

February 3, 2021



TO: Distribution  
FROM: M. Quinn  
SUBJECT: Radiation Safety Subcommittee Meeting of February 3, 2021

MEMBERS (P=Present, A=Absent):

S. Borton	A	D. Hahn	P	M. Quinn, Chair	P	P. Sedory	A
N. Chelidze	A	D. Hockin	A	D. Reitzner	A	K. Vaziri	A
J. Compton	P	R. Madiar	P	W. Schmitt	P	M. Zientarski	P
K. Gollwitzer	P	S. McGimpsey	P	M. Schoell, Deputy Chair	P		
K. Graden	P	D. Newhart	P	J. Scott	A		

Others Present: J. Fulgham, L. Reger

### New Business

1. **RSO Position is Filled** – M. Schoell reported that the open RSO position has been filled. Ben Russel will start March 1<sup>st</sup>.
2. **RPCF** – M. Zientarski reported that they are working on taking advantage of the “lull” in instruments due for calibration in April (due to mass calibration from last year due to COVID) to rearrange calibrations to better suit RPCF.

### Old Business Carried Forward

3. **Outdoor Hazard Assessment** – M. Schoell reported in January that the CSO has asked all subcommittees to perform an assessment of potential outdoor hazards in their area, this effort is being led by R. Bushek but each subcommittee is participating. Need to determine what kinds of hazards are present outdoors, not within a locked fence or building, that members of the public or untrained workers could come across and either cause harm to themselves or harm to the equipment/component.

There were no additional responses from the subcommittee on the initial list of potential outdoor hazards discussed at the January meeting (shown below). M. Zientarski noted that the weather station should be added to the list at this meeting. The initial list was presented to the “outdoor hazards” assessment team. Additional tasks/assignments for this effort will come (i.e., identifying specific hazards/locations, etc.), and will likely need input outside of regular meetings. Will likely be able to utilize existing lists/programs (i.e., fence/posting audit, nuclear material inventory, etc.) to generate this list. Stay tuned.

- Posted Radiation Areas & Posted High Radiation Areas around accelerator enclosures
  - FRCM 236.2.b.(2) through 236.2.b.(4)

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- (2) Accelerator/beamline areas shall be posted and controlled for the normal operating conditions in accordance with Table 2-6 when the safety analysis documents that delivering the maximum dose to an individual is unlikely.
- (3) Accelerator/beamline areas shall be posted and controlled in accordance with Table 2-7 when the safety analysis documents a scenario in which it is likely that the maximum dose may be delivered to an individual. Appendix 2C provides an approved methodology for taking into account the role of machine controls in determining the maximum dose that may be delivered to an individual to be used in the application of Table 2-7.
- (4) For roads over berms, culverts, parking areas adjacent to beamlines, and berm areas considered to be minimally occupied, if the safety analysis indicates an unlikely scenario which could result in a maximum dose corresponding to a posting status of no higher than a radiation area during the unlikely scenario, and no precautions are required for the normal operating condition, then no posting is required if the duration of the unlikely scenario is less than one hour.

○ Table 2-6

*Table 2-6 Control of Accessible Accelerator/Beamline Areas for Prompt Radiation Under Normal Operating Conditions (refer to Article 236.2(b))*

Dose Rate (DR) Under Normal Operating Conditions	Controls
All interlocked doors or gates leading from non-enclosures into an interlocked Exclusion Area	Signs (EXCLUSION AREA – No Access Permitted with Beam Enabled.)
DR < 0.05 mrem/hr	No precautions needed.
0.05 ≤ DR < 0.25 mrem/hr	Signs (CAUTION -- Controlled Area). No occupancy limits imposed.
0.25 ≤ DR < 5 mrem/hr	Signs (CAUTION -- Controlled Area) and minimal occupancy (occupancy duration of less than 1 hr).
5 ≤ DR < 100 mrem/hr	Signs (CAUTION -- Radiation Area) and rigid barriers (at least 4' high) with locked gates. For beam-on radiation, access restricted to authorized personnel. Radiological Worker Training required.
100 ≤ DR < 500 mrem/hr	Signs (DANGER -- High Radiation Area) and 8 ft. high rigid barriers with interlocked gates or doors and visible flashing lights warning of the hazard. Rigid barriers with no gates or doors are a permitted alternate. No beam-on access permitted. Radiological Worker Training required.
DR ≥ 500 mrem/hr	Prior approval of SRSO required with control measures specified on a case-by-case basis.

○ Table 2-7

*Table 2-7 Control of Accessible Accelerator/Beamline Areas for Prompt Radiation Under Accident Conditions When It is Likely that the Maximum Dose Can Be Delivered (See Article 236.2b for more details)*

Maximum Dose (D) Expected in 1 hour	Controls
All interlocked doors or gates leading from non-enclosures into an interlocked Exclusion Area	Signs (EXCLUSION AREA – No Access Permitted with Beam Enabled.)
D < 1 mrem	No precautions needed.
1 < D ≤ 10 mrem	Minimal occupancy only (duration of credible occupancy < 1 hr) no posting
1 ≤ D < 5 mrem	Signs (CAUTION -- Controlled Area). No occupancy limits imposed. Radiological Worker Training required.
5 ≤ D < 100 mrem	Signs (CAUTION -- Radiation Area) and minimal occupancy (duration of occupancy of less than 1 hr). The assigned RSO has the option of imposing additional controls in accordance with Article 231 to ensure personnel entry control is maintained. Radiological Worker Training required.
100 ≤ D < 500 mrem	Signs (DANGER -- High Radiation Area) and rigid barriers (at least 4' high) with locked gates. For beam-on radiation, access restricted to authorized personnel. Radiological Worker Training required.
500 ≤ D < 1000 mrem	Signs (DANGER -- High Radiation Area) and 8 ft. high rigid barriers with interlocked gates or doors and visible flashing lights warning of the hazard. Rigid barriers with no gates or doors are a permitted alternate. No beam-on access permitted. Radiological Worker Training required.
D ≥ 1000 mrem	Prior approval of SRSO required with control measures specified on a case-by-case basis.

● Radioactive Material

- Approved by RSO, must have CA/RMA postings/ropes
- Long term (30+ days) has SRSO approval
- FRCM 415.9

9. Outdoor storage of radioactive material is discouraged.
    - a. Any new outdoor storage locations that will be used more than 30 days shall be approved by the SRSO.
    - b. The use of shielding blocks for storing radioactive materials outdoors with limited protection against the outdoor weather environment and as the dominant structural element is strongly discouraged.
    - c. Outdoor storage locations that will be used for periods of less than 30 days may be approved by the assigned RSO.
    - d. In cases where outdoor storage is necessary and where removable radioactivity is present, containers of high integrity shall be chosen to prevent degradation from weathering and the resultant release of radioactive material.
    - e. Radioactive items and associated pieces of equipment shall be stored in a structurally sound manner that provides the long term ability to safely retrieve the items from both a material handling and radiation safety perspective.
  - Permanent outdoor storage places
    - PW5 is 4ft fence, locked at all times, uses padlock
    - FESS Site 39, locked unless Fermilab person actively working
    - Behind MAB, locked 8ft CA/RMA fenced area
    - Site 40, not-locked 8ft CA/RMA fenced area
    - Railhead, locked 8ft fence when Railhead personnel not present, unlocked with Railhead personnel there
  - Temporary outdoor storage of rad. Material (mainly shielding blocks being transported for installation) - CA/RMA posted ropes/stanchions
  - Nuclear Material
    - Outdoor storage behind DAB, DZero test cryostat – locked 8ft fence
    - D2 gas cylinders within fenced portion of Railhead
  - Outdoor chipmunks with checksources
    - Some outside that are outside of fences, but within doghouses
    - May have temporary chipmunks not within a doghouse
  - Skyshine/Air emissions
    - Evaluated in Shielding Assessments
  - Dose from Beam
    - Evaluated in Shielding Assessments
    - Currently working on beam-on surveys for all beamlines
    - Also expanding area monitoring program to monitor outdoor/publically accessible locations
  - Weather station (North end of site, East of FAST) (no potential harm to personnel, but could be susceptible to tampering)
4. **Review “JULIE Excavation Waiver Prohibited Zone” Map in GIS** – M. Schoell reported a recent event at MC7 where minor excavation (< 6 inches) was done outside of the MC7 enclosure to aid in shielding block installation, however no JULIE was submitted. Beam was off during the time and no required shielding was impacted. FESS is performing an HPI. However it did bring up the question about when do we (radiation safety) need to see a JULIE (for which areas as well as for which type of activity).

There is currently a map on the GIS website (<https://fess-app.fnal.gov/app/JsViewers/faces/fermilabViewer.xhtml>) showing “Prohibited Excavation Waiver Areas”, indicating areas that are required to have a JULIE before work. This area has been reviewed by RSSC, and ensures RP review of planned excavation activities. Please take a look and review the map. **Let us know if any updates are needed by February meeting.**

Feb meeting – W. Schmitt reported that the map looks relatively unchanged, no updates needed.

We've also been asked by the DSOs to clarify what activities we are concerned about and need to be part of the review/approval process within this "area" (i.e., excavation of soil, excavation of parking lots, excavation of gravel, drilling into walls/floors/ceilings, etc.), and why it's necessary (i.e., to ensure beam is off for affected areas, to ensure required shielding is returned before beam operations, to ensure survey of potentially activated soil, to ensure survey of potentially activated facility/infrastructure, etc.). They've asked that we provide ½-1 page memo/description to the DSOs so they can pass along to Task Managers/Construction Coordinators, Building Managers, etc. See initial thoughts below, **please review and send additional comments by February meeting, we will finalize memo/description for DSOs at February meeting.**

Feb meeting – no update. (see list below)

In addition, they've asked that we review FESHM 7030 (Excavation) and 7040 (Concrete Cutting/Coring) for any necessary updates from radiological perspective. Are any changes necessary for FRCM as well? **Please review FESHM chapters and have comments ready by February meeting.**

Feb meeting – W. Schmitt noted that previous incidents (i.e., IERC moving markings, MI JULIE submitted months before the work started and work was stopped because people forgot that JULIE had been done) have occurred because of some confusion on how long JULIES are valid for. May need more clarification how long JULIES are valid, or when it becomes expired – some time expectation where a new/updated JULIE is required. It's noted that per FESHM 7030, TM/CCs have 7 days within the approvals to do work and "can extend the JULIE as long as they need to", but nothing written as to how to show (confirm and notify) that the JULIE has been extended.

M. Quinn noted that JULIES are supposed to go into IMPACT. That should help somewhat for people looking at IMPACT for WPC for other jobs.

W. Schmitt commented that it would be ideal to have something explicit in 7030 that says "if a permit is x months old, a new one needs to be generated".

- Excavation
  - Soil
  - Parking Lots
  - Gravel
  - Any excavation of any material within the "Prohibited Excavation Waiver Area" requires JULIE to be submitted to allow for radiation safety review to determine if excavation will potentially impact berm and/or required shielding. If berm is impacted, beam to the affected area must be configuration controlled off by the RSO prior to the start of work, and the berm confirmed restored by the RSO at the end of the work prior to resuming beam operations. Depending on the size and scale of the

excavation, confirmation may be done visually by the RSO or may warrant a topographic survey performed by the Alignment Group. If excavation will impact required shielding, the soil will be required to be surveyed by RCTs to determine if it's activated. If the soil is activated, excavation personnel may need full Radiological Worker training and equipment may need to be decontaminated. If excavation impacts required shielding and the soil is not planned to be replaced, it must remain on site.

- Facilities (drilling walls/floors/ceiling, removal of metals/infrastructure)
  - Posted CA/RMA
    - For facilities only posted as CA/RMA, no rad restrictions apply.
  - Posted RA/EA
    - For areas where beam is present (EA/RA), infrastructure and facility equipment has the potential for activation and/or contamination. JULIEs should be performed for this work in these areas to ensure radiation safety review and approval. Material should be surveyed by RCTs prior to work, and prior to disposal (using the MMR process). Metals may be subject to the metals recycling suspension, and should be reviewed on a case-by-case basis by the RSO.
    - NOTE: MT6.1, MT6.2, MC7, NM4 and MC-1 Hall are posted EAs in addition to CA/RMA. These enclosures would fall into this category, requiring radiation safety review of all facility work (drilling walls/floors/ceilings, removal of metals/infrastructure).

5. **Target Service Integration Building** – M. Schoell reported that the facility construction is being looked at to fit budget constraints, but the Hot Cell concrete/steel construction are still included in the construction plan, and outfitting of the Hot Cells (i.e., remote arms, lead windows, etc.) will likely be moved to contingency. A draft material workflow document has been drafted by the AD HPT (High Power Targetry) Department, with RP review/input. Meeting next week with RP to start determining activity/contamination limits for various areas in the building. M. Schoell also noted that the fume hood is intended for containing any pieces potentially broken off of the activated material during the material studies, rather than for work on contaminated material. This should make things much easier from the RP requirements/controls standpoint.
6. **8 GeV Line LCW Leak** – S. McGimpsey and J. Fulgham reported that the water in this area had dried up and wipes were taken 1/13 to confirm no spread of contamination. Results are still pending.
7. **DUNE** – M. Quinn reported that there is a meeting between RP/DUNE representatives next week to discuss NRC/DOE requirements and who will be responsible for which activities in the leased space and surrounding areas (i.e., moving sources through SURF space into the leased space).
8. **2021 10 CFR 835 Triennial** – M. Quinn reported that the review will be on Sections B, F, G and K, and the review team has been established: Dianne, Kathy G, Mark, Lisa, Dave. Will have kickoff meeting soon, and will determine timing at the meeting.
9. **Frisker/Wallflower Station Assessment** – M. Zientarski reported that the assessment is wrapping up, working on entering items into iTrack and DocDB. Intent was to look at current frequently used

instruments to see if it's possible to standardize mounting scheme, space requirements (room for performing surveys comfortably) in order to deem "standard" to be implemented in new facilities.

10. **Electronic Dosimeters** – M. Zientarski reported that all identified requirements have been documented, along with any beneficial features. This requirements document is the first to be written for supplemental/electronic dosimetry, which is great to have! Two vendors have been contacted and provided documentation. Working on comparing now, and expect to be able to present soon.
11. **RPCF Source Replacement** – M. Zientarski reported that he's still working with Procurement on this effort. Vendor seems ready to go when we're ready. Also working with DSO to capture work in an HA.
12. **MC-7 Door Replacement** – M. Schoell reported that the memo has been issued to clarify recycling requirements

W. Schmitt reported that the NM parking lot has been on/off posted as Controlled Area when beam is on. This is another area similar to the MCenter fenced space that is somewhat routinely down-posted when beam is off.

R. Madiar recommended taking credit for this with respect to the dose to public question.

13. **DOE O 435 Added to Prime Contract** – D. Hockin reported that they are gathering feedback to the incorporation plan, once received will schedule a meeting with FSO to discuss.
14. **Eating/Drinking Near Source Boxes** – M. Schoell reported that this effort is still ongoing. AD DSO will be asking AD Department Heads to help look into this, along with eating/drinking near other industrial work spaces. It was also noted that the vending machines have been moved.

R. Madiar reported that ANL forbids eating/drinking in RMA, which is above 10CFR835 requirements.

15. **Dose to Public FSO Concerns** – Post-start recommendation from FSO with approval of ASE Rev 12 (MTA revision) highlighted FSO concerns about FNAL use of occupancy factors when calculating potential dose to the public. Recommended controls be put in place for any areas of concern when removing occupancy factor. Recommendation also mentions external DOE review. This stemmed from the DOE looking at Fermilab's site accessibility.

As the Fermilab site is closed to the general public, the otherwise publicly accessible areas of the site that could exceed public dose restrictions (if not for occupancy adjustment) do not represent a public risk. Prior to Fermilab allowing public access to the site, the areas that would then be publicly accessible, that could exceed public dose restrictions (if not for occupancy adjustment), must be posted as restricted to Fermilab workers unless a subsequent DOE external review proposes alternative expectations that are subsequently accepted by the FSO Manager.

RP Departments looking into this. Planning for increasing area monitors (dosimetry badges) throughout the site as well as potential beam-on surveys. Increasing area monitor locations throughout the Lab to ~300 locations, including more publically accessible areas/site boundaries.

Current Controlled Area postings are based on 2000 hours per year. Not adjusting for occupancy factors, 8760 hours per year, is not something we've considered. We have designed facilities and our postings are also based on the 10 CFR 835 limits, which are based on 2000 hours in a year, which is considered to be extremely conservative for members of the public to be on site. Will have to see results from area monitors to understand this better.

Will also wait to see new Site Security Plan to understand any changes to public access to the site to see if there is a potential for some occupancy factors.

R. Madiar reported that there will be an 10 CFR 835 reiew on the November/December timrframe. The plan for this assessment has been in the works since pre-COVID. However additional lines of inquiry from a security standpoing.

M. Quinn stated that review may be focused on our set of criteria (our occupancy assumptions) and if that's still appropriate.

From January meeting: Area monitors received and are being deployed. Beam-on surveys nearly complete, working on compiling survey information and generating the report.

New this meeting: M. Schoell reported that beam-on survey report is nearly done. Any area that is of potential concern is already behind "Authorized Personnel Only" signs. Will need additional survey at MTA to confirm. Also will be able to continually monitor through the routine area monitoring program.

16. **NEXUS DD Neutron Generator** – D. Hahn reported that it's been removed from the Mu2e pit. The generator is moved to Lab G and the deuterium bottle is at Site 40. D. Hahn also reported that this is good because Mu2e DT Neutron Generator may be delivered soon.

No update.

17. **Safety Assessment Document review** – No update.

18. **Accelerator Readiness** – No update.

19. **Contamination in Enclosures** – S. McGimpsey reported that with beam operational, build-up surveys have resumed. Waiting for results.

20. **SARP** – No update.

### **ALARA Topics**

21. M. Schoell reported 2020 Shutdown dose through Week 22 (ending Sunday November 15<sup>th</sup>) is 4,895 person-mrem, which is well below the pre-shutdown estimate of 6,759 persom-mrem. Working on finalizing post-shutdown documentation/memo.

### **Operations**

J. Compton reported that MTA is running regular beam pulses. Linac losses determined to be false readings which have been identified and fixed. Beam running everywhere except NM.

**PLACE AND DATE FOR THE NEXT MEETING: THE NEXT MEETING WILL BE ON MARCH 3, 2021 AT 2:00 PM CENTRAL VIA ZOOM (MEETING INFORMATION WITHIN OUTLOOK CALENDAR EVENT).**

**FY2021 Minutes: ESH DocDB 6112**

**Distribution via E-Mail–**

Amber Kenney – Chief Safety Officer	Subcommittee Members
Eric McHugh	Bridget Iverson
Raymond Lewis	Nicole Gee
Others Present	
RPO Department	