BROOKHAVEN NATIONAL LABORATORY

CONTAMINATION, HIGH CONTAMINATION and AIRBORNE RADIOACTIVITY TRAINING STUDY GUIDE

BNL TRAINING & QUALIFICATIONS OFFICE

Rev. 05
September 22, 2015

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Introduction

This unit is designed to inform the worker of sources of radioactive contamination and methods to control its spread. This module provides personnel performing work within a Contamination Area, High Contamination Area or Airborne Radioactivity Area with the BNL site-wide core knowledge and skills needed to work safely while minimizing the spread of radioactive contamination. Additional department specific training may be necessary in order to meet access requirements for areas with unique contamination control concerns. Check with your Facility Support Representative before accessing these areas for the first time. In additional "Respiratory Protection" training, medical evaluation and respiratory fit testing are required prior to receiving authorization to wear respiratory protection equipment.

Review of Terms

A review of some commonly used radiological terms may help you better understand the concepts of radioactive contamination control.

IONIZING RADIATION

Ionizing radiation is energy, with sufficient strength to cause the formation of ions, when interacting directly or indirectly with atoms.

RADIOACTIVE MATERIAL

Radioactive material is the physical substance that contains radioactive atoms. Radioactive material is measured in units representing the number of radioactive atoms that give off their radiation (decay) in one minute, referred to as “Disintegrations per Minute” or DPM. Radiation energy is emitted from radioactive material. Even when radioactive material is properly contained, it emits radiation that can penetrate the container and present an external radiation dose hazard.

DISPERSIBLE RADIOACTIVE MATERIAL

Radioactive material in a form that can easily be spread, such as liquid, powder, or gas, is called dispersible radioactive material. Dispersible radioactive material typically exists as sources used in performing scientific research. Care must be taken when handling dispersible radioactive material to ensure materials are not inadvertently spread to clean areas.

RADIOACTIVE CONTAMINATION

Radioactive contamination is dispersible radioactive material in places where it is not desired. When quantifying radioactive contamination, we express the amount of

removable radioactive material present on a surface area of 100 cm^2. The unit DPM/100cm^2 is the standard unit used to express removable surface contamination. This measurement reflects the amount of contamination that would be removed from a surface area of 100 cm^2 if you brushed up against it.

AIRBORNE RADIOACTIVITY

Airborne radioactivity is simply radioactive contamination suspended in air. When measuring airborne radioactivity we are concerned with the amount of radioactivity suspended within the air that might be inhaled. Airborne radioactivity is measured in units representing the amount of radioactivity (µCi) suspended in a specified volume of air (cc). The unit of µCi/cc is the standard unit used to express a quantity of airborne radioactivity.

Define a Contamination, High Contamination and Airborne Radioactivity Area

Radiological postings are used to alert personnel of various radiological hazards. For the purpose of radioactive contamination control we utilize three (3) different postings.

CONTAMINATION AREA

If removable radioactive contamination exceeds:

- 1,000 dpm/100 cm^2 **beta-gamma** contamination
  or
- 20 dpm/100 cm^2 **alpha** emitting contamination

HIGH CONTAMINATION AREA

If removable contamination exceeds 100 times the Contamination Area levels:

- 100,000 dpm/100 cm^2 beta-gamma contamination
  or
- 2,000 dpm/100 cm^2 alpha emitting contamination

AIRBORNE RADIOACTIVITY AREA

If airborne radioactivity concentration exceeds:

- Individual may be exposed to 12 DAC-Hours in a week
  or
- Individual may be exposed to 100% of a DAC at any time

Define the Terms Annual Limit on Intake (ALI) and Derived Air Concentration (DAC)

The effects from the potential uptake of radioactive material into the body are a primary concern regarding control of radioactive contamination. When evaluating an individual's total radiation dose, both external and internal exposure must be considered. This concept is called the Total Effective Dose (TED) and is the sum of the external dose registered on an individual's thermoluminescent dosimeter and the Committed Effective Dose from internally deposited radioactive materials.

ANNUAL LIMIT on INTAKE

In cases where a radioactive material accumulates in a specific organ (such as radioactive iodine in the thyroid), the organ dose is called a Committed Equivalent Dose and the associated limit is 50 rem. By applying a "Tissue Weighting Factor," the Committed Equivalent Dose can be used to evaluate the dose contribution to the Whole Body. Once applied, the Committed Equivalent Dose is considered the Committed Effective Dose to the Whole Body, with a limit of 5 rem. The Annual Limit on Intake (ALI) is the quantity (amount) of a particular radionuclide, which if taken into the body, would result in receiving either a Committed Equivalent Dose of 50 rem to a specific organ or a Committed Effective Dose of 5 rem to the Whole Body.

DERIVED AIR CONCENTRATION

The Derived Air Concentration (DAC) is the airborne radioactivity level that, if breathed by a worker continuously for a work year (40 hours per week over 50 weeks), would result in depositing an amount of radioactive material inside the body equal to the Annual Limit on Intake. The DAC is based on the ALI and is derived by dividing the ALI by the volume of air a person would breathe in an occupational year (40 hours per week for 50 weeks).

Breathing this concentration of radioactive material for 2,000 hours would result in a Committed Effective Dose of 5,000 mrem. If breathing this air for 2,000 hours results in 5,000 mrem, it can also be established that for each hour breathed, an individual could expect to receive a dose of 2.5 mrem., therefore, one DAC hour = 2.5 mrem.

Define Fixed, Removable, Soil, and Airborne Radioactive Contamination

FIXED CONTAMINATION

Fixed contamination is contamination that cannot be readily removed from surfaces by casual contact, wiping, brushing, or washing. Fixed radioactive contamination does not pose a threat of being spread unless distributed by buffing, grinding, or using volatile

cleaning liquids. Over time, fixed contamination may weep, leach, or otherwise become loose or transferable. Although it is not easily spread, at high enough levels it can pose a beta or gamma internal and external exposure.

Fixed contamination should be covered and sealed with two layers of fixative coatings having different colors. Additional coating should be applied when the bottom color appears.

REMOVABLE CONTAMINATION

Removable or “loose” contamination is contamination that can readily be removed from surfaces by casual contact, wiping, brushing, or washing. Air movement across removable/transferable contamination could cause airborne contamination. Loose contamination can be spread very easily. Once control is lost, an individual can "unknowingly" contaminate clean areas throughout the facility, personal vehicles, and private homes.

SOIL CONTAMINATION

Soil contamination is radioactive material mixed within media (e.g. soil) at levels exceeding natural background. Soil contamination may exist at Brookhaven National Laboratory in areas that have been designated for clean up or have underground radioactive material. Contamination in these areas may be well below the levels required for Contamination Area posting, but require marking to prevent events involving spreading contamination. In the event soil contamination exceeds the limits for Contamination Area, it will be posted as such and appropriate access-control measures will apply.

AIRBORNE RADIOACTIVITY

Airborne radioactivity is contamination, in any chemical or physical form that is dissolved, mixed, vaporized, or otherwise suspended in air.

Identify Methods Used to Control Radioactive Contamination

Control of radioactive contamination can be achieved by applying engineering and administrative controls using the Radiological Work Permit process and employing good radiological work practices.

Preventive Maintenance and Good Housekeeping

Preventive methods of controlling radioactive contamination include identifying and repairing leaks in radioactive fluid systems or components before they become a serious problem. A sound preventive maintenance program can prevent many radioactive material releases due to equipment failure. "Good Housekeeping" is the

prime factor in an effective contamination control program. If while working within a facility you encounter a leaking valve or equipment in need of repair, report it to your supervisor so that maintenance can be performed before the problem becomes a major contamination concern. Each individual must be dedicated to keeping their work area free of debris and unnecessary tools or equipment to help control the spread of contamination.

Pre-staging Work Areas

Another method to prevent the spread of contamination is to establish "staging areas" to prepare tools and equipment before using them with a Contamination Area. Cover piping and equipment adjacent to a work area to prevent dripping or dispersion of contamination onto clean(er) areas. Cover or tape tools or equipment used during the job to minimize the need for decontamination after the job (i.e. taping up a screwdriver before use).

HEPA Ventilation System

Buildings that are "engineered" for contamination control have ventilation systems designed to maintain airflow from areas of least contamination to areas of greatest contamination (e.g., clean from contaminated to highly contaminated areas). It is very important not to modify ventilation systems within areas that have a potential for contamination. Ventilation systems used in areas containing contamination are designed to maintain a slight negative pressure within the building or room so that any leakage is exhausted through a High Efficiency Particulate Air (HEPA) filter rather than directly to the environment.

Containment/Confinement

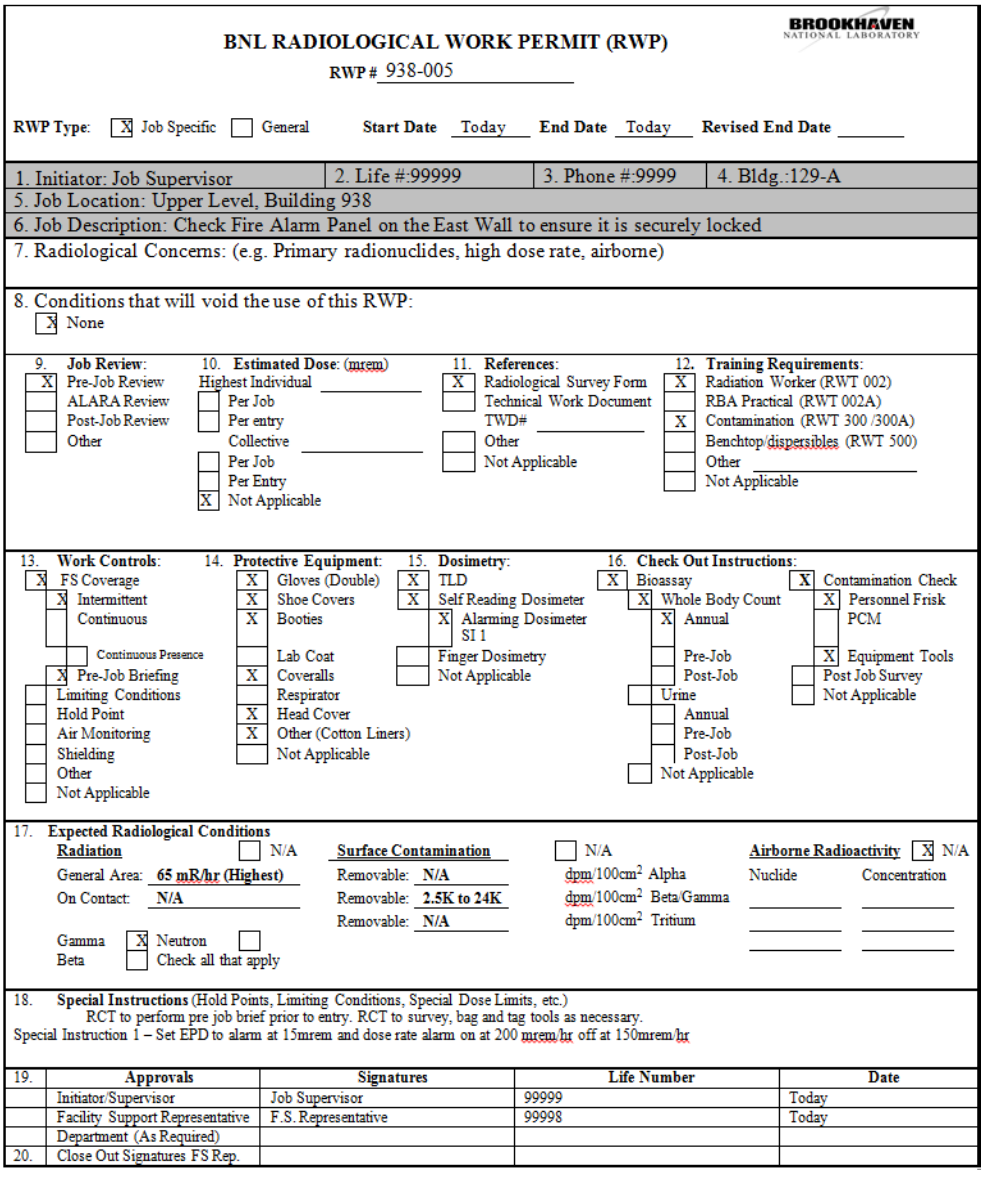
Total containment of radioactive contamination can be achieved by constructing an enclosure designed to contain all particulates, liquids, and gases that will be generated by the work activity. Using large vessels, cells, glove bags or glove boxes, and tents or huts can confine the contamination to small areas. Other useful containment and confinement techniques include using hoses, tubing or sheathing, drip pans, and catch basins to confine and collect contamination. These will also reduce the cost and time necessary for clean up and disposal of waste.

Decontamination

If removable contamination is discovered, the area may be decontaminated to reduce the potential hazard. In some situations, this is not always possible or desired. Economical and/or radiological conditions may need to be taken into account, since the cost of labor and the dose received by personnel may outweigh the hazards of the contamination present. Also, Radioactive Material Areas designated for storage can provide material accountability and control while preventing spread of contamination.

Radiological Work Permits

The Radiological Work Permit (RWP) process is an extension of the BNL Standards-Based Management System (SBMS) Work Planning and Control for Experiments and Operations process. During the initial review process, if it is determined that the work will involve entering a Contamination, High Contamination, or Airborne Radioactivity Area, then work planning must include a general or a job-specific) Radiological Work Permit. The RWP process promotes communication between Radiological Control personnel and the work group, and is used to ensure a detailed review of the work and related hazards. Supervising individuals familiar with the work activity complete the RWP. When complete, the RWP provides the work group with detailed information necessary to reduce or prevent contamination spread throughout the activity. It is very important to review all the information contained on a Radiological Work Permit prior to beginning work within a Contamination Area.



BNL RADIOLOGICAL WORK PERMIT (RWP)

BROOKHAVEN NATIONAL LABORATORY

RWP # 938-005

RWP Type: [X] Job Specific [ ] General **Start Date** Today **End Date** Today **Revised End Date** _____

1. Initiator: Job Supervisor	2. Life #:99999	3. Phone #:9999	4. Bldg.:129-A

5. Job Location: Upper Level, Building 938

6. Job Description: Check Fire Alarm Panel on the East Wall to ensure it is securely locked

7. Radiological Concerns: (e.g. Primary radionuclides, high dose rate, airborne)

8. Conditions that will void the use of this RWP:
[X] None

9. **Job Review:**
[X] Pre-Job Review
[ ] ALARA Review
[ ] Post-Job Review
[ ] Other

10. **Estimated Dose:** (mrem)
Highest Individual _____
[ ] Per Job
[ ] Per entry
Collective _____
[ ] Per Job
[ ] Per Entry
[X] Not Applicable

11. **References:**
[X] Radiological Survey Form
[ ] Technical Work Document
TWD# _____
[ ] Other
[ ] Not Applicable

12. **Training Requirements:**
[X] Radiation Worker (RWT 002)
[ ] RBA Practical (RWT 002A)
[X] Contamination (RWT 300 /300A)
[ ] Benchtop/dispersibles (RWT 500)
[ ] Other _____
[ ] Not Applicable

13. **Work Controls:**
[X] FS Coverage
[X] Intermittent
[ ] Continuous
[ ] Continuous Presence
[X] Pre-Job Briefing
[ ] Limiting Conditions
[ ] Hold Point
[ ] Air Monitoring
[ ] Shielding
[ ] Other
[ ] Not Applicable

14. **Protective Equipment:**
[X] Gloves (Double)
[X] Shoe Covers
[X] Booties
[ ] Lab Coat
[X] Coveralls
[ ] Respirator
[X] Head Cover
[X] Other (Cotton Liners)
[ ] Not Applicable

15. **Dosimetry:**
[X] TLD
[X] Self Reading Dosimeter
[X] Alarming Dosimeter SI 1
[ ] Finger Dosimetry
[ ] Not Applicable

16. **Check Out Instructions:**
[X] Bioassay
[X] Whole Body Count
[X] Annual
[ ] Pre-Job
[ ] Post-Job
[ ] Urine
[ ] Annual
[ ] Pre-Job
[ ] Post-Job
[ ] Not Applicable
[X] Contamination Check
[X] Personnel Frisk
[ ] PCM
[X] Equipment Tools
[ ] Post Job Survey
[ ] Not Applicable

17. **Expected Radiological Conditions**

Radiation [ ] N/A
General Area: 65 mR/hr (Highest)
On Contact: N/A
Gamma [X] Neutron [ ]
Beta [ ] Check all that apply

Surface Contamination [ ] N/A
Removable: N/A dpm/100cm² Alpha
Removable: 2.5K to 24K dpm/100cm² Beta/Gamma
Removable: N/A dpm/100cm² Tritium

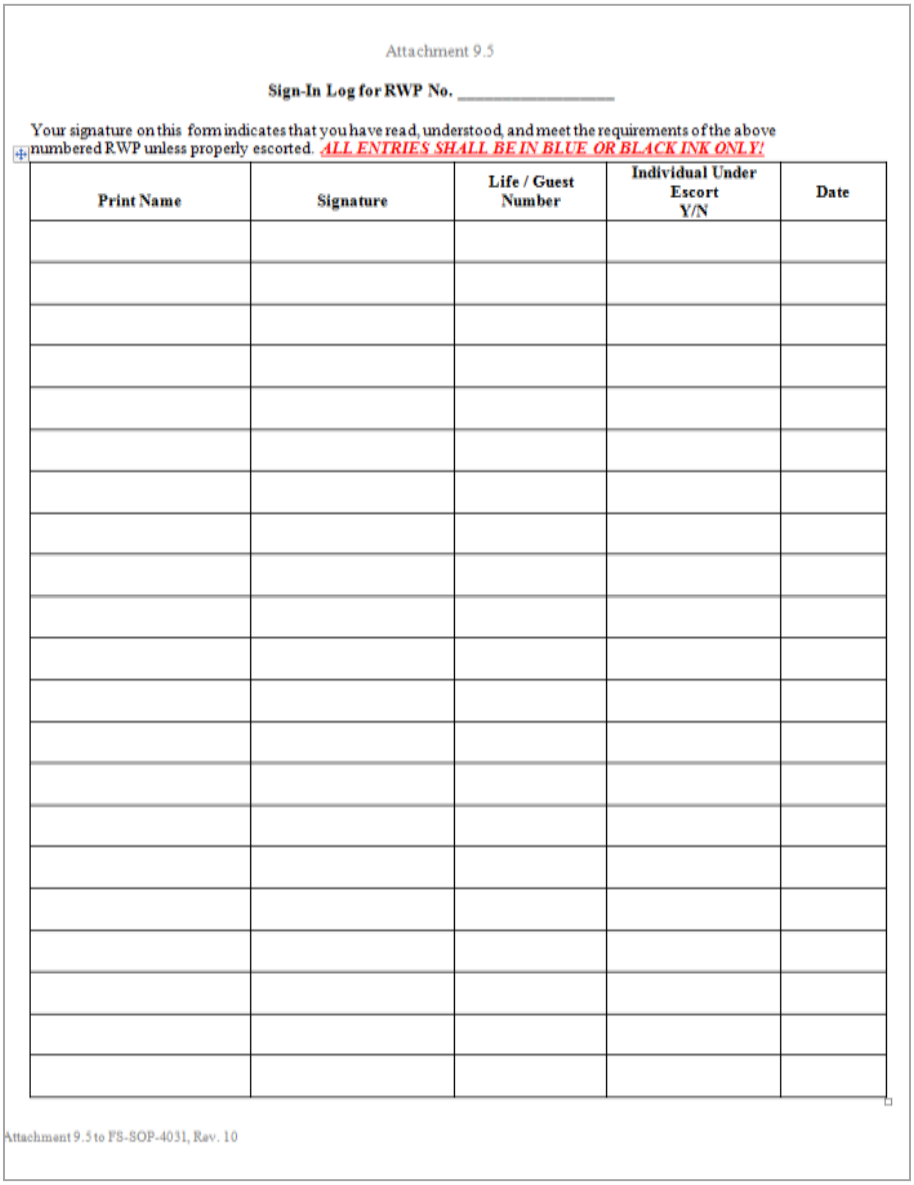
Airborne Radioactivity [X] N/A

Nuclide	Concentration

18. **Special Instructions** (Hold Points, Limiting Conditions, Special Dose Limits, etc.)
RCT to perform pre job brief prior to entry. RCT to survey, bag and tag tools as necessary.
Special Instruction 1 – Set EPD to alarm at 15mrem and dose rate alarm on at 200 mrem/hr off at 150mrem/hr

19.	Approvals	Signatures	Life Number	Date
	Initiator/Supervisor	Job Supervisor	99999	Today
	Facility Support Representative	F.S. Representative	99998	Today
	Department (As Required)			
20.	Close Out Signatures FS Rep.			

Each individual must sign the RWP log, documenting that they have reviewed the RWP prior to entering any area. If the general Radiological Work Permit does not require dose tracking using supplemental dosimetry (digital dosimeter), individuals acknowledge that they have read, understand, and will comply with the RWP. Each individual must enter their name and life number and sign and date the corresponding RWP Sign-In Log Sheet. Once signed, the individual need not re-sign for the duration of the general RWP. (Individuals may require access using a job-specific RWP, which does not require dose tracking, but does require a daily sign in.) Sign-In Logs are valid throughout the duration of the activity, not to exceed one year. If a general RWP is modified or expired, the new or revised RWP will have a new Sign-In Log Sheet posted. Individuals shall check that their signature is present on the RWP Sign-In Log Sheet before entering the work area to ensure the RWP has not changed since their last entry.



Attachment 9.5

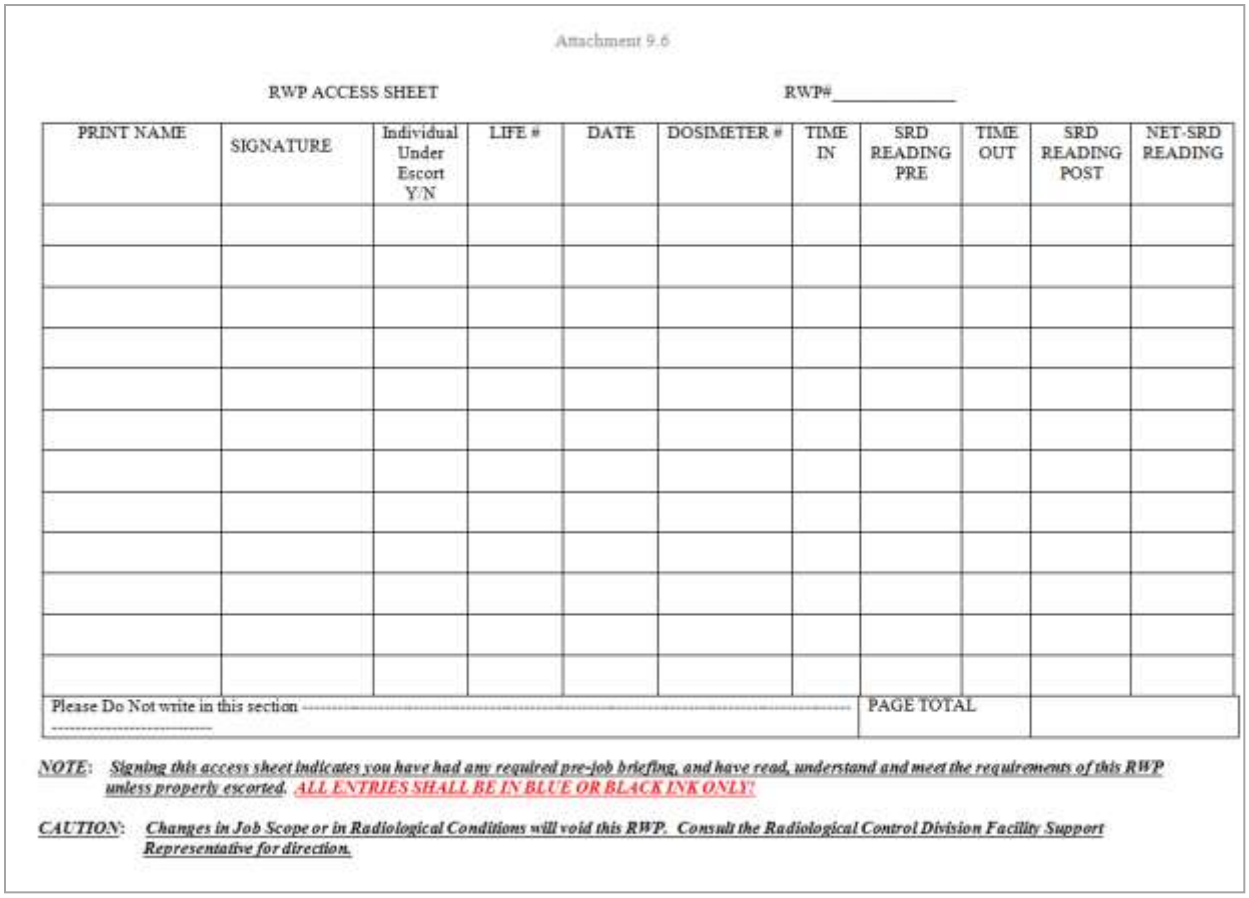
Sign-In Log for RWP No. _____

Your signature on this form indicates that you have read, understood, and meet the requirements of the above numbered RWP unless properly escorted. ***ALL ENTRIES SHALL BE IN BLUE OR BLACK INK ONLY!***

Print Name	Signature	Life / Guest Number	Individual Under Escort Y/N	Date

Attachment 9.5 to FS-SOP-4031, Rev. 10

If the general Radiological Work Permit requires dose tracking using supplemental dosimetry (digital dosimeter), individuals acknowledge on the corresponding RWP Access Control Log that they have read, understand, and will comply with the RWP. Each individual must enter their name and life number and sign and date the form, and upon entry, write the time and indicated dose on their dosimetry. After completing the activity, or when leaving the area, the individual enters the time and indicated dose upon exiting the area. At a minimum, an individual must sign in and out at least once each day they enter the area. To avoid "duplicate dose tracking," care must be exercised to ensure that individuals are "signed in" on only one RWP at any given time. Many Departments require that individuals sign-in and out for each entry and exit to prevent this from happening. Consult your FS Representative if you have any questions regarding the requirements for using the RWP Access Control Log.



Attachment 9.6

RWP ACCESS SHEET RWP#_____

PRINT NAME	SIGNATURE	Individual Under Escort Y/N	LIFE #	DATE	DOSIMETER #	TIME IN	SRD READING PRE	TIME OUT	SRD READING POST	NET-SRD READING
Please Do Not write in this section ----------							PAGE TOTAL			

NOTE: *Signing this access sheet indicates you have had any required pre-job briefing, and have read, understand and meet the requirements of this RWP unless properly escorted. ALL ENTRIES SHALL BE IN BLUE OR BLACK INK ONLY!*

CAUTION: *Changes in Job Scope or in Radiological Conditions will void this RWP. Consult the Radiological Control Division Facility Support Representative for direction.*

Protective Clothing (PCs)

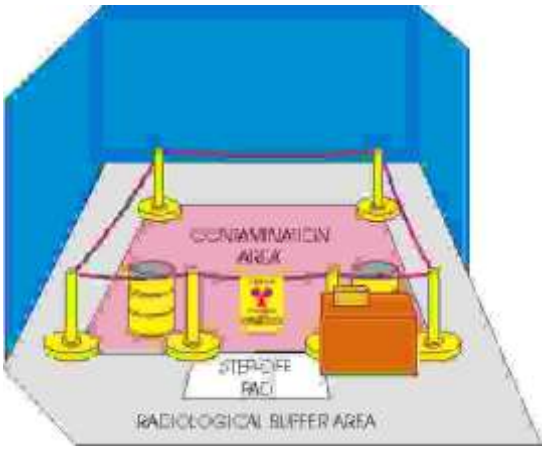
If administrative and engineering controls cannot provide adequate control for radioactive contamination, then protective clothing (PCs) should be used. Required protective clothing is prescribed on the Radiological Work Permit and is selected based on the contamination level in the work area and the anticipated work activity.

Step-Off Pads

Step-off pads are used as a transition point from a "Contamination Area" to a non-contaminated area. Contamination monitoring equipment is located at the step-off-pad. Personnel contamination monitoring must be performed while transiting from the Contamination Area to the non-contaminated area to verify no contamination is present on skin, clothing, or equipment before leaving the posted Contamination Area. There are several possible configurations for using step-off pads.

Single Step–Off Pad – Radiological Buffer Area (RBA)

A Radiological Buffer Area (RBA) is established around a Contamination Area in order to minimize the potential spread of radioactive contamination into Controlled Area. RBAs are checked routinely for contamination. Any indication of contamination within the RBA warns that the Contamination Area is inadvertently migrating beyond the posted Contamination Area boundaries.

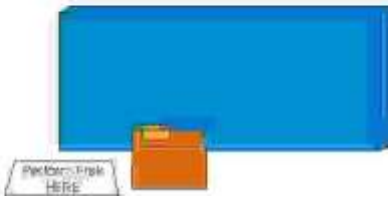


Single step-off pads are located outside of the Contamination Area, but within RBA boundaries. The pads are considered free of radioactive contamination. Labeled containers are located inside of the Contamination Area boundary for the collection of protective clothing, used respiratory protection equipment, and debris. Separate containers will be available for "Waste" and "Used PC's." It is important to segregate waste from re-usable items in order to minimize the generation of radioactive wastes.

Single Step–Off Pad – NO Radiological Buffer Area

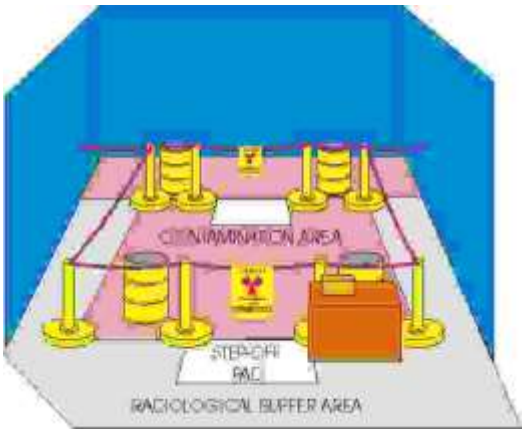
When the potential for radioactive contamination migration is unlikely (such as a Contamination Area within a sealed room) the Step-off-Pad itself can adequately serve as the Radiological Buffer Area.

Remote Step-Off-Pad



When background radiation is too high, personnel contamination monitoring equipment cannot be used to release items from a Contamination Area. Should background levels prohibit setting up a monitoring station, the Step-Off Pad (SOP) must be positioned remotely at a point where background levels are low enough to perform personnel monitoring. When using remote step-off pads, care must be exercised to minimize the chance of spreading contamination from the point of exit to the remote area. A whole body contamination check must be performed immediately after arriving at the remote step-off pad to check for the spread of contamination during transit.

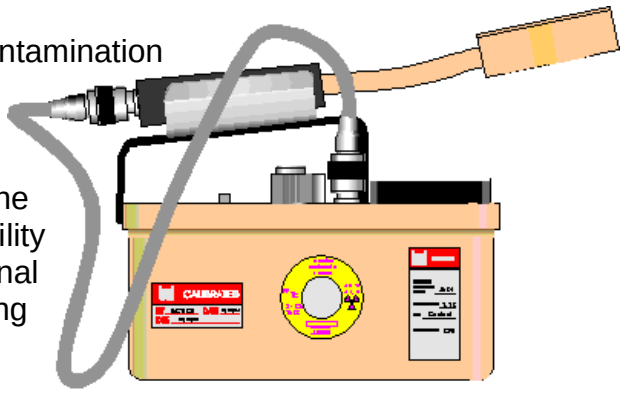
Multiple Step-Off-Pads



Multiple SOPs allow personnel dressed in multiple layers of protective clothing to remove the outer, highly contaminated, clothing while minimizing the chance of spreading contamination to clean areas. The innermost SOP (contaminated) is used to remove the outermost PCs. Highly contaminated materials should be bagged separately. The outermost SOP (clean) is used to remove the innermost protective clothing. Personnel monitoring equipment will be located outside of the outermost SOP.

Perform Pre-operational Checks of a Contamination Monitoring Instrument

The primary instrument for personnel contamination monitoring at step-off-pads is the Ludlum Model 3 with pancake style probe. This meter and probe combination is used for beta/gamma contamination monitoring. In the event alpha contamination is present, Facility Support Technicians will provide additional guidance and assistance in performing personnel contamination monitoring.



SIDEVIEW

Meter Interpretation

The Ludlum Model 3 has a range from 0 – 500K counts per minute. The detector probe is only 10% efficient, so each "COUNT PER MINUTE" (CPM) that it detects represents 10 "DISINTEGRATIONS PER MINUTE" (DPM). Since BNL's limit for contamination is 1,000 an indication of 100 CPM above background on the Ludlum Model 3 represents the contamination limit of 1,000 DPM.

The meter face on the Ludlum Model 3 ranges from 0 to 5K COUNTS/MINUTE. Using this range, it would be extremely difficult to distinguish count rates as low as 100 CPM. Each small black line represents 100 CPM. Using the detector's multiplier switch, the Ludlum Model 3 meter indication can be selected by a factor of X0.1, X1, X10, X100. When interpreting the meter indication, one must first obtain the indicated value and then apply the multiplier switch setting to obtain the actual indication.

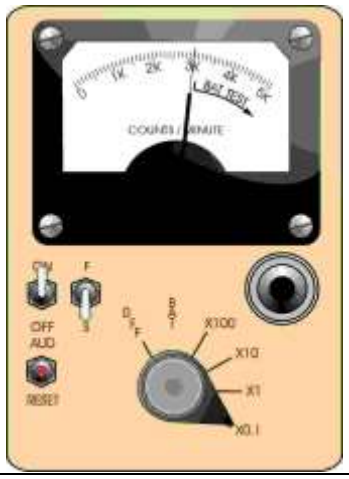
For example, with the Ludlum Model 3 meter indicating 3K and the instrument selector switch positioned on the X0.1 multiplier, the actual indication would be:

(3K CPM) X (0.1) = 300 CPM

Practice interpreting the Ludlum Model 3 meter (answers below)

A

B



C

D

E

F

(Answers: A – 1500 CPM; B – 300 CPM; C – 50 CPM; D – 3500 CPM; E – 170 CPM; F – 3000 CPM)

Pre-Operational Checks

Pre-operational checks must be performed prior to entering a Contamination Area to ensure the instrument is available for use upon exiting the area. Pre-operational checks include a visual inspection, calibration check, battery check and a source response check. The source response check is only necessary to perform once each day prior to its first use.

Visual Inspection

A visual inspection should be performed prior to entry into a Contamination Area in order to ensure the frisker is available and functional for your exit monitoring. Inspect the meter face for any damage, such as a cracked or missing window. Check the cable that attaches the probe to instrument to ensure that it is in good order. One way to determine if the cable inside the insulation is broken is to turn on the meter, put the selector switch on the 0.1 scale and jiggle the cable. If the cable is broken, the needle will swing back and forth erratically. Often, the cable will break at the end of the hard rubber pieces behind the probe and on the meter. Change the cable when needed.

Check the probe face for integrity of the mica window to ensure it is not punctured or otherwise damaged. Make sure all knobs and switches are functioning properly. Check the instrument case for any dents or breaks. If for any reason the instrument does not appear to be in good physical condition, label the instrument in a matter that clearly indicates it should not be used, such as “OUT of ORDER or “DO NOT USE.” Notify the Facility Support Technician that your frisker requires repair.

Calibration Check

On the side of each frisker is a small BNL Calibration sticker. Check that the posted “Calibration Due Date” has not expired. The calibration sticker must not only be present, but must also be current and legible. A damaged calibration sticker or one that cannot be clearly interpreted voids the calibration of the instrument. If the instrument is beyond its calibration due date or the calibration sticker is missing or illegible label the instrument and select another instrument. Notify the Facility Support Technician that the frisker requires calibration.

Battery Check

To perform a battery check, turn selector switch to the "BAT" position and watch the needle response on the meter face. If the needle falls "short" of the "BAT TEST" area on the meter face, label the inoperable instrument and select another instrument.

Contact an FS Technician to replace the batteries or provide a new frisker. It is a good practice to perform this check before each entry to ensure the instrument will work properly upon exit.

Perform a Source Response Check

Personnel contamination monitoring instruments must be source response checked at least once each day, prior to their first use. Most instruments that are used for personnel contamination monitoring are calibrated for use only on the most sensitive range (X0.1). These instruments will have a sticker indicating that the instrument was calibrated only for a specific range of detection. DO NOT USE a contamination monitoring instrument beyond the specific range that it was calibrated for.

Prior to using a contamination monitoring instrument check either the "Daily Source Response Check" tag attached to the instrument or the response check log sheet to verify a check has been performed. If indication is present indicating that a source response check has been performed previously that day, there is no need to perform this check. If the tag attached to the instrument or the response check log sheet, does not indicate that a daily response check has been performed, then the instrument MUST BE RESPONSE CHECKED prior to use. It is important to ensure that the response check has been successfully completed prior to entering a Contamination Area.

To perform this check, turn the instrument selector switch to the lowest scale (X0.1). Allow the instrument to stabilize for approximately 15 seconds and observe the needle indication on the meter. Note the expected check source response posted on the side of the instrument next to the small button source. Place the probe face directly over the button source on the side of the instrument. Allow the instrument to respond for approximately 15 to 20 seconds. If the needle falls within +\- 20% of the expected check source response, the instrument source check is satisfactory. Document completion of the daily source response check by placing your initials in the block representing the current day of the month. If the instrument is not responding properly, label the inoperable instrument and select another instrument and contact an FS Technician. DO NOT USE an instrument that does not respond as expected.

Describe the Minimum Requirements to Enter, Work in, and Exit a Contamination, High Contamination or Airborne Radioactivity Area

Entry Into a Contamination Area

Before entering a Contamination Area, each person who will be working in that area shall:

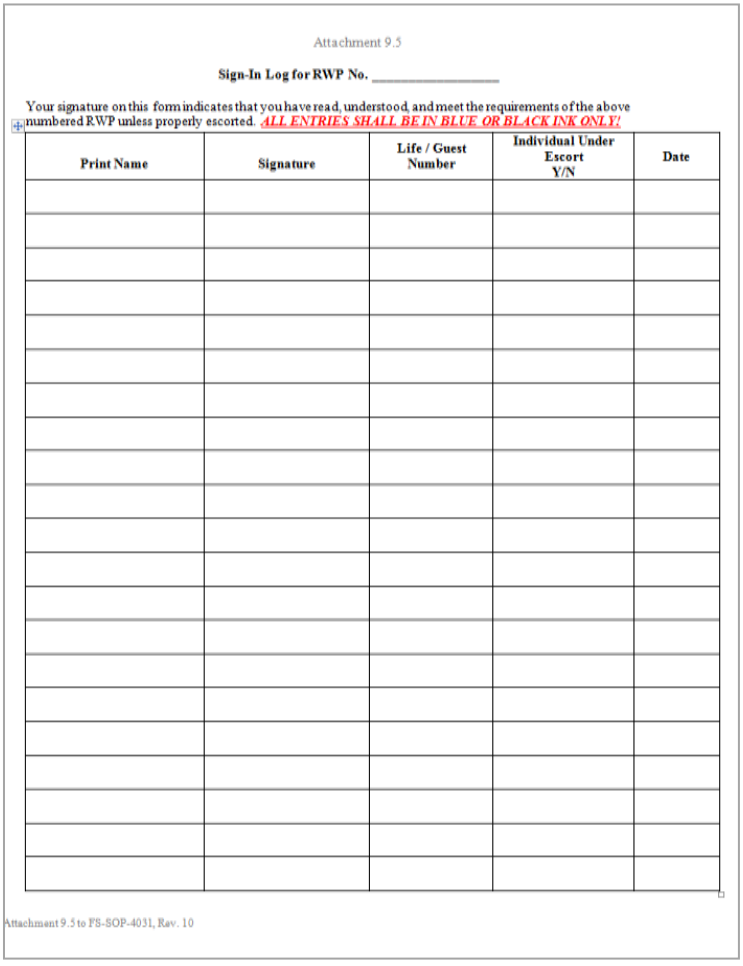
1. Know what your job is before entering the area. To ensure this, you must:
    a. Review the job package
    b. Ensure that you are qualified to perform the job
2. Sign-in on the RWP Sign-In Sheet
3. Ensure your monitoring equipment is functional.
    a. Verify Source Response Check is complete and documented
    b. Perform physical inspection, battery check
    c. Verify calibration has not expired
    d. Verify operability of monitoring equipment
        i. Observe indicated background and verify it is less than 200 CPM
        ii. Verify instrument is on X0.1 scale
        iii. Response set to "SLOW"
        iv. Verify audible is "ON"
        v. Verify good physical condition
4. Ensure that the personal monitoring instrument is set up at the area's exit and turned on.

Radiological Work Permits NOT REQUIRING DOSE TRACKING

Radiological Work Permits that do not require radiation dose tracking (do not require supplemental dosimetry) utilize a simple RWP Sign-In Log. After reviewing all of the requirements of the Radiological Work Permit and ensuring all of the requirements are understood and have been met, each individual signs into the Log with their name, life number, and date of entry.

Signing the Log allows an individual access to the specified work area throughout the duration of the General Radiological Work Permit. Each individual need only sign the log once. Job Specific Radiological Work Permits require a daily sign in.

Each day you enter the area affected by the Radiological Work Permit, you should check the sign-in log to confirm that your signature is still on record. This will ensure you will not inadvertently enter the area after a change has been made to the RWP. If the RWP has changed since your last entry, your name will not be on the new sign-in log. You will have to read the RWP thoroughly to learn the changes. If your name is listed, this is clear indication that conditions have not changed and you are still authorized to enter.



Attachment 9.5

Sign-In Log for RWP No. _____

Your signature on this form indicates that you have read, understood, and meet the requirements of the above numbered RWP unless properly escorted. ***ALL ENTRIES SHALL BE IN BLUE OR BLACK INK ONLY!***

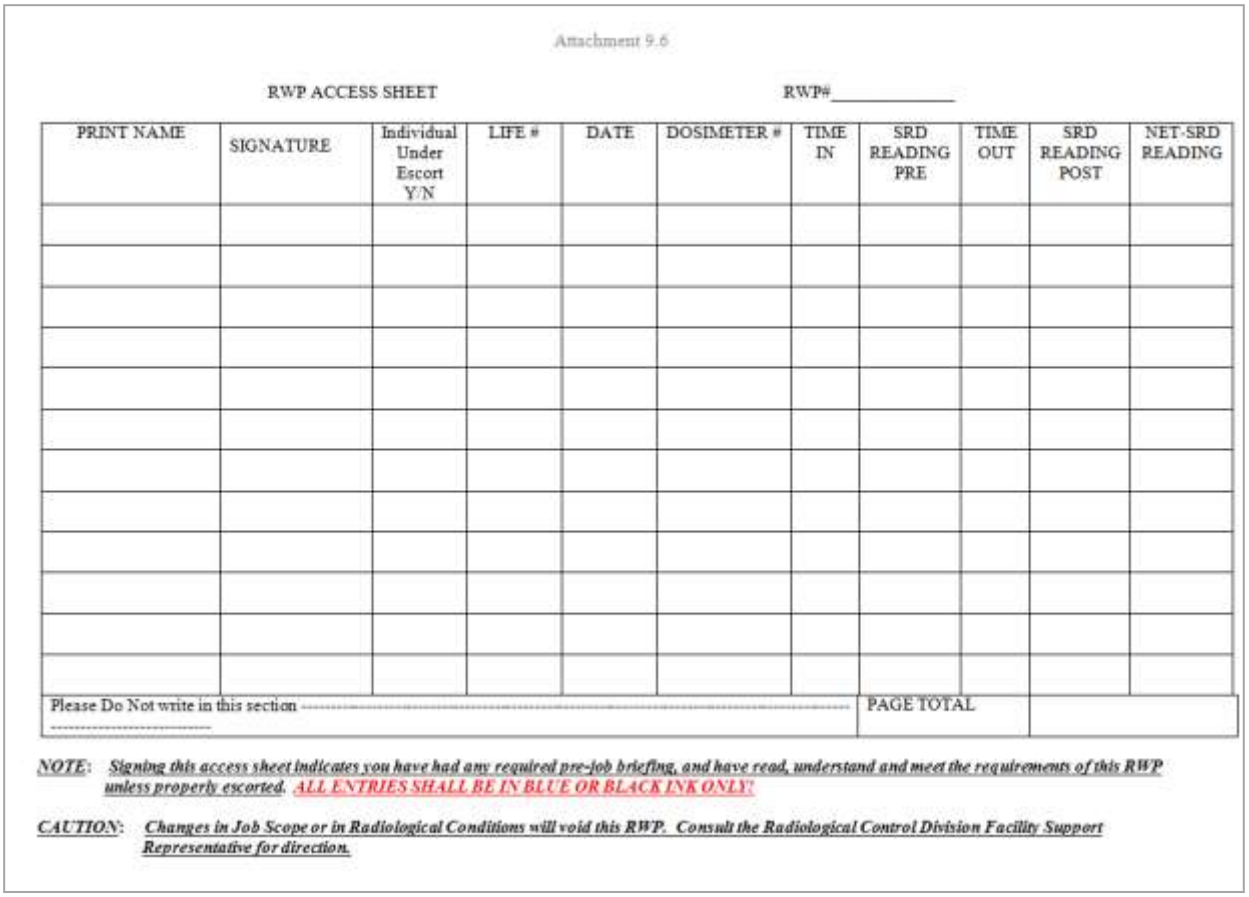
Print Name	Signature	Life / Guest Number	Individual Under Escort Y/N	Date

Attachment 9.5 to FS-SOP-4031, Rev. 10

Radiological Work Permits REQUIRING DOSE TRACKING

Radiological Work Permits requiring dose tracking (require use of supplemental dosimetry) utilize a more sophisticated RWP Access Control Log. This log provides space for each individual to track the amount of time and radiation dose for the specific job. Each individual signs into the Access Record with their name, life number, date, time, dosimeter serial number, and dosimeter reading upon entry. When leaving the job, the individual signs out of the Access Record by entering the time and dosimeter reading upon exit. The value entered in the far right column, dosimeter reading TOTAL, is the cumulative dose obtained while within the work area and is derived by subtracting the value of the dosimeter reading upon entry from the dosimeter reading upon exit.

Each time you enter and leave the area affected by the Radiological Work Permit, you must sign-in and sign out of the Access Control Log. Exceptions are allowed when individuals are making multiple entries to the same area during the same day. In this case, it is only required that the individual sign-in upon initial entry and sign out upon final exit each day.



Attachment 9.6

RWP ACCESS SHEET RWP#_____

PRINT NAME	SIGNATURE	Individual Under Escort Y/N	LIFE #	DATE	DOSIMETER #	TIME IN	SRD READING PRE	TIME OUT	SRD READING POST	NET SRD READING
Please Do Not write in this section ----------							PAGE TOTAL			

NOTE: Signing this access sheet indicates you have had any required pre-job briefing, and have read, understand and meet the requirements of this RWP unless properly escorted. ALL ENTRIES SHALL BE IN BLUE OR BLACK INK ONLY!

CAUTION: Changes in Job Scope or in Radiological Conditions will void this RWP. Consult the Radiological Control Division Facility Support Representative for direction.

Working Within Contamination Areas

Workers must abide by the requirements of the Radiological Work Permit issued for their job. While working in a Contamination Area, avoid practices that promote the spread of contamination, such as dragging your feet across surfaces, sweeping or brushing surfaces, or using compressed air. If air hoses or electrical supply lines must breach the Contamination Area boundary, ensure they are securely fastened to the floor or an immovable object to avoid inadvertently spreading contamination by moving the lines in and out of the affected area. Do not touch any exposed skin, such as your face. To minimize the potential for getting radioactive material inside your body, do not enter Contamination Areas with open cuts or abrasions. Immediately leave the Contamination Area if you cut yourself or open a wound. Do not smoke, eat, drink, or chew while within Contamination Areas. If your protective clothing will not protect you against a spill of radioactive contamination, such as a liquid spill when using cloth PCs, immediately leave the area and contact the Facility Support Technician for assistance. DO NOT attempt to stop the spill unless you can do so without jeopardizing the integrity of your protective clothing.

Exiting a Contamination Area

When exiting a Contamination Area, approach the step-off pad, but do not cross the Contamination Area barrier rope without first removing your protective clothing. Stay one or two feet away to minimize the chance of contamination falling off onto the clean Step-Off Pad. All protective clothing except inner green gloves with cotton liners must be removed while within the Contamination Area and personnel contamination monitoring must be performed before exiting the Step-Off Pad.

All equipment and materials must be left behind within the Contamination Area until a qualified Facility Support Technician surveys them to ensure they are not contaminated.

Select, Don, and Remove Protective Clothing

Before entering a Contamination Area, workers must select the appropriate protective clothing based upon the requirements specified within the Radiological Work Permit. The sample Radiological Work Permit illustrated below identifies that double gloves, inner and outer booties, full coveralls, and a head cover are required for this job. When selecting protective clothing, workers should ensure that they have selected the proper size clothing (such as coveralls, outer gloves, and outer rubber overshoes).

BNL RADIOLOGICAL WORK PERMIT (RWP)

BROOKHAVEN NATIONAL LABORATORY

RWP # 938-005

RWP Type: [X] Job Specific [ ] General **Start Date** Today **End Date** Today **Revised End Date** _____

1. Initiator: Job Supervisor	2. Life #:99999	3. Phone #:9999	4. Bldg.:129-A

5. Job Location: Upper Level, Building 938

6. Job Description: Check Fire Alarm Panel on the East Wall to ensure it is securely locked

7. Radiological Concerns: (e.g. Primary radionuclides, high dose rate, airborne)

8. Conditions that will void the use of this RWP:
[X] None

9. **Job Review:**
[X] Pre-Job Review
[ ] ALARA Review
[ ] Post-Job Review
[ ] Other

10. **Estimated Dose:** (mrem)
Highest Individual _____
[ ] Per Job
[ ] Per entry
Collective _____
[ ] Per Job
[ ] Per Entry
[X] Not Applicable

11. **References:**
[X] Radiological Survey Form
[ ] Technical Work Document
TWD# _____
[ ] Other
[ ] Not Applicable

12. **Training Requirements:**
[X] Radiation Worker (RWT 002)
[ ] RBA Practical (RWT 002A)
[X] Contamination (RWT 300 /300A)
[ ] Benchtop/dispersibles (RWT 500)
[ ] Other _____
[ ] Not Applicable

13. **Work Controls:**
[X] FS Coverage
[X] Intermittent
[ ] Continuous
[ ] Continuous Presence
[X] Pre-Job Briefing
[ ] Limiting Conditions
[ ] Hold Point
[ ] Air Monitoring
[ ] Shielding
[ ] Other
[ ] Not Applicable

14. **Protective Equipment:**
[X] Gloves (Double)
[X] Shoe Covers
[X] Booties
[ ] Lab Coat
[X] Coveralls
[ ] Respirator
[X] Head Cover
[X] Other (Cotton Liners)
[ ] Not Applicable

15. **Dosimetry:**
[X] TLD
[X] Self Reading Dosimeter
[X] Alarming Dosimeter SI 1
[ ] Finger Dosimetry
[ ] Not Applicable

16. **Check Out Instructions:**
[X] Bioassay
[X] Whole Body Count
[X] Annual
[ ] Pre-Job
[ ] Post-Job
[ ] Urine
[ ] Annual
[ ] Pre-Job
[ ] Post-Job
[ ] Not Applicable

[X] Contamination Check
[X] Personnel Frisk
[ ] PCM
[X] Equipment Tools
[ ] Post Job Survey
[ ] Not Applicable

17. **Expected Radiological Conditions**

Radiation [ ] N/A
General Area: **65 mR/hr (Highest)**
On Contact: **N/A**
Gamma [X] Neutron [ ]
Beta [ ] Check all that apply

Surface Contamination [ ] N/A
Removable: **N/A** dpm/100cm² Alpha
Removable: **2.5K to 24K** dpm/100cm² Beta/Gamma
Removable: **N/A** dpm/100cm² Tritium

Airborne Radioactivity [X] N/A

Nuclide	Concentration

18. **Special Instructions** (Hold Points, Limiting Conditions, Special Dose Limits, etc.)
RCT to perform pre job brief prior to entry. RCT to survey, bag and tag tools as necessary.
Special Instruction 1 – Set EPD to alarm at 15mrem and dose rate alarm on at 200 mrem/hr off at 150mrem/hr

19.	Approvals	Signatures	Life Number	Date
	Initiator/Supervisor	Job Supervisor	99999	Today
	Facility Support Representative	F.S. Representative	99998	Today
	Department (As Required)			
20.	Close Out Signatures FS Rep.			

Before donning the protective clothing, all personal effects such as watches, rings, and chains should be removed. If desired, wedding rings may be left on, but should be taped to prevent damage to the PC's. Personal clothing should not be worn under protective clothing. Instead, "modesty garments," such as surgical scrubs or gym shorts and shirts, may be worn.

Before donning, inspect all protective clothing for defects, such as rips, tears, holes, and degradation of seams, broken zippers, or missing buttons. Also, check for pinholes in gloves by trapping air and lightly squeezing the glove to check for deflation. **DO NOT** use damaged PC's. If defective PCs are identified, mark them DO NOT USE and set them aside for disposition by the Facility Support Technician.

Donning Protective Clothing

The sequence for donning PCs listed below is designed to provide adequate protection from contamination and minimize the risk of a personal contamination event when attempting to remove the PC's. The sequence is as follows:

1. Check to ensure your TLD is attached to your innermost garment.
2. Don the inner booties.
3. Don the coveralls, then tape the coverall legs to the inner booties. Tab the end of the tape to aid in removal.
4. Next, don the outer rubber overshoes.
5. If supplemental dosimetry is required, place it in the pocket of the coveralls.
6. Don the inner protective gloves and tape them to the coverall sleeves. Cloth inner gloves may be worn, BUT are not considered protective gloves.
7. Don the outer protective gloves, BUT do not tape them to the coveralls.
8. Don respiratory protection if required by the RWP.
9. Don the head cover taping as necessary to keep it in place while working.

When exiting a Contamination Area, approach the step-off-pad, but do not cross the pad without removing PC's first. Stay a foot or two away from the pad so as to minimize the chance of contamination falling off into a clean area.

Removing Protective Clothing

As with donning, this sequence of removing protective clothing is not "cast in stone" but instead is based on years of experience. Removing protective clothing in the prescribed sequence will minimize the risk of personal contamination when attempting to exit the Contamination Area. Instructions for the correct sequence for removing protective clothing should be posted near the step-off pad. It is important that you stay back from the Contamination Area boundary while removing protective clothing to prevent spreading onto the clean Step-Off Pad. The sequence for removing protective clothing is as follows:

1. First, remove all exposed tape and dispose of it in the "Contaminated Trash."
2. Remove your rubber overshoes and place in the "Used PCs." Face away from the SOP while removing overshoes to prevent contamination from spreading onto the SOP.
3. Remove outer protective gloves and place them in the "Used PCs."
4. Remove the head cover and place it in the "Used PCs."

5. If worn, remove respiratory protection and place it in the “Used Respirators.”
6. If used, remove supplemental dosimetry and place it on the edge of the SOP. Read the dosimeter before placing it on the SOP in case it gets damaged.
7. Remove tape from inner gloves and dispose of it in the "Contaminated Trash."
8. Remove coveralls and place in the “Used PCs.”
9. Take down the barrier rope.
10. Remove inner booties one at a time, stepping unprotected foot onto SOP
11. Replace the barrier rope.
12. Remove inner gloves and dispose of it in the "Contaminated Trash."
13. Perform personal contamination monitoring before leaving the Step-Off Pad.

Perform Personnel Contamination Monitoring

A whole body contamination check must be performed prior to leaving the Contamination Area Step-Off Pad.

Contamination Monitoring Procedure

With the probe in its holder, survey your hands without picking up the probe. Hold the surface of your hand within ½ inch from the surface of the probe. Survey the entire surface of each hand, moving your hand across the surface of the probe at a rate of approximately 1 to 2 inches per second. If your hands are contaminated, **DO NOT PICK-UP THE PROBE**. Contact, or have someone else contact, the Facility Support Technician to assist you. If your hands are not contaminated, pick up the probe from its holder and begin frisking your whole body.

A survey of your entire body, if done correctly, should take several minutes. When frisking your head, pause for approximately 5 seconds in the area of your nose and mouth. Next, frisk your neck and shoulders. When frisking your arms, pause at each elbow, and then continue to frisk your chest, abdomen, back, hips, and the seat of your pants. Pause at each knee when frisking your legs. Continue with your shoe tops and bottoms. Finally, frisk your dosimetry before you pick it up. During the survey, it is very important to concentrate your efforts on locations that are most likely to become contaminated, such as hair and face, elbows, seat of your pants, pant leg bottoms, shoe tops and soles, and hands.

Respond to Indication of Contamination on Skin or Clothing

Increased Audible Count Rate

Multiple "clicks" will occur randomly while performing a frisk. If while performing personal monitoring, you encounter multiple “clicks”, move the probe back slightly so it is positioned over the area surveyed just before the noticeable increase. Hold the probe in that position for just a few seconds and allow the instrument to respond. If the rate of audible "clicks" decreases, continue with your survey. If the rate of audible "clicks" remains higher than normal observe the indication on the meter. If at any time the meter indicates greater than 100 counts/minute above background, contamination exists above the release limits and corrective actions are necessary.

Required Actions

Do not panic if the personal monitor indicates greater than 100 counts/minute above background. Instead, it is important that you continue surveying the remainder of your body to identify whether additional areas of contamination are present. If while continuing to survey the remainder of your body, another person arrives or is present, have them go to a phone and contact the Facility Support Technician for assistance. If, after completing a whole body contamination survey, there is no one else available to assist, it will be necessary for you to leave the immediate area to obtain assistance. Knowing where the contamination is on your body, carefully go to the nearest phone and contact the Facility Support Technician. Attempt to control the spread of contamination by not allowing the affected area of the body to touch any other surface. If necessary, cover the affected area before touching a clean surface. If the contamination is on the bottom of your shoes remove them before leaving the Step-Off-Pad.

After contacting the Facility Support Technician remain near the telephone in case the Facility Support Technician needs to contact you for additional information.

Personnel Contamination Monitors (PCMs)

In Contamination Areas where there are frequent entries of many people, a Personnel Contamination Monitor, commonly referred to as a PCM, may be present. This device performs a survey of your entire body in a fraction of the time required for the hand-help “frisker.” When available, these devices are typically located near the Step-Off Pad, within the Radiological Buffer Area. Personnel exiting the Contamination Area typically survey only hands and feet, then proceed along a prescribed path from the Step-Off Pad to the PCM. The PCM completes the survey of the entire body. If contamination is detected, the PCM will alarm and inform the individual of the approximate location of the body that is contaminated.

If an alarm occurs while using a Personnel Contamination Monitor immediately contact a Facility Support Technician for assistance and follow the protocol at the monitoring station.

Internal Radiation Monitoring Program

An internal radiation dose can be received as a result of radioactive material being taken into the body through inhalation, ingestion, injection, absorption through the skin or entry through a wound. For this reason, a “BASELINE” bioassay may be required prior to working in authorized areas depending on work assignment.

The methods used for internal monitoring are whole body counts (invivo) and urinalysis (invitro) to determine the amount of radioactive material taken into the body, and to calculate a dose for the uptake. If you are suspected of getting contamination inside your body, you may be asked to provide a urine sample and/or have a whole body count. The results of the internal monitoring (calculated dose) will be documented in your dose records.

Invivo Bioassay

The invivo bioassay method is commonly referred to as the “Whole Body Count.” This method involves monitoring the radiation emitted from body using a sophisticated detection system linked to a computer. Using the measurements obtained from the detector, the computer system identifies the type and amount of radioactive materials within the body, allowing the internal dosimetrist to calculate the radiation dose that will result from the deposits. This dose is then tracked as part of your BNL dose records.

Invitro Bioassay

If the radioactive materials within the body emit radiation that has insufficient energy to penetrate out of the body (tritium, Strontium-90 or alpha emitters) a “Whole Body Counter” cannot be used. In this case a sample of body fluid or excretion, such as urine must be obtained and analyzed. This method of internal dose monitoring is known as the invitro bioassay.

Describe the Normal Methods for Personnel Decontamination

If a worker should become contaminated while in a Contamination Area, decontamination of the individual will only be done at the direction of Radiological Control Division personnel. Only QUALIFIED personnel are allowed to direct decontamination. It is important not to take it upon yourself to determine the need for or to perform personnel decontamination unless directed to do so.

There are several methods that can be used to remove contamination from an individual. Washing with lukewarm (tepid) water and mild soap is used most often as the initial attempt to decontaminate. If the contamination is liquid, then initially it is removed from the skin with a blotting action, avoiding any wiping motion that may embed contamination into the skin

Particulate type contamination may be removed using a tape press, waterless cleaners, vacuuming (but only with special vacuums), and sweating. Sweating is an effective method to remove contamination from the hands. It involves wearing rubber gloves with absorbent inner lining. As the individual's hands sweat, the contamination is transferred to the absorbent inner lining.

As with all methods of decontamination, **NO** abrasive methods will be used. In the event the "mild" decontamination methods fail to remove the contamination, alternative methods will be evaluated thoroughly by medical and/or professional personnel before any other additional attempts are performed.

State the Necessary Actions to Release Material from a Posted Contamination Area

Everything in a posted Contamination Area is considered contaminated with radioactive material. To remove something from a Contamination Area, the item must first be proven to be free of radioactive contamination, often referred to as "clean." As with personnel exiting a Contamination Area, all tools and equipment must be surveyed for radioactive contamination prior to release from the area.

Release Criteria

A qualified Facility Support Technician must survey all the items leaving the posted Contamination Area. It is therefore very important that you plan your job well and take only those materials necessary to perform the work into the area.

If the Facility Support Technician surveying the item determines that the item is free of radioactive contamination, then the item can be immediately removed from the area. If radioactive contamination is found on the item, it must be properly packaged and labeled before it can be released from the area. Packaged items can be removed from the posted Contamination Area but cannot be opened unless they are within another posted Contamination Area.

If the item surveyed is found to have fixed contamination only, it must be tagged as such (clearly marked and labeled) for release.

All items removed from a posted Contamination Area for unrestricted use must be itemized on a Clean Item Log or Release Log, typically located at the area step-off-pad.

Describe the Methods Used for Decontamination of Areas, Tools, and Equipment

Only qualified personnel may perform decontamination. Decontamination of areas, tools, and equipment must be performed under the direction of Radiological Control Division personnel.

In general, most low level contamination on tools or equipment can be removed by wiping with a damp cloth. For contamination on floors or large surface areas, decontamination is performed using a damp mop or water and a squeegee.

To minimize the spread of high levels of contamination to areas of lower levels, decontamination always begins at the area of lowest contamination and proceeds to the area of greater contamination. If decontamination were to begin in the area of highest levels, residual radioactive contamination on gloves and protective clothing could be inadvertently transferred to areas of lower contamination levels. This technique can also be applied while performing work within a Contamination Area. If practical, plan your work so the activities in the lowest contamination levels within the area are performed first. That way, as the job progresses, residual contamination levels on gloves and protective clothing will not be higher than the contamination levels in the next work area.

State the Correct Response to Accidents, Injuries, and Emergencies

A spill of non-radioactive material looks exactly like that of a radioactive spill. It is important to treat as CONTAMINATED any uncontrolled release of material that may have the potential of being contaminated. Not taking spilled material seriously or ignoring indications of a possible spill has resulted in incidents of wide spread contamination.

Encountering Radioactive Liquid Spills

In dealing with a radioactive liquid spill, it is important that you DO NOT manipulate valves to stop a radioactive liquid spill UNLESS you are personally qualified to operate the system involved. Shutting valves to stop liquid spills may appear to be the “common sense” approach, BUT unless you are fully aware of what effect manipulating the valve has on the system, serious unplanned consequences may develop.

Follow these steps if you find a radioactive spill in your area:

1. Notify everyone in the area of the spill.
2. Place your work in a safe condition.
3. Notify the Facility Support technician. If you cannot contact a technician, call 2222 or 911 and notify the BNL Emergency Response personnel.
4. Remain nearby to restrict access and brief response personnel when they arrive.

Encountering Evacuation Alarms While In a Contamination Area

Emergencies always take priority over the normally required removal of PC and frisking. If you hear the building evacuation alarm and a drill has not been announced, you must assume it is a true emergency and that the danger may not be readily apparent to you. Immediately place your work in a safe condition and evacuate the building without removing protective clothing or performing contamination monitoring.

Encountering Injuries In a Contamination Area

A life-threatening injury will ALWAYS take priority over any radiological consideration. Medical treatment should NEVER be delayed unless the radiation is also life threatening to response personnel. If a life-threatening injury occurs within a Contamination Area, controlling the spread of contamination becomes a secondary concern. The saving of a life WILL ALWAYS TAKE PRECEDENCE!

Immediately exit the area and call 2222 or 911 and advise the BNL Fire/Rescue Group of the injured person within a posted Contamination Area. Do not hesitate by removing protective clothing. Do not hesitate by performing personnel monitoring. Immediately proceed to the nearest method of communication and call for help. It cannot be stressed enough the importance of IMMEDIATE NOTIFICATION in the event that a life-threatening injury is encountered within a Contamination Area.

Given a Radiological Work Permit and Associated Radiological Survey Form, Demonstrate the Ability to Interpret and Utilize the Information

In the Contamination, High Contamination, and Airborne Radioactivity classroom training each individual is given a Radiological Work Permit and Radiological Survey Form for a job that will be performed during the practical exercise. It is important that you review this information before taking a challenge examination because questions may contain information pertaining to the Radiological Work Permit and Survey Form.

BNL RADIOLOGICAL WORK PERMIT (RWP)

BROOKHAVEN NATIONAL LABORATORY

RWP # 938-005

RWP Type: [X] Job Specific [ ] General **Start Date** Today **End Date** Today **Revised End Date** _____

1. Initiator: Job Supervisor	2. Life #:99999	3. Phone #:9999	4. Bldg.:129-A

5. Job Location: Upper Level, Building 938

6. Job Description: Check Fire Alarm Panel on the East Wall to ensure it is securely locked

7. Radiological Concerns: (e.g. Primary radionuclides, high dose rate, airborne)

8. Conditions that will void the use of this RWP:
[X] None

9. **Job Review:**
[X] Pre-Job Review
[ ] ALARA Review
[ ] Post-Job Review
[ ] Other

10. **Estimated Dose:** (mrem)
Highest Individual _____
[ ] Per Job
[ ] Per entry
Collective _____
[ ] Per Job
[ ] Per Entry
[X] Not Applicable

11. **References:**
[X] Radiological Survey Form
[ ] Technical Work Document
TWD# _____
[ ] Other
[ ] Not Applicable

12. **Training Requirements:**
[X] Radiation Worker (RWT 002)
[ ] RBA Practical (RWT 002A)
[X] Contamination (RWT 300 /300A)
[ ] Benchtop/dispersibles (RWT 500)
[ ] Other _____
[ ] Not Applicable

13. **Work Controls:**
[X] FS Coverage
[X] Intermittent
[ ] Continuous
[ ] Continuous Presence
[X] Pre-Job Briefing
[ ] Limiting Conditions
[ ] Hold Point
[ ] Air Monitoring
[ ] Shielding
[ ] Other
[ ] Not Applicable

14. **Protective Equipment:**
[X] Gloves (Double)
[X] Shoe Covers
[X] Booties
[ ] Lab Coat
[X] Coveralls
[ ] Respirator
[X] Head Cover
[X] Other (Cotton Liners)
[ ] Not Applicable

15. **Dosimetry:**
[X] TLD
[X] Self Reading Dosimeter
[X] Alarming Dosimeter SI 1
[ ] Finger Dosimetry
[ ] Not Applicable

16. **Check Out Instructions:**
[X] Bioassay
[X] Whole Body Count
[X] Annual
[ ] Pre-Job
[ ] Post-Job
[ ] Urine
[ ] Annual
[ ] Pre-Job
[ ] Post-Job
[ ] Not Applicable

[X] Contamination Check
[X] Personnel Frisk
[ ] PCM
[X] Equipment Tools
[ ] Post Job Survey
[ ] Not Applicable

17. **Expected Radiological Conditions**

Radiation [ ] N/A
General Area: **65 mR/hr (Highest)**
On Contact: **N/A**
Gamma [X] Neutron [ ]
Beta [ ] Check all that apply

Surface Contamination [ ] N/A
Removable: **N/A** dpm/100cm^2 Alpha
Removable: **2.5K to 24K** dpm/100cm^2 Beta/Gamma
Removable: **N/A** dpm/100cm^2 Tritium

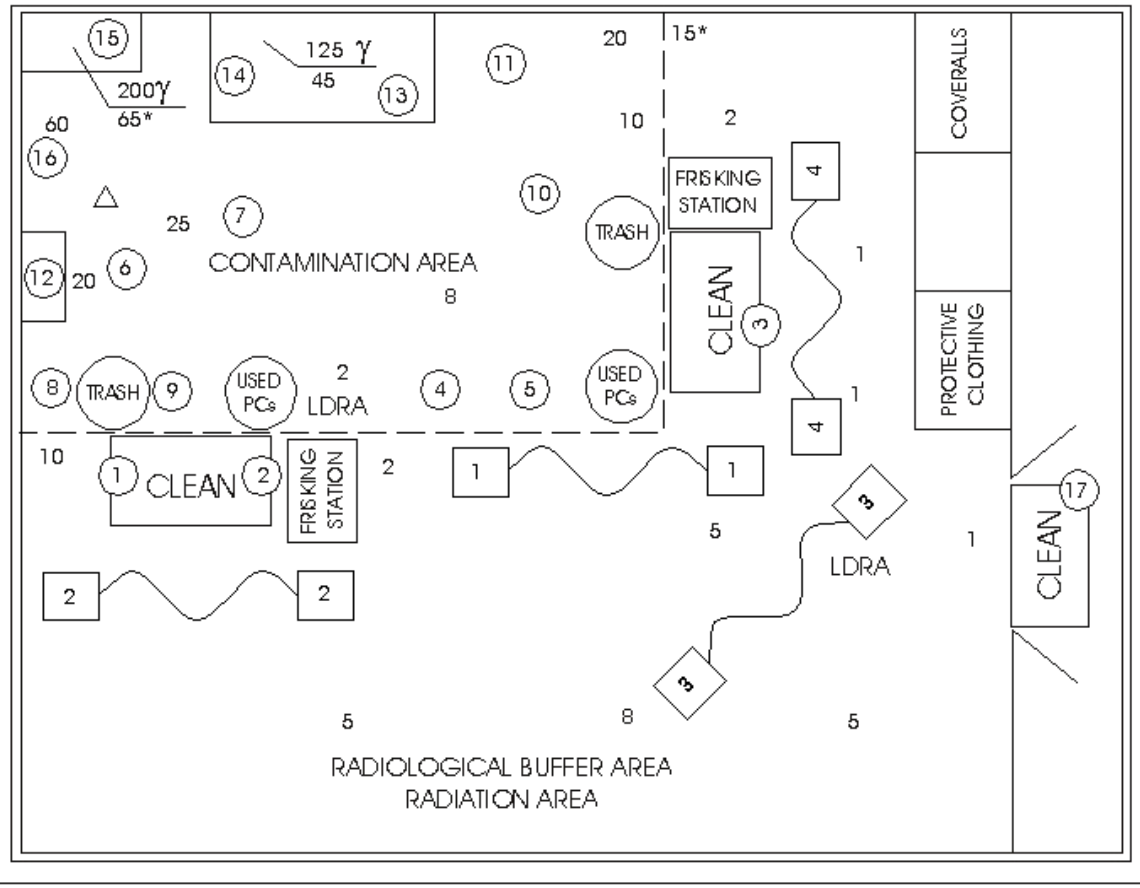
Airborne Radioactivity [X] N/A

Nuclide	Concentration

18. **Special Instructions** (Hold Points, Limiting Conditions, Special Dose Limits, etc.)
RCT to perform pre job brief prior to entry. RCT to survey, bag and tag tools as necessary.
Special Instruction 1 – Set EPD to alarm at 15mrem and dose rate alarm on at 200 mrem/hr off at 150mrem/hr

19.	Approvals	Signatures	Life Number	Date
	Initiator/Supervisor	Job Supervisor	99999	Today
	Facility Support Representative	F.S. Representative	99998	Today
	Department (As Required)			
20.	Close Out Signatures FS Rep.			

RADIOLOGICAL SURVEY FORM (FS 1000.1)	REASON FOR SURVEY ☐ ROUTINE ☐ SPECIAL ☒ RWP # 938-005	
LOCATION / EQUIPMENT: Building 938 Upper Level	DATE Today	TIME This Morning



INSTRUMENT # Model # Serial #		CAL DUE
Tennelec	2001 00	08/13/04
Eberline RO-2	100045	08/13/04
Ludlum Model 3	2001 23	08/13/04

LEGEND

○ SMEAR SURVEY LOCATION △ AIR SAMPLE LOCATION

☐ MASSLINN SURVEY LOCATION

XXXX Y / ZZZ — XXX - CONTACT READING; Y - RADIATION TYPE; Z - READING @30 CM

AIRBORNE ACTIVITY SURVEY

Sample #	Duration	Flow Rate	Field Analysis cpm	Field Analysis µCi/cc	% DAC
9383	20 min	28 LPM	300	1E-12	0.05

RADIATION AREA (HIGHEST)

CONTACT READING	
200	
GENERAL AREA	
65 (CA)	15 (RBA)

MASSLINN SURVEY RESULTS (DPM)

1. < 1000	5.	9.
2. < 1000	6.	10.
3. < 1000	7.	11.
4. < 1000	8.	12.

SMEAR SURVEY RESULTS (DPM/100 CM²) α, (β–γ), ³H

1< 1000	7. 4.5K	13. 22K
2< 1000	8. 2.5K	14. 24K
3< 1000	9.. 3.5K	15. 19K
4. 2.5K	10. 9K	16. 8K
5. 3K	11. 12K	17.< 1000
6. 4.5K	12. 12K	18.

Surveyed By: F.S. Technician

Reviewed By: F.S. Representative