Fermilab

Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

Radiological Worker — Practical Factors [FN000471/OJ/01]

Environment, Safety, Health & Quality Section

Rev. 05/2016

Introduction

Department of Energy (DOE) Safety Policy

In conjunction with Fermilab, DOE is firmly committed to having a radiological control program of the highest quality. This program, as outlined in 10 CFR Part 835, *Occupational Radiation Protection* and the Fermilab Radiological Control Manual (FRCM), requires that managers and supervisors at all levels are to be involved in the planning, scheduling and conduct of radiological work. Adequate radiological safety shall not be compromised to achieve research objectives.

Non-cooperation or flagrant disregard of environment, safety and health procedures will be cause for disciplinary action or for denial of use of Fermilab facilities.

Introduction

Course Objective and Overview

Generic practical exercises allow the radiological worker to apply the theory portions of this course in a simulated, controlled work environment. This exercise will be evaluated against pre-established criteria. A rating of Satisfactory is required for successful completion of Practical Factors Training.

As a trained radiological worker, you will be qualified to work on, with, or in the proximity of radiation producing machines or radioactive material.

Dose Limits and Fermilab Doses

DOE Legal Dose Limits

- Whole Body – 5,000 mrem in a year
- Lens of the Eye – 15,000 mrem in a year
- Extremities – 50,000 mrem in a year
- Skin – 50,000 mrem in a year
- Declared pregnant worker – 500 mrem during the gestation period
- Minors – 100 mrem in a year

Doses at Fermilab

- Fermilab has established an Administrative limit of 1500 mrem (whole body) in a year.
- 95% of Fermilab workers receive <100 mrem in a year.
- Internal exposures, where people intake radioactive materials are extremely rare at Fermilab.

Radiological Work Permits (RWPs)

- Radiological Work Permits are the primary document at Fermilab for specifying requirements applicable to work in radiological areas, or in some cases work on radioactive materials.
- They are tailored to individual work areas and/or beam enclosures.
- Where does one find the RWP?
  - For beam enclosures, where one gets the access keys:
    - Main Control Room or
    - Near Remote Key Trees
  - Elsewhere: As distributed by the Radiation Safety Officers (RSOs) or Radiological Control Technicians (RCTs).

Radiological Work Permits (RWPs)

- They need to be READ (ALL OF IT!) and followed.
- They commonly have more than one page.
- They need to be signed.
- We show here 2 examples, one for Supervised Access, another for Controlled Access.
- There are other types of RWPs in use at Fermilab.

RWP – Supervised Access Example – Specifications

Fermilab
Radiological Work Permit No. **AD-1484**

Area Name
NuMI Pretarget and Target Hall

Permit Type	General
Issue Date	13 Jan 15
Issue Time	3:35 PM
Expiration Date	31 Jan 16

Description of Work
All work, tours, and inspections EXCEPT FOR:
1. *Cutting, drilling, or grinding on radioactive material*
2. *Work in areas posted as High Radiation and/or Contamination areas*
3. *Work on beam pipes and magnet interface areas. See "Special Requirements."*

Access Type
- ○ *Controlled Access*
- ◉ *Supervised Access*
- ○ *Open Access*
- ○ *Other*

Basic Work Area Conditions
Primary Beam Enclosure - Beam-off access only
HV Present

Additional Work Area Conditions
One key per person
Two Person Rule

Area Posting
Radiation Area

Time Limits
None

Dose Limits
100 mrem per week and 1500 mrem per year are administrative control limits

Work Documents
None

Getting close to the weekly dose limit?

RWP – Supervised Access Example – Specifications

Dosimetry Requirements

- ☐ *None required*
- ☒ *Dosimetry Badge*
- ☒ *Pocket Dosimeter*
- ☐ *Digidose*
- ☐ *Ring Badge*
- ☐ *See special requirements*

Basic Training Requirements

Radiation Worker

Other Training Requirements

LOTO II required for all work on or near exposed electrical conductors Requirements for tours and visitors are set on a case-by-case basis by the Area RSO.

Portable Survey Instruments

- ☒ *None required*
- ☐ *LSM*
- ☐ *Ludlum 14C*
- ☐ *E140N*
- ☐ *Minimeter*
- ☐ *Teletector*
- ☐ *Bicron Analyst*
- ☐ *SmartIon*
- ☐ *See special requirements*

Personal Protective Equipment

- ☒ *None required*
- ☐ *Gloves*
- ☐ *Shoecovers*
- ☐ *Labcoats*
- ☐ *Coveralls*
- ☐ *Hood*
- ☐ *Respiratory Protection*
- ☐ *See attached instructions*
- ☐ *See special requirements*

Additional Instructions

- ☐ *Notify Div/Sec ESH prior to work*
- ☐ *Rad tech coverage required*
- ☒ *Review survey map*
- ☐ *Pre-job briefing*
- ☒ *Personal frisk on exit*
- ☒ *Survey & label materials on exit*
- ☐ *Post-job de-briefing*
- ☒ *No eating, drinking, smoking*
- ☒ *See special requirements*

SPECIAL REQUIREMENTS

*Contact MCR to request RSO approval **prior** to working in any posted High Radiation (100 mrem/hr or greater) and/or Contamination Areas. There is always a potential for contamination on beampipes and in magnet interface areas, therefore before removing any material from such areas, contact Radiation Safety for additional guidance.*

Prepared By

Gary Lauten

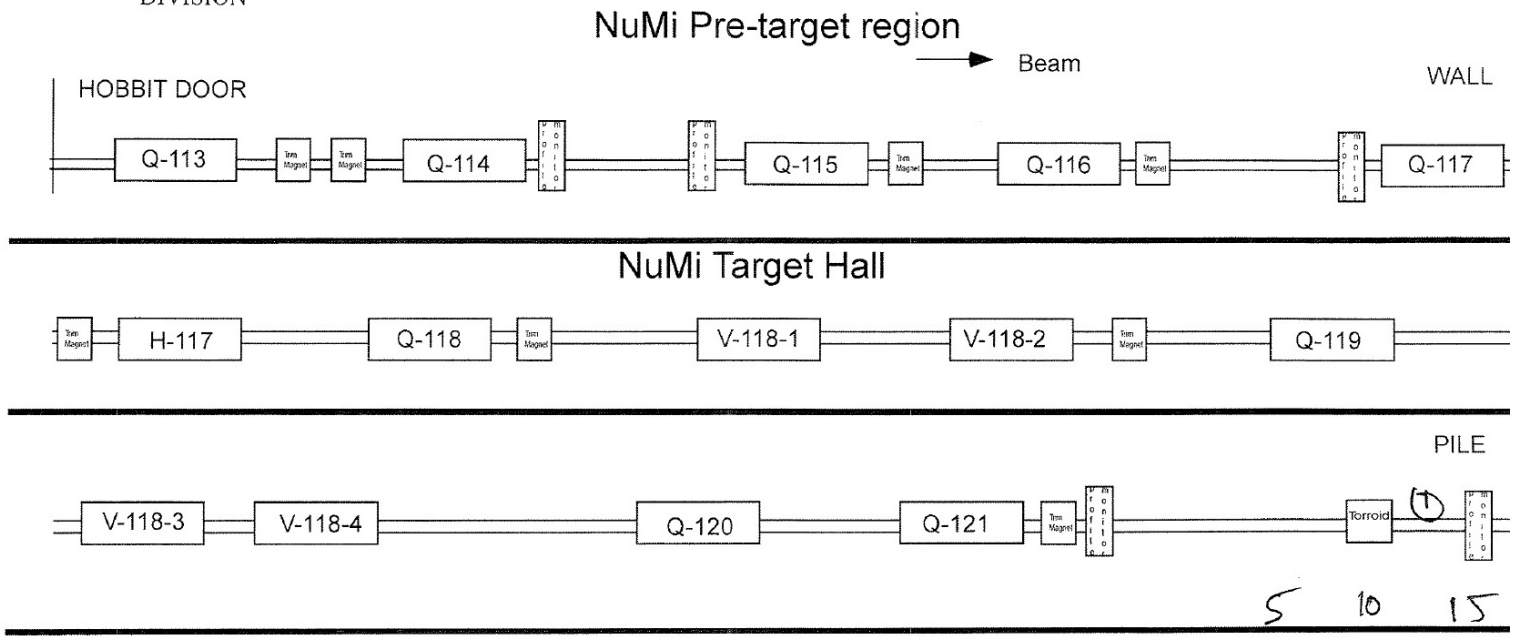
RSO Authorization

Gary Lauten

RWP – Supervised Access Example – Survey Map

FERMILAB
ACCELERATOR
DIVISION

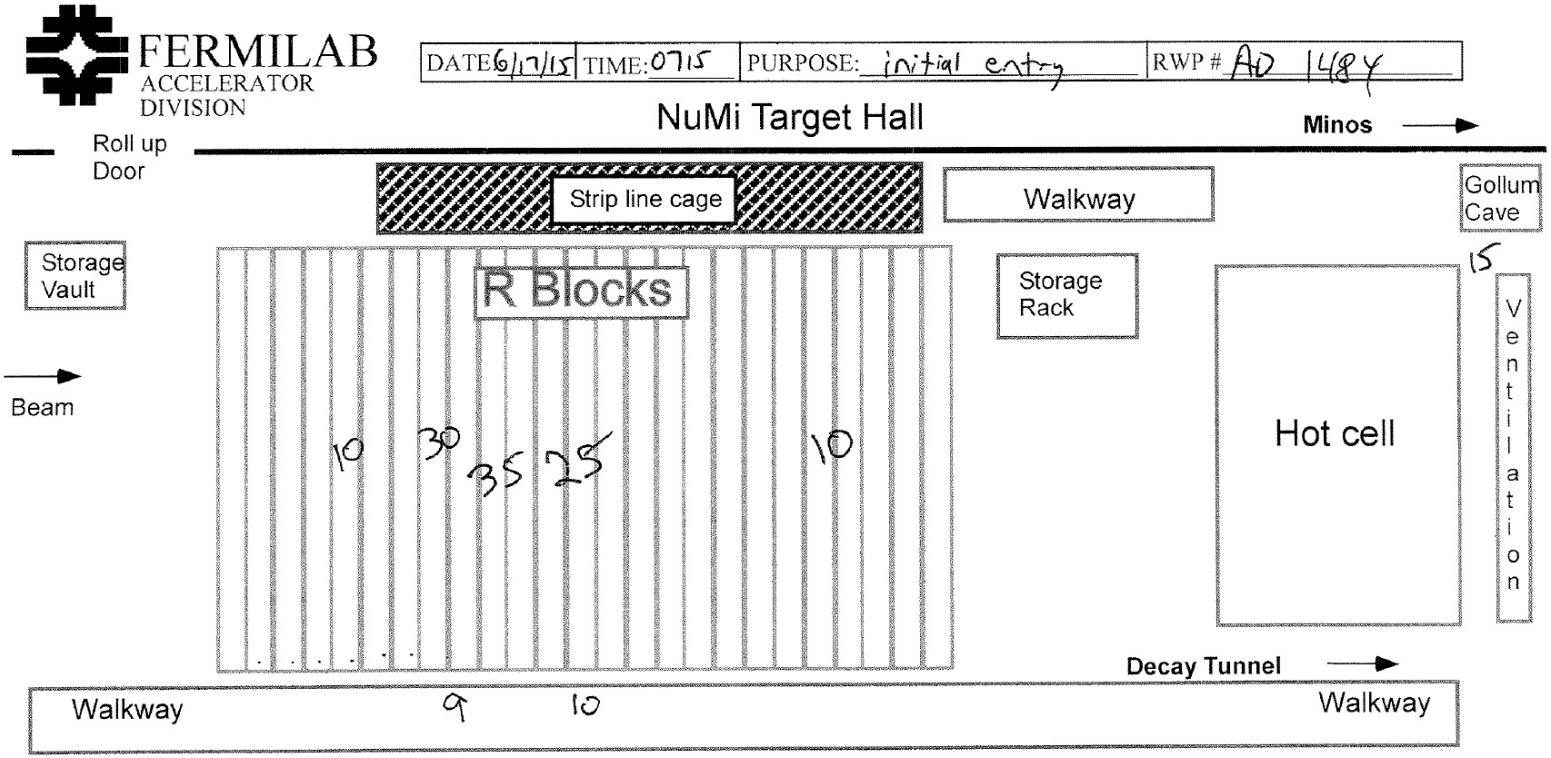
DATE: 6/17/15	TIME: 0715	PURPOSE: initial entry	RWP # AD 1484



All Dose Rates Below 5 mR/hr Unless Noted.			Bkgd 30 cpm			Highest Dose Rate Found 15 mR/hr at 1 ft.
Inst Type: LSM			Wipe #	Reading	Wipe # / Reading	Note: RSO approval required to work in areas where it is: >100 mR/hr @ 1 foot OR >100 CCPM on a wipe.
Inst No: 3			1	0 ccpm	ccpm	
Batt/Source Chk: Sat				ccpm	ccpm	
Cal. Due Date: 10/15				ccpm	ccpm	Comments:
LEGEND				ccpm	ccpm	
Numbers appearing on map are mR/hr @ 1 ft readings unless denoted with symbols below				ccpm	ccpm	
* = mR/hr @ contact			Beam Off Date: 6/17/15			Surveyed By: Burch / Sedory
A = Air Sample ◯ = Wipe (F) = Floor wipe			Beam Off Time: 0200			Reviewed By: [signature] for C.L.
			Intensity: 2.9 E13			

REVISED 11/9/04

RWP – Supervised Access Example – Survey Map



All Dose Rates Below 5 mR/hr Unless Noted.			
Inst Type: LSM			
Inst No: 3			
Batt/Source Chk:			
Cal. Due Date: 10/15			

LEGEND
Numbers appearing on map are mR/hr @ 1 ft readings unless denoted with symbols below
* = mR/hr @ contact
A = Air Sample ◯ = Wipe (F) = Floor wipe

Bkgd _____ cpm

Wipe #	Reading	Wipe #	Reading
	ccpm		ccpm
	ccpm		ccpm
	ccpm		ccpm
	ccpm		ccpm
	ccpm		ccpm

Beam Off Date: 6/17/15
Beam Off Time: 0200
Intensity: 2.9E13

Highest Dose Rate Found 35 mR/hr at 1 ft.

Note: RSO approval required to work in areas where it is: >100 mR/hr @ 1 foot OR >100 CCPM on a wipe.

Comments:

Surveyed By: Bush / Sedory
Reviewed By: [signature] for G.L.

REVISED 8/16/07

RWP – Supervised Access Example – Signature Page

Fermilab
Radiological Work Permit

NuMI Pretarget and Target Hall

SUPERVISED ACCESS
RWP SIGN-IN SHEET

RWP No **AD-1484**
Survey Date **6/17/15**

Employee I.D. No.	PRINT NAME	DATE MO/DAY/YR	JOB LOCATION OR DESCRIPTION *Be as specific as possible* *Examples: "P01" to "Check for vacuum leak "*	LEVEL OF PROTECTIVE CLOTHING	LSM NUMBER (Survey Meter)	SIGNATURE *By signing this form you agree to observe the RWP requirements*
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	
				NONE	NONE	

RWP – Controlled Access Example - Specifications

Fermilab
Radiological Work Permit No. **AD-1466**

Area Name

Booster

Permit Type	General
Issue Date	12 Jan 15
Issue Time	4:37 PM
Expiration Date	31 Jan 16

Description of Work

All work, tours, and inspections EXCEPT FOR:

1. *Cutting, drilling, or grinding on radioactive material*
2. *Removal of materials from Magnet interface areas, or areas where dose rates are greater than 20 mR/hr at 1'. See "Special Requirements."*
3. *Areas reading greater than 100 mrem/hr at 1', or posted as High Radiation and/or Contamination Areas*

Access Type

- (●) *Controlled Access*
- ( ) *Supervised Access*
- ( ) *Open Access*
- ( ) *Other*

Basic Work Area Conditions

Radiation Area
Beam off access only
HV Present

Additional Work Area Conditions

One key per person
Two Person Rule

Area Posting

Radiation Area

Time Limits

None

Getting close to the weekly dose limit?

Dose Limits

100 mrem per week and 1500 mrem per year are administrative control limits

Work Documents

None

RWP – Controlled Access Example - Specifications

Dosimetry Requirements

- ☐ *None required*
- ☒ *Dosimetry Badge*
- ☒ *Pocket Dosimeter*
- ☐ *Digidose*
- ☐ *Ring Badge*
- ☐ *See special requirements*

Basic Training Requirements

Rad Worker
Controlled Access

Other Training Requirements

LOTO II required for all work on or near exposed electrical conductors. Requirements for tours and visitors are set on a case-by-case basis by the Area RSO.

Portable Survey Instruments

- ☐ *None required*
- ☒ *LSM*
- ☐ *Ludlum 14C*
- ☐ *E140N*
- ☐ *Minimeter*
- ☐ *Teletector*
- ☐ *Bicron Analyst*
- ☐ *SmartIon*
- ☐ *See special requirements*

Personal Protective Equipment

- ☐ *None required*
- ☐ *Gloves*
- ☐ *Shoecovers*
- ☐ *Labcoats*
- ☐ *Coveralls*
- ☐ *Hood*
- ☐ *Respiratory Protection*
- ☒ *See attached instructions*
- ☐ *See special requirements*

Additional Instructions

- ☐ *Notify Div/Sec ESH prior to work*
- ☐ *Rad tech coverage required*
- ☐ *Review survey map*
- ☐ *Pre-job briefing*
- ☒ *Personal frisk on exit*
- ☒ *Survey & label materials on exit*
- ☐ *Post-job de-briefing*
- ☒ *No eating, drinking, smoking*
- ☒ *See special requirements*

SPECIAL REQUIREMENTS

Prior RSO approval is required before working in a posted High Radiation or Contamination Area. If dose rates exceed 500mR/hr at 1', turn back, and notify the MCR. Contact MCR to request Rad Safety guidance before removing components from magnet interface areas or areas where dose rates exceed 20 mR/hr at 1'.

Prepared By
Gary Lauten

RSO Authorization
Gary Lauten

RWP – Controlled Access Example – No Survey Map!

CONTROLLED ACCESS
PROTECTIVE CLOTHING REQUIREMENTS

LEVEL 1: Personnel will just walk and look. No climbing, crawling, leaning onto or close to, kneeling, or working on potentially contaminated surfaces:	*Gloves and Shoe Covers
LEVEL 2: Personnel will perform any type of work, which includes leaning close to, leaning onto, or touching potentially contaminated surfaces. No climbing, crawling, or kneeling:	*Lab Coat, Shoe Covers, and Gloves *Also wear a hood if it is likely that your head or hair may touch a contaminated surface.
LEVEL 3: Personnel will perform any type of work that likely involves climbing, crawling, or kneeling	*Coveralls, Shoe Covers, and Gloves *Also wear a hood if it is likely that your head or hair may touch a contaminated surface.
LEVEL 4: Electrical work with potential arc-flash hazard or welding.	The standard PPE used for Radiological Contamination concerns is flammable. When job tasks require PPE for NFPA 70E or for welding, the PPE required for Arc-Flash protection or welding takes precedence over PPE for Radiological Contamination concerns. Tyvek suits, coveralls, gloves, and booties **shall not** be worn.

RWP – Controlled Access Example

CONTROLLED ACCESS
RWP SIGN-IN SHEET

RWP No **AD-1466**

Employee I.D. No.	PRINT NAME	DATE MO/DAY/YR	JOB LOCATION OR DESCRIPTION *Be as specific as possible Examples: "Period 4" to "Check for vacuum leak "*	LEVEL OF PROTECTIVE CLOTHING	LSM NUMBER (Survey Meter)	SIGNATURE *By signing this form you agree to observe the RWP requirements*

RWPs: Dosimetry and Instruments

Dosimetry

- Dosimetry badge, always!
- Pocket Dosimeter, required for most beam enclosures and many other places.
- Ring badges, as specified by an RWP or Radiation Safety staff.
- Electronic dosimeters (“digidoses”), as specified by a job-specific RWP or Radiation Safety staff.

RWPs: Dosimetry and Instruments

Survey Instruments

- Log Survey Meters (LSMs) are needed for Controlled Access, since area is unsurveyed.
- Other instruments are mainly used by Radiation Safety staff.
- If an instrument is specified on the RWP, ask about it!
- Return all instruments to where you checked it out.
- Take care of instruments, they are expensive!
- First person entering the enclosure on a controlled access should be using the LSM.

RWPs: PPE and Additional Instructions

Personal Protective Equipment (PPE)

- This is mostly about protective clothing
- Wipes are performed, if “clean” may allow street clothes.
- Contamination areas are often roped off. STOP Stay out unless wearing the specified PPE.
- Controlled access is different since are has not been surveyed – see RWP.
- Know what work you are doing. All contamination is not found by wipes.

Additional Instructions

- Read carefully!
- This tells what you need to do before, during, and after the work.

RWPs: Special Requirements, Signatures,

Special Requirements

- There may be a lot of content here to review.
- Reminds people when prior RSO approvals are needed.
- There could be additional pages.

Signatures

- All RWPs must be signed
  - Controlled Access – **every** time you enter, even on the same day!
  - Supervised access: 1st time, then every month after that. (approx. every 30 days).

Questions?

- If you have questions, ask your supervisor.
- Otherwise, ask Radiation Safety personnel.

Dosimetry

Policies for ALL Dosimetry Devices

- To be worn only by the person to whom it is issued.
- With few exceptions, only issued to trained Radiological Workers.
- To be worn at all times when required by signs, RWPs, and/or radiological control personnel.
- Do not take dosimetry devices off-site.
- If any dosimetry device becomes lost, off-scale, damaged, or potentially contaminated:
  - Put work in a safe condition.
  - Alert others in the vicinity.
  - Immediately exit the area.
  - Notify the assigned RSO or Radiation Safety Staff.

The Official Dosimetry Badge

- Legal record of exposure.
- Measures beta, gamma and neutron dose.
- Permanent dosimetry badges issued on assigned badge racks at the beginning of each quarter (Jan 1, April 1, July 1, Oct 1).
- Temporary dosimetry badges obtained from the Communications Office on the ground floor of Wilson Hall.
- Badges are sent off-site for processing, get results normally 5-6 weeks later.
- Badge wearers get an annual report in the springtime.
- DO NOT OPEN OR TAMPER WITH DOSIMETRY BADGES.

Policies Specific to Dosimetry Badges

- Should be returned for processing at the end of each quarter, or upon request.
- Dosimetry badges can be returned by placing them on the badge rack for the correct quarter.
- Should be worn facing forward on the chest area, on or between the waist and neck.
- Should be stored in a proper storage location, an area with a low background without excessive heat or moisture.
- Should not be taken or worn off-site unless specifically authorized by the Senior Radiation Safety Officer.
- Should not be knowingly exposed to security x-ray devices, excessive heat, moisture, or medical sources of radiation.

Supplementary Dosimetry - Pocket Dosimeters

- Direct reading dosimeter used to keep track of exposure during work.
- Measures gamma dose only.
- Used as a back-up for the dosimetry badge in case it is lost.
- Should be zeroed when >75% of the full scale using a Dosimeter Charger.
- There are several models in use.

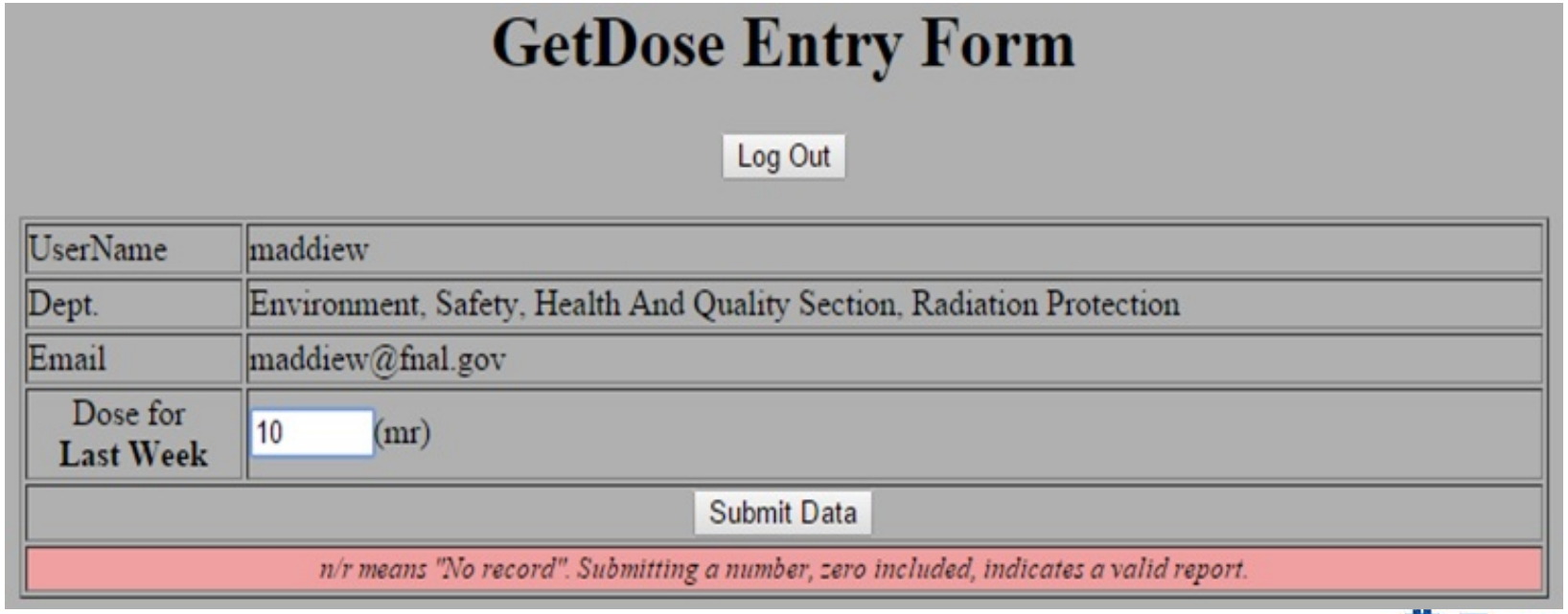
Supplementary Dosimetry - Pocket Dosimeters

- Get Pocket dosimeters from the stockroom.
- Wear pocket dosimeters next to dosimetry badge, normally on the trunk of the body.
- Return the dosimeter when it is due for calibration, on the last day of the month indicated by the sticker.
- Two ranges in use; 0-200 mR and 0-500 mR. Phasing out the 0-500 mR ones!
- Mechanical shocks, such as dropping the dosimeter, can cause false high or full-scale readings.
- Read the dosimeter at the same orientation; gravity works!
- Zero (i.e., reset) when at 75% of full scale.
- Hold by the clip and push down with some force.
- Don’t be too fussy about getting the initial reading “exactly” zeroed, a few mR is ok, just remember the number.

Recording your Pocket Dosimeter Readings

Preferred Method: Online GetDose system

- Tracks ONLY pocket dosimeters.
- Log in with Fermilab Services Username/Password, enter data.
- As a radiological worker, you will receive weekly emails on Mondays reminding you to enter pocket dosimeter readings.
- If you do not wear a pocket dosimeter (or other supplemental dosimeter) you may delete/ignore the weekly email or enter n/r (for “no record”).



GetDose Entry Form

Log Out

UserName	maddiew
Dept.	Environment, Safety, Health And Quality Section, Radiation Protection
Email	maddiew@fnal.gov
Dose for **Last Week**	10 (mr)

Submit Data

n/r means "No record". Submitting a number, zero included, indicates a valid report.

Recording your Pocket Dosimeter Readings

Current Record

--- Latest Record First ---

Dates indicate the ending Monday for each one week interval.
(Data entered today will be associated with the week before the nearest last Monday.
If today is Monday, then today is the nearest last Monday.)

Wolter, Maddie	16344	2016-02-22	2016-02-15	2016-02-08	2016-02-01	2016-01-25	2016-01-18	2016-01-11	2016-01-04	2015-12-28	2015-12-21	2015-12-14
		0	0	0	0	0	0	0	0	0	0	0
Wolter, Maddie	16344	2015-12-07	2015-11-30	2015-11-23	2015-11-16	2015-11-09	2015-11-02	2015-10-26	2015-10-19	2015-10-12	2015-10-05	2015-09-28
		0	0	0	0	0	0	0	0	0	10	0
Wolter, Maddie	16344	2015-09-21	2015-09-14	2015-09-07	2015-08-31	2015-08-24	2015-08-17	2015-08-10	2015-08-03	2015-07-27	2015-07-20	2015-07-06
		0	0	0	0	0	0	0	0	0	0	0
Wolter, Maddie	16344	2015-06-29	2015-06-22	2015-06-15	2015-06-08	2015-06-01	2015-05-25	2015-05-18	2015-05-11	2015-05-04	2015-04-27	2015-04-20
		0	10	0	0	0	0	0	0	0	0	0

Some groups still use 3X5 cards.

Fill out, turn in to Supervisor.

They then go to Radiation Safety.

Other Supplemental Dosimeters

Digidose

- Small electronic dosimeter used for high dose jobs
- Measures gamma dose.
- Beeps once for each accumulated mrem of dose
- Specified by area RSO when required.
- Typically issued by the area RSO and collected upon completion of the job for which they were issued.

Finger Ring

- Worn if there is a chance for significant dose to the fingers.
- Assigned to individuals by area RSOs.
- Read out offsite by dosimetry vendor, like the dosimetry badge.
- Not entered on GetDose.

Frisking

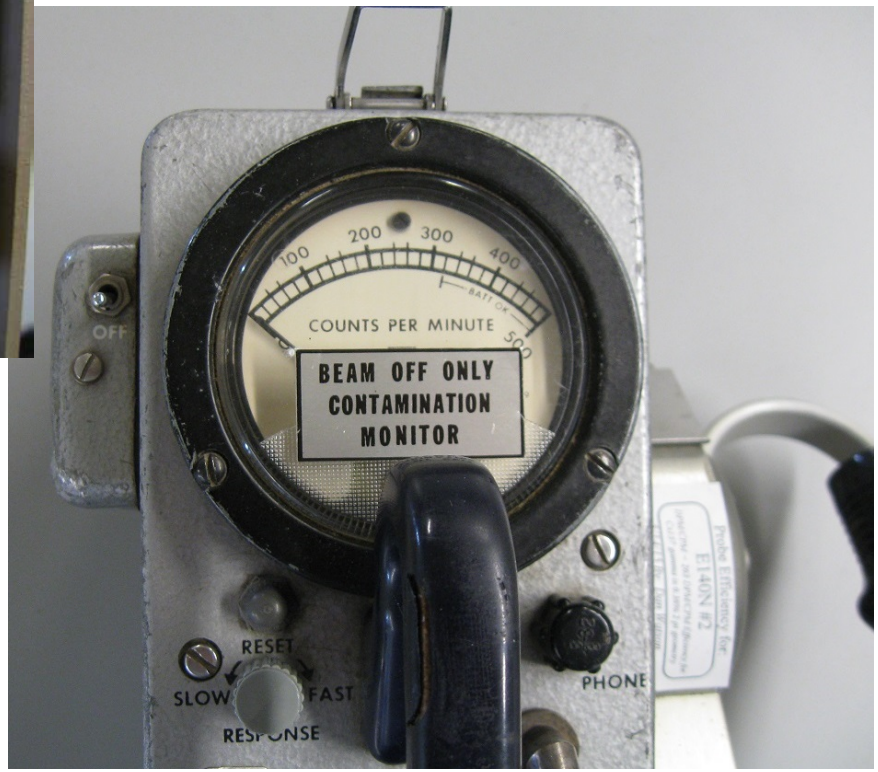
There are two uses for the frisker instrument:

1. See if you or some object is contaminated with removable radioactivity.
2. Determine if objects being removed from a beam enclosure are radioactive.

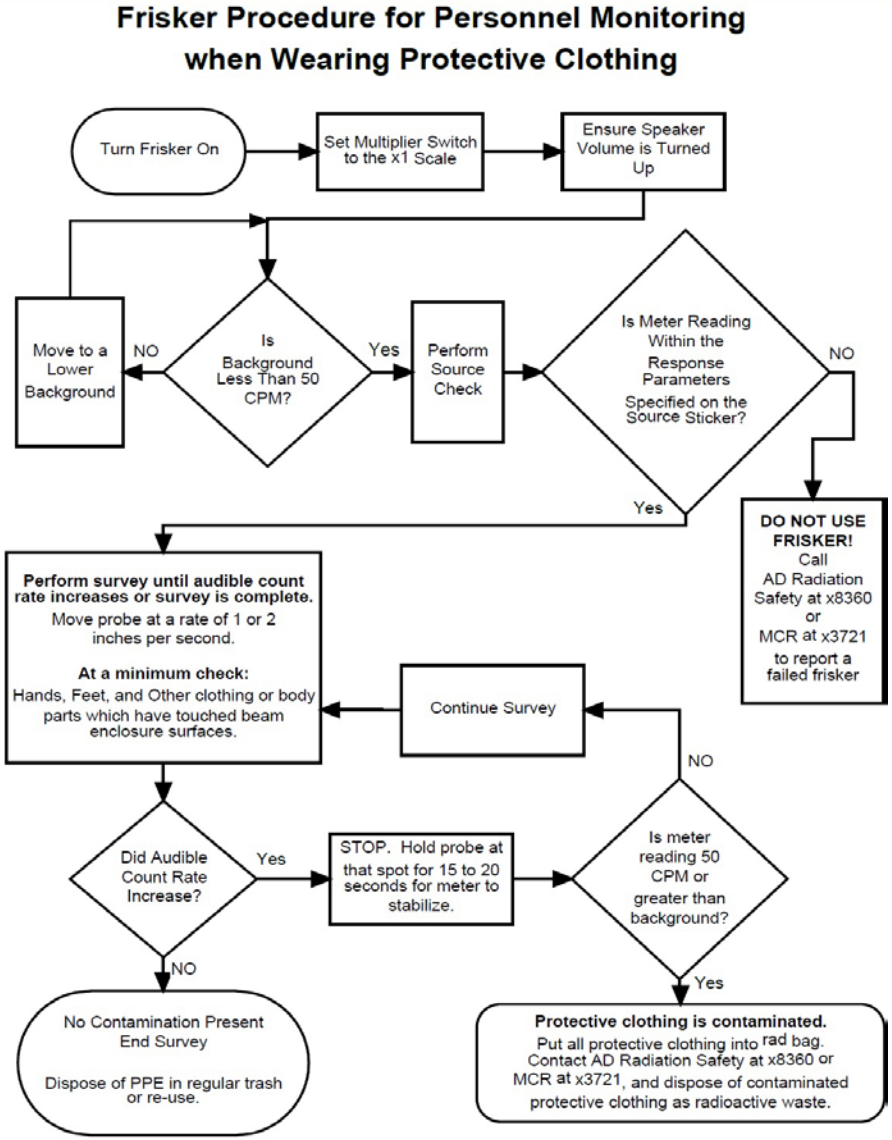
We have two models, line powered (plugged in) and another battery powered.

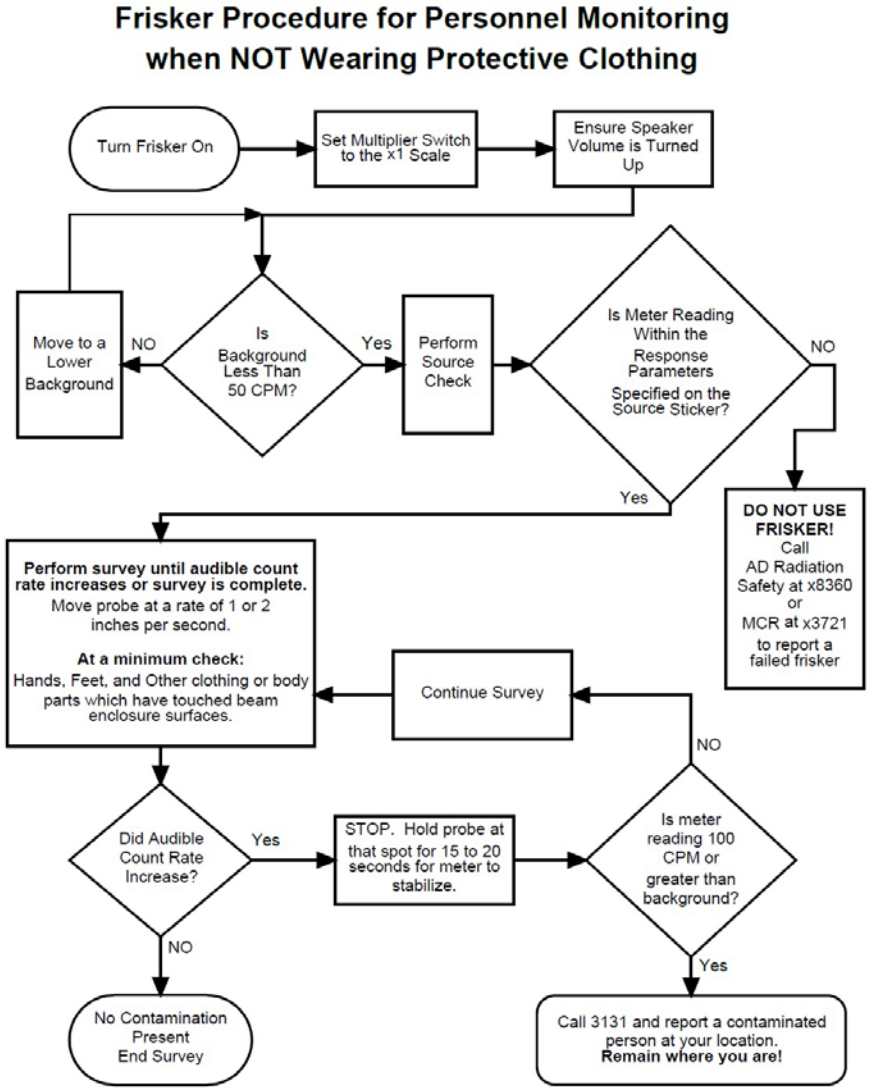
Frisking

ALARM
X1
X10
X100
RANGE
RESET
COUNTS/MIN
100
200
300
0.5
1.0
1.5
DETECTOR KV
MODEL 177-4


OFF
100
200
300
400
500
COUNTS PER MINUTE
BEAM OFF ONLY
CONTAMINATION
MONITOR
RESET
SLOW
FAST
RESPONSE
PHONE

Frisking Flow Charts





Frisking to Check for Removable Radioactivity (Contamination)

- Look for damage, bad cables, then turn on.
- Look for calibration due dates, report and do not use if expired.
- Turn on the meter, or verify that it is turned on!
- Check background – usually it will be 50 counts/minute (cpm).
- Have probe pointing up.
- First person to use instrument should do source check with probe.

Frisking to Check for Removable Radioactivity (Contamination)

- Check hands (gloves if wearing PPE), no more than 2 inches (5 cm) per second, with the probe ¼ inch (6 mm) away.
- Overlap within the probe's width, about 2 inches (5 cm).
- At a minimum:
  - Frisk hands (front & back)
  - Frisk shoes (bottom, top, and sides)
- Check other body parts that touched something.
  - Check knees if you have been kneeling,
  - Seat of the pants if sitting on something,
  - Elbows if leaning on some equipment item.

Frisking to Check for Removable Radioactivity (Contamination)

- Listen/watch the count rate, don't stop if it goes into alarm, you need the actual reading.
- If more than 100 cpm above background on your person, you are possibly contaminated.
  - Its usually with dust or dirt, grease or water.
  - Call 3131, Radiation Safety and/or the Fire Department will respond.
  - Most of the time, soap and water or masking tape will remove contamination at the location where it is identified.

    STOP Do not do yourself, wait for a response to your call!
  - We have an onsite decontamination facility used if needed.
    - This is rarely needed.
- Sometimes it is radon, will decay away by itself.
  - Radiation Safety staff will check for this and advise.

PPE Demonstration

- Mostly used for controlled access.
- Sometimes used in work supervised by RCTs.
- Check for rips, tears, and holes.
- There is no specified order for donning.
- Some labcoats have pockets, others do not.
- Wear dosimetry on the outside of PPE.
- Upon exit, frisk the PPE.
- As before, go slowly, “overlapping” within the width of the probe.
- If the one PPE item reads greater than 50 cpm above background, all PPE items are considered contaminated. STOP
  - Doff the PPE and dispose of all of it into Radioactive Waste containers.
  - Frisk whole body in street clothes after PPE is removed.

PPE Order of Removal ("Doffing")

1. The hood
2. The labcoat or coveralls
   - Pull off backwards and roll up inside out.
   - The purpose of this is to wrap up any removable contamination.
3. The shoecovers - Roll up inside out.
4. The gloves (last) - Roll up inside out.
5. If contamination is found, do a whole body frisk of your street clothes.
   - Be thorough, should take 3-5 minutes.
   - If you find more than 100 cpm over background

     - Call Radiation Safety.

Checking Materials for Radioactivity

Two instruments used

First: Use the FRISKER to <u>identify</u> items as radioactive

Second: Use the WALLFLOWER to <u>classify</u> items (Class 2, or higher).

Frisker

Wallflower

Checking Materials for Radioactivity

Two instruments used

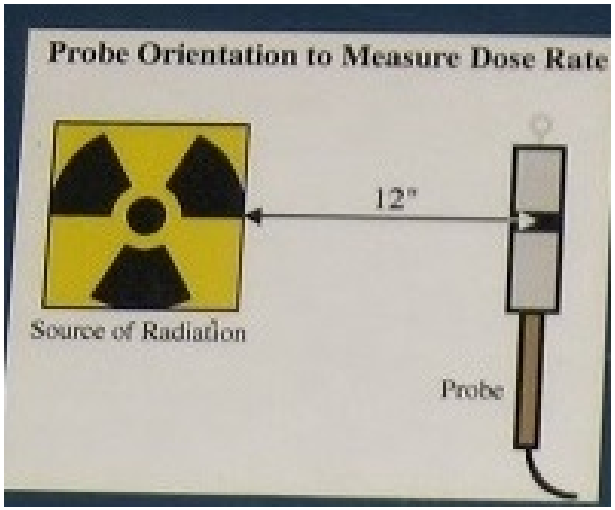
First: Use the **Frisker** to <u>identify</u> items as radioactive

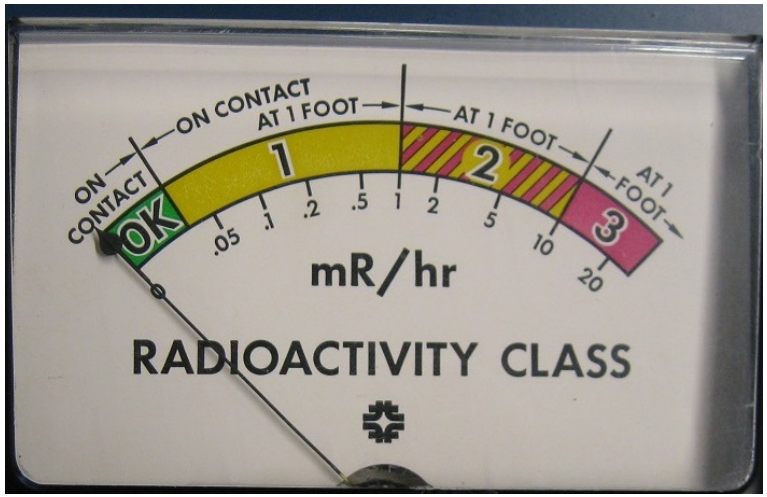
- Check all surfaces and edges with the probe at ¼ in (6 mm) away.
- If found to be radioactive on the frisker (greater than 50 cpm above background), then it is radioactive and at least Class 1.
- If not greater 50 cpm above background the item is not radioactive.

Checking Materials for Radioactivity

Second: Use the **Wallflower** to classify items (Class 2, or higher).

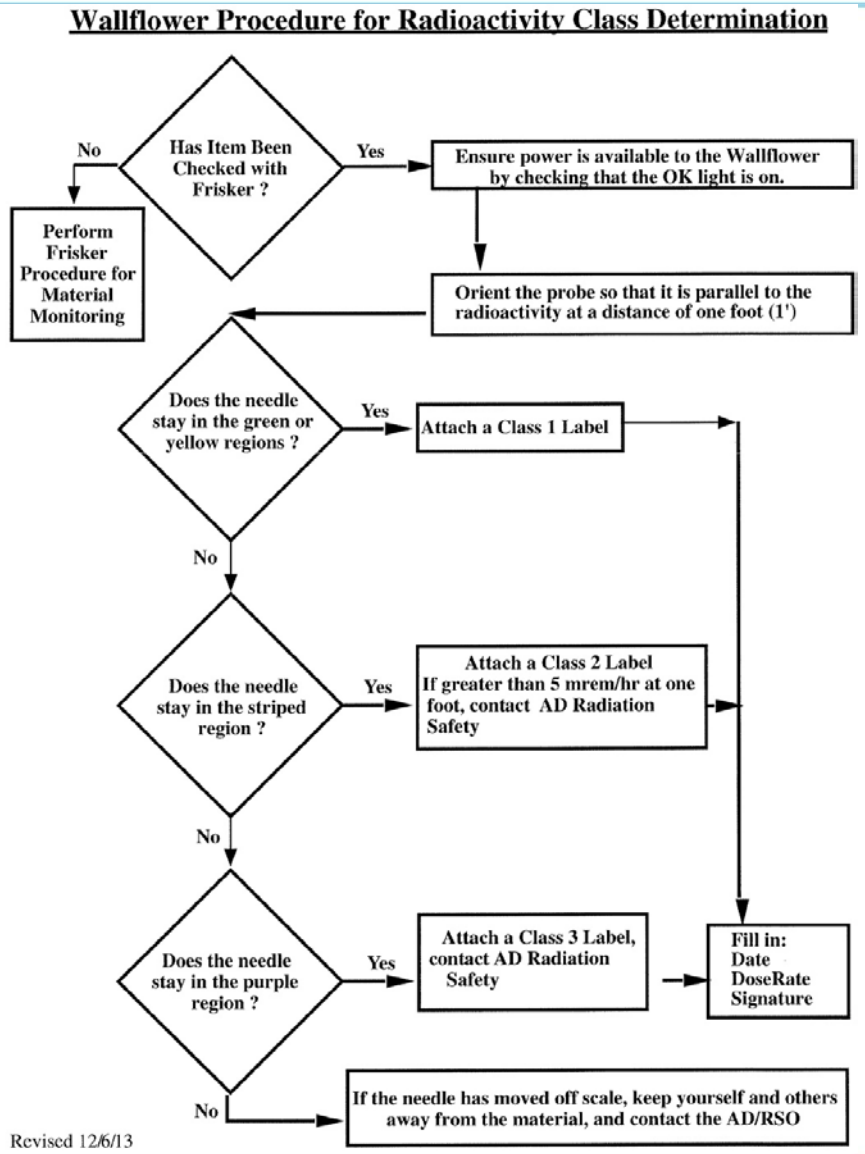
- Used for items found to be radioactive by the frisker.
- Take readings 1 ft (30 cm) away.
- Use the probe sideways (at 90 degrees), centered over hot spot,
- Mark dose rate **legibly** on label with your name or initials, or FNAL ID.
- Alarms can be annoying, if you turn the alarm off, please turn it back on when you are done.
- Above Class 2? STOP call Radiation Safety.





Wallflower Flowchart

These are posted at some locations Near wallflowers.



Radioactive Waste Management

- We want to minimize radioactive waste.
- We do not want to create mixed or “unknown” wastes.
  - Why? We must identify and characterize
  - Disposal of some such wastes are impossible or difficult and always costly.
- You are responsible for the waste you generate.
- Contact Hazard Control Technology Team (HCTT) with questions
- Certain items cannot be placed in drums
  - Liquids or rags
  - Pumps, including check valves
  - Valves
  - Writing pens
  - Lead of any kind, including solder in electronic components
  - Vacuum seals
  - Batteries
- Do not dispose of non-radioactive trash as radioactive waste!

Radioactive Waste Management

- There are a variety of container types for:
  - Compactible materials
  - Dry solids
  - Mixed waste
  - Liquids
- Questions?

Call Radiation Safety or the Hazard Control Technology Team
- There are Radioactive Waste Certification and Pickup Request (RWCPR) Forms to be filled out!
  - As completely as possible.
  - Legibly!!
  - Include your employee ID number.
  - Do it now when you are filling the container as you will <u>not</u> remember what you tossed in later!

Key to RWCPR Form

Item	Description
Page 1 of	Enter total number of pages
Fermilab ID#	Generator's Fermilab ID number.
Name	Generator's printed name.
Signature	Generator's signature certifying that the waste is accurate and is not mixed with a hazardous waste as defined by 40 CFR Subpart C 261.20 Characteristics of Hazardous Waste and Subpart D Lists of Hazardous Waste 261.30 through and including 261.33.
Location of Waste	Location where waste is to be picked up from.
Div/Sec.	Generator's Division or Section.
Ext.	Generator's onsite telephone extension.
Pager	Generator's onsite or long distance pager number.
Date	Date form was completed.
Generator #	Package must be assigned a generator number and written on the container or package. Format for generator number is year, month, day, Generators initials and item number. i.e., 160314DH01
Package Type	Description of package i.e., 55-Galllon Drum, 30-Galllon Drum, Steel Box, Poly Rad Bag, Unpackaged Bulk, Skid or Pallet, 5-Galllon Carboy, etc.
Empty Package Delivery	To request an empty container delivery enter the quantity and type of containers needed.
Gross Weight	Estimated gross weight of the waste and container.
Waste Volume	Volume of waste in cubic feet i.e., 55-Galllon Drum = 7.4 cu.ft. Red Steel Box = 64 cu.ft. 30-Galllon Drum = 4 cu.ft. for other types of containers an estimate is acceptable.
Contact Dose Rate	Highest contact dose rate of the container in mR/hr. The dose rate must also be entered onto the Radioactive Waste Label.
Radionuclides	List all radionuclides that contribute to more than 1% of the total activity. i.e., H-3, Be-7, Na-22, etc.
Activities	The activity of the respective radionuclides. List in Curies, mCi, uCi, etc.
Sample Method	Check all methods that apply and include copies of all analytical results with request form.
Sample Numbers	Enter the sample numbers for samples that were submitted for analysis i.e., radioactive and/or chemical waste characterization.

Key to RWCPR Form

Div/Sec Coordinator Review	Signature of Radioactive Waste Coordinator and date request form was reviewed.
Routine?	**ASSIGNED BY HCT TEAM**
Pickup #	**ASSIGNED BY HCT TEAM**
Pickup Date	**ASSIGNED BY HCT TEAM**
By	**ASSIGNED BY HCT TEAM**
Stor. Loc.	**ASSIGNED BY HCT TEAM**
Date	Date waste was loaded into the package or for unpackaged bulk items date the item was declared waste.
Description of Waste	A complete description of the waste including proper names when applicable and the materials of construction (e.g., Kautzky valve (49% stainless steel, 49% aluminum and 2% polypropylene), bellows (stainless steel), HE-150 vacuum pump oil, PVC insulated copper cable, etc.). Use as many lines as necessary to describe an item. A "Continuation Sheet" is required when there are more than 8 waste items to be loaded into a package.
Approximate Weight	Approximate weight in pounds of the item or material.
Signature of Waste Generator	Signature of the person that generated and described the item.
Disposition of Waste	**ASSIGNED BY HCT TEAM**

A "Radioactive Waste Certification and Pickup Request Form" (RW Form #31) is required for each package. A "Continuation Sheet" is required when there are more than 8 waste items to be loaded into the package. Log each waste item onto the continuation sheet at the time it is loaded into the package. Use as many continuation sheets as needed to thoroughly describe all waste items loaded into the package.

Examples of Completed RWCPR Forms

Fermilab

Radioactive Waste Certification and Pickup Request Form

Page 1 of 1

I certify that, to the best of my knowledge, the information entered below is accurate and the contents of the waste package has been checked for radioactivity and is not mixed waste (radioactive and hazardous).

Fermilab ID # 15641 Name DAN VRBOS Signature DORVbs

Location AP-0 Div/Sec AD/MS Ext. 2994 Pager _____ Date 8/24/15

Generator # 150824DV01 Package Type PALLET

Gross Weight 250 lbs. Waste Volume 3 cu.ft. Contact Dose Rate .02 mR/hr

Empty Package Delivery
Qty. ____ Type _____

* Radionuclides	CO60	Na22	Mn54	Zn65		
* Activities	2.97-6	2.94-6	1.97-4	9.91-7		

Sample Method ☐ Gamma Ray Spectroscopy ☐ Scintillation Counter (H-3) ☑ Dose Rate to Activity Conversion

Sample Numbers

(Attach copies of all analytical results pertaining to the waste.)

Div / Sec Coordinator Review
Sign TGB
Date 8/24/15

Routine ? ☒ YES ☐ NO

EP Pickup # 150310 Pickup Date 8-26-15 By [illegible] Stor. Loc. Site 40

Date	Description of Waste	Approximate Weight	Generator Signature (Signature certifies that description is accurate, waste is not hazardous, and has been checked for radioactivity)	Disposition of Items
8/24/15	PALLET OF MAGNET STANDS	200 lbs.	DORVbs	
	99% Steel 1% BRASS	lbs.		
		lbs.		
		lbs.		
		lbs.		
		lbs.		
		lbs.		
		lbs.		

RW Form #31 *(See Reverse For Instructions)* Revision Date 04/15/2015

Each waste item must be logged onto this form as it is loaded into the package. A "Continuation Sheet" is required when there are more than 8 waste items to be loaded into the package.

Date entered: 8-26-15 By: DC

Fermilab

Examples of Completed RWCPR Forms – Multiple Pages!

Fermilab

Radioactive Waste Certification and Pickup Request Form

Page 1 of 2

I certify that, to the best of my knowledge, the information entered below is accurate and the contents of the waste package has been checked for radioactivity and is not mixed waste (radioactive and hazardous).

Fermilab ID # 12886 Name John E. Anderson III Signature

Location AP0 Div/Sec MS/AD Ext. 2675 Pager Date 4-14-16

Generator # 4635 Package Type Drum

Gross Weight 359.0 lbs. Waste Volume 7.4 cu.ft. Contact Dose Rate 1.8 mR/hr

Empty Package Delivery: Qty. ____ Type ____

* Radionuclides	Co 60	Na 22	Mn 54	Zn 65		
* Activities	8.21-3	6.62-4	4.95-3	5.76-4		

Sample Method ☐ Gamma Ray Spectroscopy ☐ Scintillation Counter (H-3) ☑ Dose Rate to Activity Conversion

Sample Numbers

(Attach copies of all analytical results pertaining to the waste.)

Routine ? ☑ YES ☐ NO

Div / Sec Coordinator Review: Sign ____ Date 4/25/16

EP Pickup # 160326 Pickup Date 4-27-16 By ____ Stor. Loc. Site 40

Date	Description of Waste	Approximate Weight	Generator Signature (Signature certifies that description is accurate, waste is not hazardous, and has been checked for radioactivity)	Disposition of Items
4-14-16	Nuts, Bolts, Washers, Unistrut Nuts, Threaded Rod, Silver	200 lbs.		
	Plated Bolts, Gold Plated Bolts-Nuts, Graphite Impregnated	lbs.		
	Bolts-Nuts. >99% Steel, <1%Gold, <1%Silver, <1% Graphite	lbs.		
		lbs.		
4-19-16	Steel Banding, Steel Brackets, Eye Bolts, C-Clamps, Flange	80 lbs.		
	Plate, Stand Adjustment Plate, Pipe cut-off, Screws, Unistrut	lbs.		
	cut-off, Sheet metal cut-offs, Rectangle Steel Brackets.	lbs.		
	100% Steel	lbs.		

RW Form #31 *(See Reverse For Instructions)* Revision Date 03/15/2016

Each waste item must be logged onto this form as it is loaded into the package. A "Continuation Sheet" is required when there are more than 8 waste items to be loaded into the package.

Date entered:_____ By:_____

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RWCPR Forms – Page 2 is a "Continuation Sheet"

Fermilab

Radioactive Waste Certification and Pickup Request Form Continuation Sheet

Page 2 of 2

Package #	Package Type	Pickup #
	Drum	

Date	Description of Waste	Approximate Weight	Generator Signature (Signature certifies that description is accurate, waste is not hazardous, and has been checked for radioactivity)	Disposition of Items
4-19-16	Metal Shavings, Plastic Bag. 99% Steel, 1% Plastic	1.0 lbs.		
		lbs.		
4-19-16	Copper Seals, Silver Plated Copper Seal, O-rings, Aluminum	5.0 lbs.		
	Seals. 97% Copper, 2% Aluminum, 1% Viton, <1% Silver	lbs.		
		lbs.		
4-19-16	Quick Disconnects, Hose Barbs, Brass Bolts-Nut, Feed Through	2.0 lbs.		
	85% Brass, 10% Steel, 4% Ceramic, 1% Buna Rubber	lbs.		
		lbs.		
4-19-16	Motor actuator. 40% Copper, 40% Steel, 15% Aluminum	10.0 lbs.		
	5% Plastic	lbs.		
		lbs.		
4-19-16	Stainless Steel Brazing Rod, Stay-Sill 5-15	1.0 lbs.		
	80% Copper, 13% Silver, 3% Steel, 4% Phosphorus	lbs.		
		lbs.		
4-19-16	Ion Gauge Cover, Power Supply Strip-lines, Mica Sheets,	60.0 lbs.		
	Silver Plated Copper Power Plates, Strip-line Brackets,	lbs.		
	Strip-line Bolting Plate, Nut locks, Copper Nuts, Copper Shims	lbs.		
	90% Copper, 5% Steel, 4% Mica, 1% Silver	lbs.		
		lbs.		
		lbs.		

RW Form #31 Continuation Sheet - A "Continuation Sheet" is required when there are more than 8 waste items to be loaded into a package. Log each waste item onto the continuation sheet at the time it is loaded into the package. Use as many continuation sheets as needed to thoroughly describe all waste items loaded into the package.

Revision Date 04/15/2015

Hands-On Activities

- Break into 3 groups of roughly equal size, one for each station:
  - Dosimeter Station
  - Frisker Station
  - Wallflower Station
- After completing task at each station, rotate to the next task as a group until done.
- Instructor watches frisking to assure proper technique, slowness of the survey, etc.
- Review Radioactive Material (RAM) labels each group competed and answer questions.

Points of Contacts and Phone Numbers

Assigned Radiation Safety Officers (Go to others on list, if unavailable)		
ORGANIZATION	**RSO**	**Extension**
In Any Emergency		X3131
Accelerator Division	Gary Lauten	X8360
Accelerator Division	Wayne Schmitt	X4407
Particle Physics Division	Maddie Wolter	X4807
Neutrino Division	Maddie Wolter	X4807
Technical Division	Kathy Graden	X4939
FESS	Susan McGimpsey	X8386
Core Computing Division	Susan McGimpsey	X8386
Scientific Computing Div.	Susan McGimpsey	X8386
Rest of Laboratory	Don Cossairt	X3465

Points of Contacts and Phone Numbers

Hazard Control Technology Team Points of Contact	
	Extension
In any Emergency	X3131
Dave Hockin	X4498
Jon Ylinen	X4081
Steve Carrigan	X8879
Jose DeLao	X2557
Greg Thompson	X8376
Sylvia Wilson	X4489

Wrap Up

- Review correct labeling of radioactive materials.
  - Emphasize that if higher than Class 2, contact Radiation Safety
  - If between 5 – 10 mR/hr at one 1 ft (30 cm) STOP Call Radiation Safety.
- Reminder: People sometimes receive radioactive materials internally as part of medical procedures.
  - We ask people to voluntarily notify the Occupational Medical Department (preferred) or Radiation Safety.
  - RSO can evaluate dose to co-workers.
  - Patients are usually radioactive for 2-3 days.
  - Cannot wear dosimetry, as this is not occupational dose, or perform frisks.
  - Please take personal trash,such as tissues or chewing gum, home with you!

Wrap Up

- Reminder: Pregnant Fermilab employees may elect to declare their pregnancy
  - This notification is voluntarily.
    - If not done regular worker dose limits will apply.
  - Done by notifying the Occupational Medicine Office
  - Assigned RSO or ESH&Q Section Dosimetry Program Manager will be notified.
  - A dose limit of 500 mrem for the remainder of the gestation period will be applied to the embryo/fetus
  - Options will be explained at that time.

- Hand out cards with contacts and phone numbers.