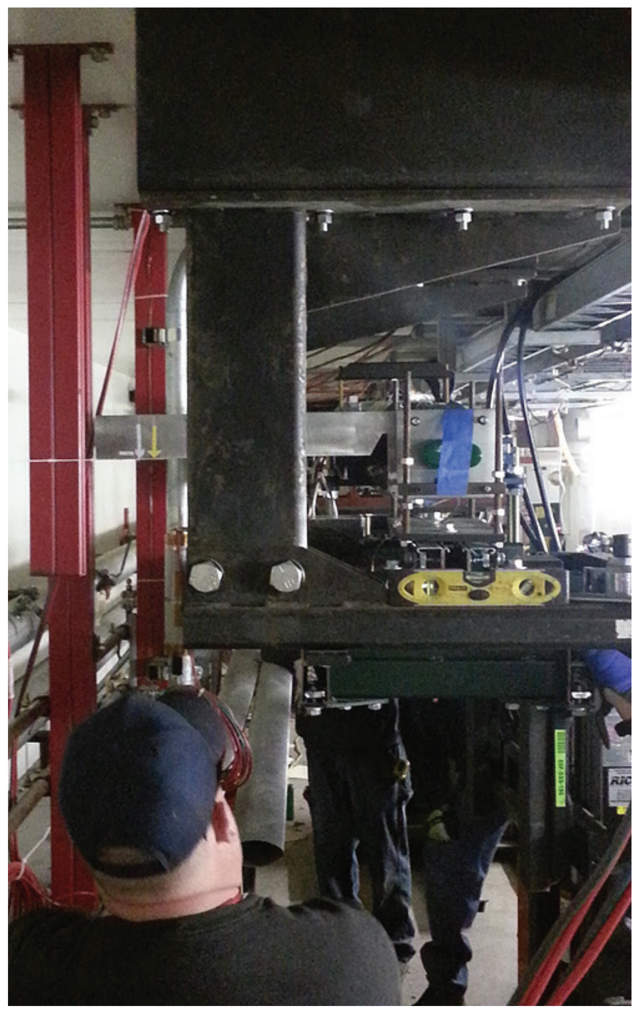
Exhibit 4-4:
MI-60 Girder System Installed

total collective dose of about 100 person-mrem which represents a total dose savings of 180 person-mrem per installation. The ability to perform a significant portion of the necessary survey and alignment outside of radiological areas also contributed to reduction of exposures.

4.1.4.2. Alignment Guide Wire

In the Main Injector, an alignment guide wire was installed so that girders could be installed in the correct location (See *Exhibit 4-5*). Installation of these alignment lines eliminated one complete alignment survey resulting in less alignment time and thus, reduction in collective dose.

Exhibit 4-5:
Alignment Guide Wire and Offset Correction



4.1.4.3. Cable Re-Spooling

New ring-wide beam position monitor (BPM) cabling was installed. About 600,000 feet of helix cabling was installed and over 1.3 million feet of cable was pulled. A new and innovative method of re-cabling was accomplished that reduced work duration and saved collective dose to workers. Original cable reel lengths ranged from 1,300 feet to 5,500 feet. Instead of using fixed length cable spools, the cables were re-spooled so that new cable reel lengths matched each individual cable run. The buildings needing the longest cable pulls were completed first. In addition, tags were placed at the location of each cable destination in higher dose rate areas to save electricians time in identifying cable destination locations (See *Exhibit 4-6*). Without re-spooling, each service building would have taken about 2 weeks to complete. Re-spooling reduced the duration of the work to about 1 week for each service building. Re-spooling not only achieved cost savings, but also significant dose savings. The estimated total collective dose for the old re-cabling method was about 5,700 person-mrem. This novel re-spooling activity resulted in a total collective dose of about 2,800 person-mrem which resulted in a dose savings of 2,900 person-mrem for this enormous job.

Exhibit 4-6:
Cable Tag Location for Cable Destination

4.1.4.4. Electrical Quick Connects/Disconnects

At NuMI, the Main Injector exchange skid electrical was upgraded with the addition of quick connects/disconnects to allow more efficient and quicker pump removal (See *Exhibit 4-7*). The new quick connection/

Exhibit 4-7:
MI-65 Service Building Exchange Skid Electrical Quick Connects/Disconnects

disconnection allows termination of correction elements to be conducted in a lower dose rate area and in less time. This innovation will greatly reduce radiation exposures to personnel in the future.

4.1.4.5. NuMI Shielding Platform

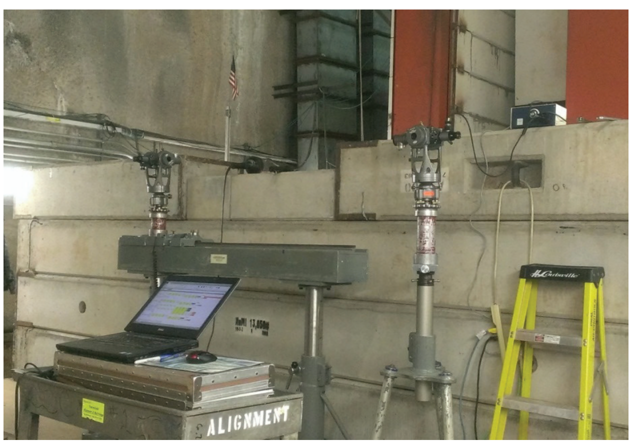
Shielding platforms were constructed and installed to allow workers to conduct alignment surveys with the NuMI Horn 1 located inside the target system structure, called the "chase" (See *Exhibit 4-8*). Longer shielding plugs were removed during the alignment survey. Shorter 8 inch shielding plugs were made so they could be installed to reduce radiation exposure at times when particular ports are not needed. These shielding platforms were made near the end of the shutdown to provide shielding to reduce future doses to alignment personnel.

Exhibit 4-8:
NuMI Shielding Platform

4.1.4.6. NuMI Shield Wall

A new shield wall for future high activity components was constructed to reduce radiation dose to workers who conduct alignment surveys of apparatus located inside the NuMI work cell (See *Exhibit 4-9*). Alignment personnel will stand behind this wall to survey components located inside work cell with the door open. This ALARA advancement will reduce collective doses to workers when working with high activity NOvA components in the future.

Exhibit 4-9:
NuMI Work Cell Shield Wall



4.1.4.7. Installation of Additional NuMI TieFighter Shielding

As part of the NuMI upgrade, additional TieFighter shielding was added to the NuMI medium energy opening to reduce future collective doses (See *Exhibits 4-10* and *4-11*).

Exhibit 4-10:
NuMI Before TieFighter Shielding

Exhibit 4-11:
NuMI After TieFighter Shielding Installation

4.1.4.8. MI-60 Service Building Support Stands and Shielding

At MI-60 Service Building, support stands were built to support penetration shielding for 14 bias power supply stations (See *Exhibits 4-12* and *4-13*). A total of 9,974 pounds of shielding was installed to reduce radiation exposures and subsequent collective dose to personnel.

Exhibit 4-12:
MI-60 Shielding Support Stand

Exhibit 4-13:
MI-60 Bias Power Supply Shielding

4.1.5. Designated Disposal of Radioactive Sources

In January of 2013, the ESH&Q Section designated a total of 171 sealed sources that were no longer in use to be disposed. These sources were removed from the source safe at Site 40 and transferred to a remote secure location. Many of these ^{60}Co and ^{137}Cs wire sources from the Collider Detector Facility (CDF) contributed significantly to exposure rates in the source storage safe (See *Exhibit 4-14*). Removal of these sources reduced exposure rates from 10's of mR/hr down to background levels. Also, removal of these sources to be disposed greatly reduced collective dose to personnel during performance of radioactive source semi-annual leak testing and inventory verification. This action also reduces the radiation exposures each time the source safe is accessed. Additional ALARA collective dose savings is achieved by the fact it takes less time to complete the semi-annual leak testing and inventory verification task because there are fewer sources in the active Fermilab radioactive source inventory.

Exhibit 4-14:
^{60}Co Radioactive Source Wire to be Disposed

4.1.6. Summary of Collective Dose to Personnel

Individual radiation doses for 276 workers were tracked during the 2012-2013 shutdown and 69% (190) of shutdown workers received less than 100 mrem. The collective dose received by these 190 workers was 5,500 person-mrem. The average individual radiation dose per worker per week was 0.46 mrem. Twenty eight percent (28%) of workers received between 100 mrem and 400 mrem. Only 3% of shutdown workers received between 400 mrem and 800 mrem. Fermilab achieved the shutdown goal of no individual worker exceeding 800 mrem despite unplanned layoffs of contract workers in the middle of the shutdown and an extension to the shutdown that lasted four additional months. During short duration shutdowns, collective doses are predominantly received as a result of performance of work outlined in ALARA plans. In contrast, during long duration shutdowns as in the 2012-2013 shutdown, small doses received by many workers resulted in higher collective doses. Over the course of the shutdown, the average tunnel background exposure rate was estimated to result in a collective dose of about 4,000 person-mrem.

A collective dose estimate of 18,000 person-mrem was anticipated for the entire shutdown. A total of 26,253 person-mrem through 63 weeks was received. This 8,353 person-mrem difference was due to the extension of the shutdown and completion of additional jobs that were not originally planned. Additionally, doses were not captured as part of the ALARA plans for those workers performing routine maintenance and repairs. Most of this work was conducted to increase machine reliability and to reduce future radiological exposure and collective dose. *Exhibit 4-15* summarizes the collective dose received during this shutdown.

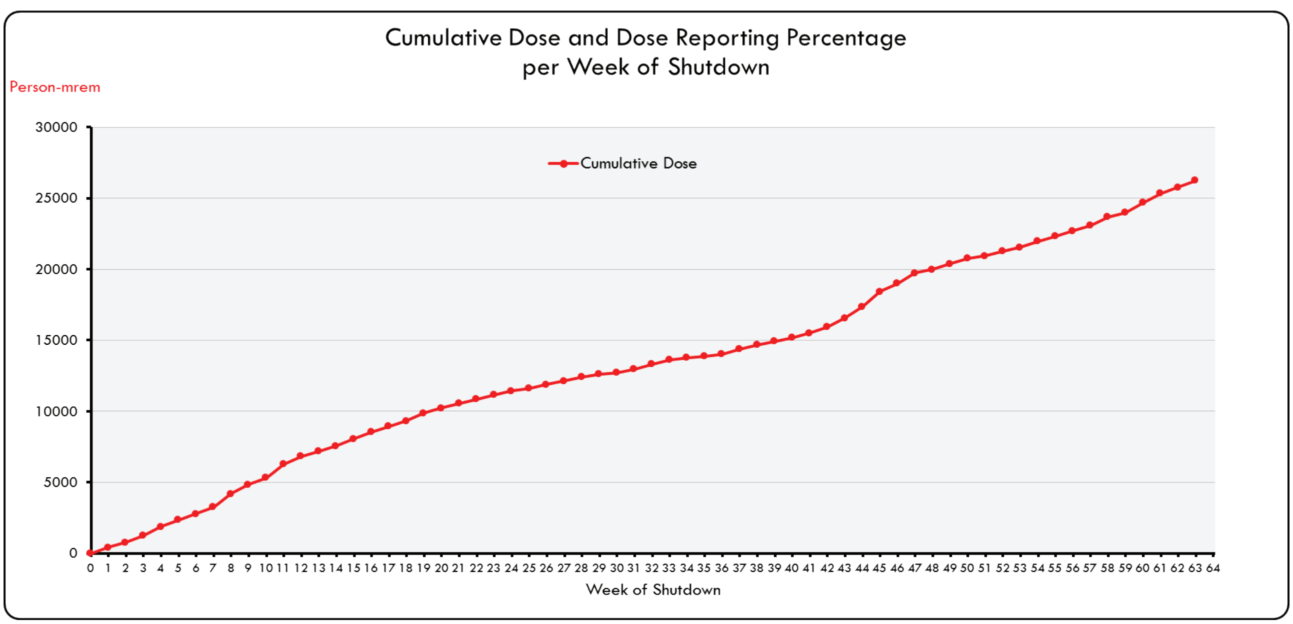
4.2. ALARA Activities at the Savannah River Site

4.2.1. Integration of ALARA Principles into the 8.3 Suckback Recovery Plan in H-Canyon

The mission statement for the 8.3 Suckback recovery plan is to provide an overview of the recovery plan and the techniques used to address the radiological concerns resulting from a suckback that occurred during a steam purge of Tank 8.3 instrumentation piping in H Canyon. The primary objective of Phase I of the recovery plan was to eliminate the source of the substantial dose rate. To accomplish this objective, it was decided to remove the hose containing the source, place it in a drum, and transport it to Hot Crane Maintenance Area where the crane can remotely move the drum into the Hot Canyon until a final disposition path is chosen.

There are several instrumentation pipes routed from the center section of the 2nd level to process vessels inside the canyon. These pipes are used to remotely monitor various properties of solution contained within process vessels. On occasion, instrumentation piping becomes clogged due to fouling or solids within the process vessel. Under these circumstances, the obstruction is cleared by connecting a steam

Exhibit 4-15:
Total Collective Dose as a Function of Shutdown Week Number



blow-down cart to the appropriate wall nozzle on the 2nd level and purging the line with 150# steam and/or 90# process air. However, if the line is not adequately purged with air after the obstruction is cleared, steam will condense inside the pipe. In a closed piping system this creates a negative pressure which has the potential to draw solution from the process vessel through the wall nozzle and back into the blow-down cart on the 2nd level. This chain of events is known as a suckback. The recovery plan was divided into five major tasks as follows: (1) Remove bagged end of discharge hose from the floor and place it in a 110 gallon drum; (2) Simultaneously disconnect the 150# steam supply hose and the discharge hose from the cart, bag the ends and place them into the drum; (3) Place lid on the drum and insert shackle into rigging; (4) Transport the drum from 2nd level Section 8 to the south freight elevator and send the elevator up to the 4th level; (5) Receive the drum on the 4th floor, remove it from the south freight elevator, and transport it to Hot Crane Maintenance Area.

On February 12, 2013 a suckback occurred while an operator attempted to clear an obstruction from a liquid level instrumentation dip tube. This particular dip tube is used to measure the liquid level in the dissolver receipt/accountability tank, 8.3. At the time of the suckback, Tank 8.3 contained dissolved spent fuel which comprises a nitric acid solution with a high concentration of fission products and actinides. Follow up surveys on the steam blow-down cart indicated 6 R/hr whole body and 22 R/hr extremity at the low point of one or more of the hose loops. Removable contamination levels on the floor around the blow-down cart were 1,000 dpm/100 cm^2 alpha and 2 mrad/hr beta-gamma. The wall nozzle that the discharge hose was connected to had removable contamination levels of 20,000 dpm/100 cm^2 alpha and 1,500 mrad/hr beta-gamma.

The recovery plan was successfully executed with no increase in airborne radioactivity or gross spread of contamination. After the hose was removed from the blow-down cart and placed in the shielded drum, the ambient dose rates decreased significantly indicating that the primary source was contained in the hose that was removed. The maximum whole body dose received by a single individual was 12 mrem. The collective dose for all personnel involved in the evolution was 66 mrem. By incorporating the three simple ALARA concepts into the work planning process, a significant radiological hazard was mitigated and ultimately eliminated safely and effectively. Initial exposure estimates indicated the potential for a collective dose of 473 mrem. The recovery plan was executed successfully with actual collective dose of 66 mrem.

The three primary ALARA concepts (time, distance and shielding) were integrated into the planning process. Time was minimized by developing a mock up scenario which allowed personnel to practice several times, get familiar with their task and become more proficient. The rigging on the drum was assembled prior to the evolution. In order to quickly move the source from 2nd level to 4th level, a 110 gallon drum was staged on a flatbed cart. Straps were used to hold lead shielding on the drum and were strategically placed so they could quickly be cut in a manner that the shielding would fall away from the drum. Removing the lead shielding before disposition allows this item to be categorized as low-level waste (instead of mixed hazardous waste) and the shielding can be reused. As soon as personnel completed their particular task they exited to a low dose area. Additionally, doors were propped open where possible to ease transport and reduce transport time.

The distance from the source was maximized by instructing personnel to work at arm's length and to keep as much distance between them and the source. The shielded drum was placed as far as possible on the opposite end of the cart to maximize the distance between personnel and the source. Also, personnel remained in the low dose area until their task was ready to be completed.

Three layers of lead shielding were placed around the drum and one additional layer was placed near the handle of the cart to further reduce exposure to the individual pushing the cart. Individuals handling the hose wore shielded vests and gloves to provide additional dose reduction with minimal effect on dexterity.

Other ALARA techniques of significance include the use of electronic pocket dosimeters (EPDs) to wirelessly monitor personnel's dose in real-time; the use of craft paper to place on the floor along the transport route to mitigate the spread of contamination and simplify decontamination; the use of plastic to wrap the cart prior to the evolution which was then peeled off as it transitioned out of the high contamination area; and the use of absorbent to add to the drum prior to the evolution to absorb any liquid in the hose.

The whole body exposure was estimated for each task. Unknown dose rates were estimated using the known whole body dose rate, assuming a 43% dose rate reduction per lead sheet, and the 1/r rule to account for distance.

The project staff included operators, radiological control inspectors and a rigger.

4.2.2. Demolition & Removal and Update systems within the 773-A E-002 Service Trench

The mission statement is to successfully remove abandoned radiologically contaminated systems within the 773-A E-002 service trench, without spreading contamination beyond pre-established boundaries nor exposing unprotected workers to known hazards.

The project description is to open 773-A E-002 trench covers to install services inside service trench for A-Block consoles. In addition, demolition & removal (D&R) and update systems within the service trench to include the removal of the pneumatic rabbit system. Activities will also include the following; asbestos insulation removal, electrical upgrades, maintenance activities, radiological protection survey/coverage, decontamination, housekeeping, observations, and waste removal.

The pneumatic sample transfer rabbit system had known internal transferable contamination levels of 200,000 dpm alpha and 100,000 dpm beta-gamma/100 cm^2. The rabbit system was constructed with polymer plastic piping and was very brittle due to age. The removal of this system required the use of secondary containment and sleeving to reduce the spread of contamination potential.

The successful removal of the abandoned sample transfer rabbit system and additional D&R work scheduled within the E-002 service trench was accomplished with minimal radiological personal protective clothing. The rabbit system was successfully removed from the E-002 service trench safely and without the spread of contamination beyond the established containment.

Multiple ALARA techniques were used prior to and during the removal of the sample transfer rabbit system. These include: (1) A review of historical radiological survey data related to the rabbit system; (2) team assisted hazard analysis (AHA) performed during the planning process to ensure all hazards associated with work were identified; (3) pre-job ALARA review; (4) secondary containment evaluations conducted to ensure proper selection for work; (5) work activity mock-ups and equipment testing conducted by all personnel assigned to task; (6) facility management review of activity prior to authorization of work; and (7) detailed pre-job briefings.

The project staff included the Savannah River National Laboratory (SRNL) radiological protection department, SRNL engineering, site construction, SRNL lab operations department, SRNL health physics technology department, and SRNL safety & health department.

4.2.3. Savannah River National Laboratory Disposal of “Out of Service” E-Wing A-In-Cell Crane

The mission statement for Savannah River National Laboratory (SRNL) was to safely remove the “out of service” E-wing A-in-cell crane from the E-079 mezzanine and place inside a burial box for final disposal.

SRNL successfully disposed of the E-wing A-in-cell crane. This crane was pulled from the operating A-cells and replaced by a new operating crane in 2012. In 2013, the out of service A-in-cell crane was packaged, placed inside a burial box, and removed from E-wing for disposal. Excellent planning and coordination between several site organizations was the key to the successful disposal of this highly contaminated crane. Due to the length of operation time inside the operating shielded cells area, the radiological hazards presented to support personnel during inspections and maintenance activities had become very challenging. Therefore, along with known mechanical issues, the decision was made by SRNL engineering to replace this crane with a newly designed model. This replacement not only solved the operational issues surrounding this crane, but also reduced the radiological hazards presented to support personnel during maintenance and inspection activities. After the crane was removed from the active cell region of E-wing in 2012, it was staged for disposal within E-079. A very high priority was placed on the disposal process of this crane to reduce the radiological hazard presented to personnel supporting the daily operation within E-wing. On November 12, 2013, staged A-in-cell crane was successfully placed inside a waste container, removed from E-wing, and sent to the SRNL waste staging pad. The removal, packaging, and disposal process of this crane was performed with the primary focus on the ensured safety of all involved personnel. The excellent teamwork exhibited by all who supported this project was the key to the successful completion of this project.

The A-In-Cell Crane was contaminated to levels of 10,000 dpm alpha and 20 mrad/hr beta-gamma/100 cm^2. The dose rate levels associated with crane were 20,000 mrem/hr extremity, 15,000 mrem/hr skin, and 40 mrem/hr whole body.

Multiple ALARA techniques were used prior to and during the removal of the E-wing A-in-cell crane. These included: (1) A review of current radiological survey data related to the A-in-cell crane; (2) team assisted hazard analysis (AHA) performed during the planning process to ensure all hazards associated with work were identified; (3) pre-job ALARA review; (4) facility management review of activity prior to authorization of work; and (7) detailed pre-job briefings.

During the initial removal process from the active cell, the crane was placed inside a large plastic bag, and positioned for removal from the E-079 mezzanine area. A waste box was prepared outside of the posted radiological area with a plastic liner and then relocated to E-055. Additional plastic packaging material was secured around the crane prior to lifting from mezzanine. Upon lifting packaged crane from mezzanine with overhead E-079 crane, the radiological protection department (RPD) personnel performed surveys to ensure contamination levels were within established pre-loading levels. The crane was then safely lowered from the E-079 mezzanine and down to a prepared floor area in E-079 using the overhead crane. Due to the overhead crane setup in E-wing, the E-055 overhead crane was required to complete the package movement to the waste box located in E-055. The packaged crane was then safely rigged, lifted, and placed into a prepared waste box. All rigging was removed remotely from package and the lid placed on the waste box. The waste box was sealed, surveyed, removed from E-055, and relocated to the outside waste pad for later disposition. During the removal process, all contamination and radiation levels remained within the established guidelines. No increase in airborne contamination was detected throughout the process and no personal contamination issues encountered.

The project staff included: site rigging department, SRNL radiological protection department, SRNL operations department, and SRNL safety & health department.

4.2.4. SRNL E-Wing (E-114) Roof Replacement

The mission statement for SRNL was to provide support to an off-site vendor for the safe removal and replacement of the E-114 roofing material.

SRNL provided an off-site vendor with support during the removal of the E-114 roof removal. This area was posted as a “Radiological Buffer Area (RBA)” and “Internal Contamination Area (ICA)” due to potential internal contamination hazards related to a release that occurred in SRNL back in the early 1960’s. The original contaminated E-114 Roof material was removed during the early 90’s; however, the roof area remained posted as an RBA and ICA. Based on the review of historical surveys performed during the last roof replacement and interviews performed of radiological protection (RP) personnel who supported the original roof work, SRNL RPD made the decision to maintain the roof area as an RBA during the 2013 roof replacement. The decision to maintain the roof area as an “RBA”, instead of upgrading the area to a “Contamination Area (CA)” during the roof material removal process, greatly reduced the heat stress hazards associated with the application of radiological personal protective equipment (PPE). During the removal process, RPD personnel surveyed all roofing materials to ensure clean area limits. At the completion of the material removal process, the entire E-114 roof area was downgraded from the historically posted “RBA” and “ICA”, to a “Controlled Area”.

The project staff included: CE Borne Construction, SRNL radiological protection department, SRNL operations department, and SRNL safety & health department.

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