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Control of Radioactive Material Within an RCA

RP02.07
RP03.07

Approved Revision 0: 5/18/2018

STE SCOPE:
Material within a Radiologically Controlled Area (RCA) must be surveyed and evaluated to be controlled as Radioactive Material OR for the release by a senior Radiation Protection (RP) technician.

REFERENCES:
- NISP-RP-13: Radiation Protection Standard Glossary of Terms
- NISP-RP-07: Control of Radioactive Material
- ICES 325605: Contaminated Tool Bag

SUPPORTING MATERIALS (STUDENT HANDOUTS):
- NISP-RP-13: Radiation Protection Standard Glossary of Terms
- NISP-RP-07: Control of Radioactive Material
- ICES 325605: Contaminated Tool Bag

ESTIMATED TIME:
3 hours

EVALUATION STANDARDS
The STE Knowledge Examination required a scoring grade of 80% to pass the examination. Remedial training must be provided after two unsuccessful attempts and a third attempt is allowed. Once complete, the Performance Evaluation must be passed to gain credit for the completion of the STE in the EPRI completion registry.

Revision 5/18/2018 based upon comments from EPRI STE Working Group held week of May 2, 2018.

This lesson plan contains the material to support 2.07/3.07, but separate tests will be administered for Juniors and Seniors.

Standardized Task Evaluation Program

The Standardized Task Evaluation (STE) program promotes a work-ready workforce through the standardization of common tasks by defining the knowledge and skills required to perform a given task. Subject Matter Experts (SMEs) analyze the task and generate lesson plans, knowledge examination, and performance evaluation elements. These elements are combined to create an STE package.

The Electric Power Research Institute (EPRI) facilitates the development, oversees the quality, and programmatically implements each STE. EPRI STE members have access to these materials and permission to implement these STEs in accordance with their site training and qualification procedures.

EPRI STE program disclaimer. For more information contact Chuck Lease: clease@epri.com.

Control of Radioactive Material Within an RCA Overview

Controlling Radioactive Material is important!

Why?

- Possible unknown radiological hazards

- Areas not being posted

- NRC regulatory violations

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Ask the students why they think it is important. After class discussion, summarize the following three points bringing up each bullet individually:

1. Possible unknown radiological hazards: Failure to properly survey and control radioactive material could result in workers not knowing the actual extent of a radiological hazard.
2. Areas not being posted: Failure to control and properly store radioactive material could result in areas of the plant not being posted, not being posted correctly, and radiological boundaries and controls not being established as required.
3. NRC regulatory violations: Failure to properly control radioactive material can result in NRC regulatory violations.

Control of Radioactive Material Within an RCA Overview

Controlling Radioactive Material is important!

ICES 325605: Contaminated Tool Bag at H.B Robinson Plant Unit 2

- Contaminated canvas bag discovered during monitoring at protected area exit
- Caused by different standards between vendor and plant personnel

1. Have students read the handout and lead a general discussion using the handout on what happened and why.
2. Bring up bullets to summarize and move on.

Control of Radioactive Material Within an RCA Overview

This STE does not cover and will not qualify you to:

- Control or release materials packaged for transportation under Department of Transportation regulations.
- Control radioactive sources which may be used at the station for calibration or instrument response verification or Special Nuclear Material.
  - Special Nuclear Material (SNM) (**Definitions – EO 1)**
    - Plutonium, Uranium-233, Uranium enriched in the isotope 233 or the isotope 235, and any other material that the NRC, pursuant to the provisions of Action 51 of the Act, determines to be special nuclear material, but does not include source material.
    - Any material artificially enriched by any of the foregoing, but does not include source material.

1. Bring up each bullet individually and discuss.
2. Final animation brings up all the text, ask students what questions they have.

Terminal Objective

Junior

- Given radioactive material, incumbent will move, store, and recognize the need to release by a senior RP technician in accordance with NISP-RP-07, Control of Radioactive Material.
- Given personal items and security equipment properly released from RCA.

Senior

Given the need to survey material for conditional and unconditional release from a Radiologically Controlled Area (RCA), determine if the material if free of radioactive material and can be released in accordance with NISP-RP-07, Control of Radioactive Material.

Enabling Objectives

From memory:

1. Define the following terms:
   a. Conditional Release
   b. Detectable Radioactivity
   c. Material Release Plan
   d. Naturally Occurring Radioactive Material (NORM)
   e. Personal Clothing

The following shall be accomplished in accordance with the conditions and standards indicated in the Terminal Objective except where otherwise noted.

Enabling Objectives

From memory: (continued)

1. Define the following terms:
   - f. Personal Items
   - g. Radioactive Material Area
   - h. Radioactive Material Label
   - i. Special Nuclear Material (SNM)
   - j. Tools and Equipment Monitor (TEM)

The following shall be accomplished in accordance with the conditions and standards indicated in the Terminal Objective except where otherwise noted.

Enabling Objectives

From memory:

2. State the limits for radioactive contamination for release of materials, equipment, and areas for unrestricted use.
3. State the requirements for surveying and releasing personal items.
4. State the requirements for surveying and releasing tactical gear worn by security personnel.

The following shall be accomplished in accordance with the conditions and standards indicated in the Terminal Objective except where otherwise noted.

Enabling Objectives

From memory:

5. State the requirements for the unconditional release of items.
6. State the basic operating characteristics of a Tools and Equipment Monitor (TEM).
7. State the requirements for the operation of a Tools and Equipment Monitor (TEM).
8. Recognize the level of approval needed and the requirements for transporting radioactive material that has been temporarily (conditionally) released from an RCA.

The following shall be accomplished in accordance with the conditions and standards indicated in the Terminal Objective except where otherwise noted.

Enabling Objectives

From memory:

9. Explain the potential impacts and their consequences related to the movement and storage of radioactive material.
10. State the requirements for storing radioactive material within buildings or in outside areas.
11. State the requirements for moving radioactive material.

The following shall be accomplished in accordance with the conditions and standards indicated in the Terminal Objective except where otherwise noted.

Enabling Objectives

From memory:

12. State dose rates requiring RP escort for moving radioactive material.
13. State the requirements to unconditionally release liquids.
14. State the requirements to unconditionally release bulk or aggregate materials.
15. Describe methods used for decontamination of areas within a plant.

The following shall be accomplished in accordance with the conditions and standards indicated in the Terminal Objective except where otherwise noted.

State the limits for radioactive contamination for release of materials, equipment, and areas for unrestricted use. – EO2

To be able to determine and then control radioactive material as necessary limits will need to be known.

Ask students what limits they are aware of prior to going to next slide.

State the limits for radioactive contamination for release of materials, equipment, and areas for unrestricted use. – EO2

- No detectable fixed activity above background, other than naturally occurring isotopes.
  - Detectable Radioactivity (**Definitions – EO 1)**
    - Radioactivity is considered detectable whenever instrumentation gives a reproducible positive indication of its presence, i.e., a reproducible signal distinguishable from background.
    - Detectability is different for different instrumentation and survey techniques.
  - Naturally Occurring Radioactive Material (NORM) (**Definitions – EO 1)**
    - Radioactive material that consists of radionuclides found in the environment that are not a result of licensee activity.
    - NORM can include uranium, radium, thorium and their various decay products.

1. Bring up each bullet individually and discuss.
2. Final animation brings up all the text.

State the limits for radioactive contamination for release of materials, equipment, and areas for unrestricted use. – EO2

- No detectable loose surface contamination.
- No detectable/suspected internal contamination.
- No detectable alpha contamination.
- No radioactive labels or markings.
  - Radioactive Material Label (**Definitions – EO 1)**
    - A label or tag which contains the standard radiation symbol and the words, "Caution Radioactive Material" or "Danger Radioactive Material".
    - Information including dose rates, contamination levels, other information deemed necessary.
    - Allows workers handling the material to keep their exposures ALARA.

1. Bring up each bullet individually and discuss.
2. Final animation brings up all the text.

State the limits for radioactive contamination for release of materials, equipment, and areas for unrestricted use. – EO2

In conclusion, the limits are:

- No detectable fixed activity above background, other than naturally occurring isotopes.
- No detectable loose surface contamination.
- No detectable/suspected internal contamination.
- No detectable alpha contamination.
- No radioactive labels or markings.

1. Have students recall the five limits discussed.
2. Click to have limits come up for a summary.

State the requirements for surveying and releasing personal items. – EO3

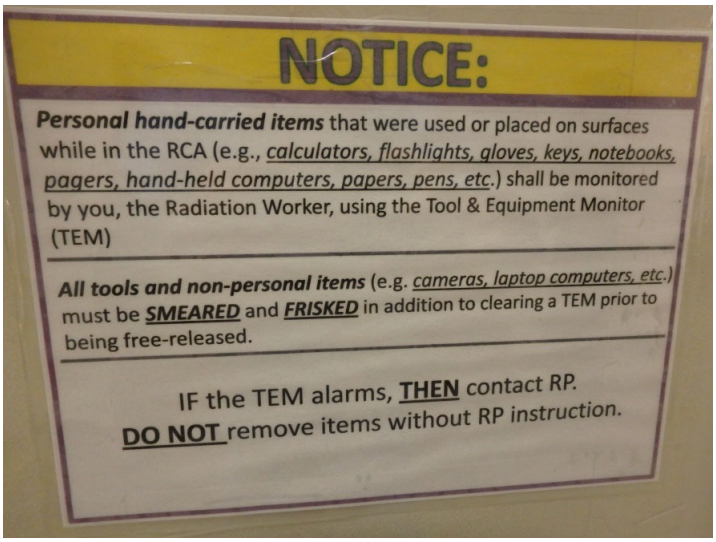
Who can process personal items to exit a RCA?

- Personal Items (**Definitions – EO 1)**
  - Items normally carried by personnel while in the RCA.
  - This does not include plant tools or equipment.
  - Radiation Protection will develop and post a list of personal items at each RCA egress area.
  - Personal items may be monitored by the individual possessing these items.

When possible, personal items should not be taken inside the RCA.

1. Bring first question up and discuss. Cover the following:
   At the exit points of RCAs, personal items will be processed by individual radiation workers.
   RP personnel help support and oversee this process.
2. Bring up definition. Go over these further details:
   Personal items inside pockets or worn on the belt such as cell phones, pagers, radios and keys may remain on the individual and worn through the whole body contamination monitors.
   Lanyards, hard hats, badges and primary and secondary dosimetry may remain on the individual and worn through the whole body contamination monitors.
   Items removed from pockets while in the RCA should be monitored using the Tool and Equipment Monitor (TEM) prior to leaving the RCA.
3. Last animation brings up “Radiation Protection will develop and post a list of personal items at each RCA egress area.”
   The next slide has an example of what one looks like from River Bend Station in St. Francisville, LA.

State the requirements for surveying and releasing personal items. – EO3



State the requirements for surveying and releasing personal items. – EO3

Gloves should always be monitored in a Tools and Equipment Monitor (TEM) for release.

- TOOLS AND EQUIPMENT MONITOR (**DEFINITIONS – EO 1)**
  - GENERIC NAME GIVEN FOR THE VARIOUS AUTOMATED DEVICES TO COUNT TOOLS AND EQUIPMENT.



1. Discuss gloves.
2. Discuss definition.

State the requirements for surveying and releasing personal items. – EO3

How would you process your personal items at a TEM?

- Place items in the center of the TEM and minimize stacking of materials.
- Initiate the count.
- No alarm, individual may retrieve the item from the unit.

What if it alarms?

1. Ask if anyone knows how to operate a TEM.
2. Go over the 3 basic steps how individuals may release personal items through the use of a TEM:
   Place items in the center of the TEM and minimize stacking of materials.
   Initiate the count.
   No alarm, individual may retrieve the item from the unit.
3. Ask what steps are required if the TEM alarms.

State the requirements for surveying and releasing personal items. – EO3

If an alarm occurs:

- Initiate the count cycle again.
- If alarm does not occur, it may be released.
- If alarm occurs again, RP will either:
  - Decontaminate and release if it clears the TEM.
  - Control it as RAM

Amplifying information for steps to cover:

- Initiate count cycle again on the TEM as per posted instructions. If alarm occurs do not open the unit but contact RP for additional surveying.
- No alarm, individual may remove the item.
- RP will determine the cause of the alarm and decontaminate the item as appropriate.
- RP will place item in TEM after decontamination. No alarm the item may be released.
- Any item which cannot clear a TEM will be controlled as radioactive material and labeled in accordance with NISP-RP-04.

State the requirements for surveying and releasing personal items. – EO3

Personal clothing, which had been contaminated and deconned, can be processed normally.

- PERSONAL CLOTHING (**DEFINITIONS – EO 1)**
  - ARTICLES OF CLOTHING OTHER THAN ANTI-CONTAMINATION PROTECTIVE CLOTHING (EXCLUDING HARD HATS AND SAFETY GLASSES).

Personal clothing, which had been contaminated and deconned, can be released after direct frisk of the affected area has been completed, or the item successfully passes the TEM with no indications of radioactivity.

State the requirements for surveying and releasing tactical gear worn by security personnel. – EO4

What do you do when someone wearing all this shows up?

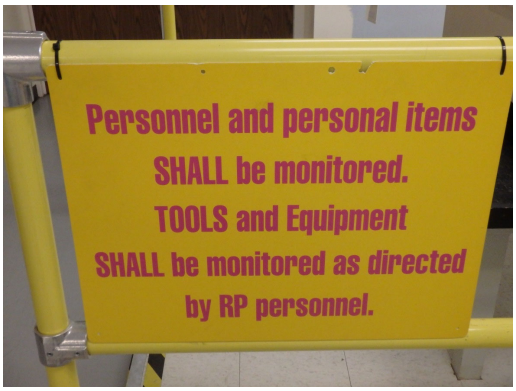
- Wear it all through the monitors.
- A qualified RP tech is needed to supervise required decontamination.

Do <u>not</u> touch any of the equipment.

Amplifying information:
1. Security personnel may wear tactical gear through the personnel whole body monitors for release.
2. In the event an alarm occurs, a senior RP technician is to provide oversight of the survey and decontamination of the security equipment.
3. Tactical gear are items such as weapons, ammunition, emergency respiratory equipment, gloves, or other security equipment.

State the requirements for the unconditional release of items. – EO5 - Senior

Except for personal items, release of material from radiological control can only be performed by a senior ANSI qualified Radiation Protection technician.



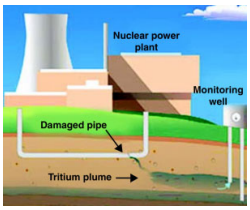
State the requirements for the unconditional release of items. – EO5 - Senior

Only a senior qualified RP technician may unconditionally (free) release items other than personal items.

- UNCONDITIONAL (OR FREE) RELEASE (**DEFINITIONS – EO 1)**
  - MATERIAL OR EQUIPMENT THAT HAS NO DETECTABLE LICENSEE GENERATED MATERIAL ABOVE BACKGROUND AND THEREFORE MAY BE RELEASED FROM THE SITE FOR UNRESTRICTED USE.

1. Discuss definition

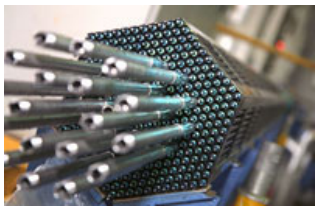
State the requirements for the unconditional release of items. – EO5 - Senior



Pure beta emitters

Tritium contamination

Examples of alpha and beta emitters?



Pure alpha emitters

Items and systems that associate with fuel

2. Ask students if they know any pure beta or alpha emitters
3. Discuss amplifying information below:

- Items suspected of having the potential for being contaminated with pure beta emitters, such as components from PWR waste gas or BWR off gas systems shall be surveyed with an instrument capable of detecting beta activity.
- In addition to typical release survey requirements, items which could have been contaminated with alpha contamination must be surveyed with an instrument capable of detecting alpha contamination.

State the requirements for the unconditional release of items. – EO5 - Senior

Some other specific notes:

- Smoke detectors, or other plant equipment containing radioactive sources, cannot be free released without RP Supervision approval.
- Items used during the entry in a contamination area should always be released in a TEM.

1. Items used during the entry in a contamination area should always be evaluated using a TEM. These items include:

- Data logging devices including lap top computers
- Radios
- Flashlights
- Hand carried items such as notebooks and pens

2. Poll answers to question and then go to the next slide to summarize.

State the requirements for the unconditional release of items. – EO5 - Senior

- Personnel clothing, which had been contaminated and deconned, can be released after direct frisk of the affected area has been completed, or the item successfully passes the TEM with no indications of radioactivity.

- Can you think of any special considerations that should be made when releasing non personal items?

See NISP-RP-07 Attachment 4

At this time pass out NISP-RP-07 Attachment 4 and discuss each item.

State the requirements for the unconditional release of items. – EO5 - Senior

Consider:

- Internal contamination
- Alpha contamination
- Pure beta contamination
- Size
- Was it disassembled?

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Amplifying information:

- If internal contamination is suspected then the unit must be dissembled so internal surfaces can be surveyed. If the internal conditions cannot be verified the item is to be controlled as radioactive material.
- If alpha contamination is suspected (i.e. from an Alpha Level 3 area) then complete a direct/ loose surface alpha survey. If no detectable activity is noted during internal or alpha contamination surveys then place the item in the center of a TEM and activate the count cycle.
- If pure beta contamination is suspected, then complete a direct/loose surface beta survey.
- If the item is too large to place inside a TEM then contact RP Supervision for proper survey methods to release the item.
- If the item had been disassembled it must be placed back into the same configuration for monitoring as it will be used once free released. It cannot be released piece by piece.

State the requirements for the unconditional release of items. – EO5 - Senior

Certain items require a survey plan to be developed using an Unconditional Release Survey Plan.

- MATERIAL RELEASE PLAN (**DEFINITIONS – EO 1)**
  - A WRITTEN PLAN DESCRIBING THE SURVEY REQUIREMENTS FOR REMOVING MATERIAL FROM THE RCA WHEN THAT MATERIAL DOES NOT FALL WITHIN THE BOUNDS OF THE PROCEDURE FOR RELEASE OF MATERIAL.

Amplifying information:
1. Survey methodology exists for special items (computers, video monitors, breakers, cameras, gauges and power tools) per Attachment 4, Unconditional Release of Certain Equipment.
2. For the release of a large volume of equipment, or for the release of very large items, a survey plan should be developed using an Unconditional Release Survey Plan.

State the requirements for the unconditional release of items. – EO5 - Senior

AGAIN:

Except for personal items, release of material from radiological control can only be performed by a senior ANSI qualified Radiation Protection technician.

State the basic operating characteristics of a Tools and Equipment Monitor (TEM). – EO6

What is this?

How does it work?

Ask students and use the next slide to summarize.

State the basic operating characteristics of a Tools and Equipment Monitor (TEM). – EO6

- Large area plastic scintillator detectors that surround all sides.
- Sensitive measuring volumes for the detection of gamma radiation.
- Ambient backgrounds in the cavities are minimized by lead shielding.

Typical TEMs include large area plastic scintillator detectors that surround all sides of the cavities providing highly sensitive measuring volumes for the detection of gamma radiation. Ambient backgrounds in the cavities are minimized by lead shielding.

State the requirements for the operation of a Tools and Equipment Monitor (TEM). – EO7

What considerations must be given to the size of items and self shielding effects?

There are also alarm set points requirements to consider:

- Established by the site based on:
  - Background
  - Instrument efficiency
  - Hard to detect radionuclides
- Should alarm when 5000 dpm of radioactivity has been detected.

If the TEM does not alarm, and direct frisk surveys are equivalent to background, then the item may be released.

Faciliate discussion on the question. Below is the minimum amplifying material:
1. Non-personal items less than 100 square cms in size cannot be released through TEM only. Additional surveys must be completed by a frisker or similar instrument in a background of <200 cpm.
2. Release of non-personal items can be completed by using a TEM. If the size of the object prevents the use of a tool monitor then RP Supervision will determine the survey methods.
3. If monitoring multiple items concurrently in the TEM, consider the effects of self-shielding. Avoid stacking items when possible. The shielding effects of approximately ¼ inch of steel or 2 inches of paper may reduce monitor sensitivity to unacceptable levels.
4. Alarms on a TEM indicate the presence of radioactive material and proper contamination controls will be implemented by the RP Technician in response to alarms. As a minimum wear protective gloves for removing the item and performing additional surveys.

State the requirements for the operation of a Tools and Equipment Monitor (TEM). – EO7

NOTE

If the item is released by survey methods other than a TEM then document the release on an Unconditional Release Survey.

State the requirements for the operation of a Tools and Equipment Monitor (TEM). – EO7

Right or Wrong?

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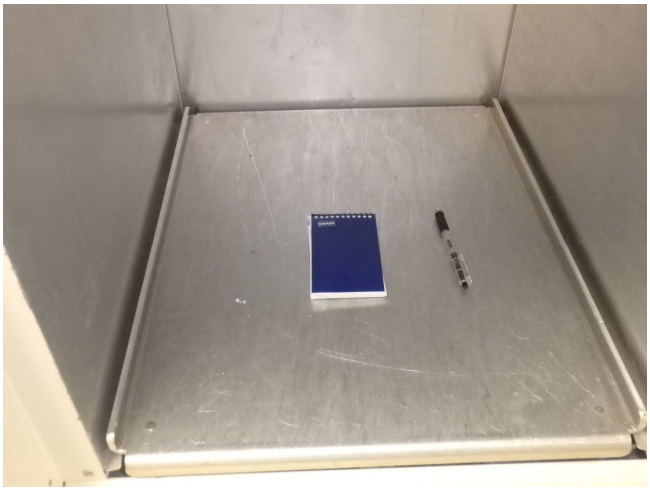
Instructor: Discuss with students

Wrong

- Items are stacked. Reduce the amount of material in there.
- Non personal items. Have they been evaluated by a senior RP technician?

State the requirements for the operation of a Tools and Equipment Monitor (TEM). – EO7

Right or Wrong?



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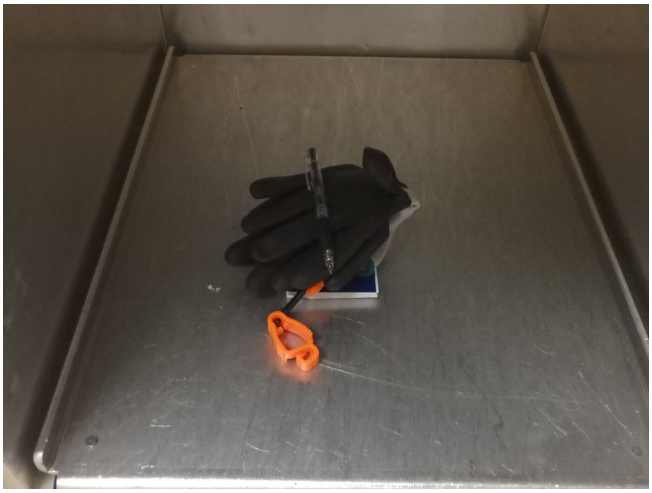
Instructor: Discuss with students

Right!

State the requirements for the operation of a Tools and Equipment Monitor (TEM). – EO7

Right or Wrong?



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Instructor: Discuss with students

Right!

State the requirements for the operation of a Tools and Equipment Monitor (TEM). – EO7

Right or Wrong?

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Instructor: Discuss with students

Could be either

- Non personal items. Have they been evaluated by a senior RP technician?

Recognize the level of approval needed and the requirements for transporting radioactive material that has been temporarily released from an RCA. – EO8 - Senior

Items that can not be released and are controlled per NISP-RP-04 may need to be moved from one RCA to another RCA.

Who's approval do we need to conditionally (temporarily) release an item?

- RP Supervisor
  - CONDITIONAL RELEASE (**DEFINITIONS – EO 1)**
    - A RELEASE OF RADIOACTIVE MATERIAL TO AN INDIVIDUAL OTHER THAN RP WITH SPECIFIC RADIOLOGICAL RESTRICTIONS OR CONTROLS WHILE OUTSIDE A POSTED RADIOLOGICALLY CONTROLLED AREA.

What criteria must be met to be conditionally released?

- Documented
- Labeled
- No loose surface contamination

Go over definition after the first question.
Criteria information:
Conditionally released items are to be documented in a Radioactive Material Log.
Item is labeled as radioactive material in accordance with NISP-RP-04, Radiological Posting and Labeling.
There is no loose surface contamination.

Recognize the level of approval needed and the requirements for transporting radioactive material that has been temporarily released from an RCA. – EO8 - Senior

- When conditionally releasing radioactive material you must verify it does not meet the requirements for posting of a Radioactive Material Area
- RADIOACTIVE MATERIAL AREA (**DEFINITIONS – EO 1)**
  - AN AREA IN WHICH LICENSED RADIOACTIVE MATERIAL IN AN AMOUNT EXCEEDING 10 TIMES THE QUANTITY SPECIFIED IN APPENDIX C, 10CFR20, IS USED OR STORED.
  - THIS DOES NOT APPLY TO RADIOACTIVE MATERIALS CONTAINED WITHIN PROCESS EQUIPMENT OR MATERIALS IN TRANSPORT AND PACKAGED AND LABELED IN ACCORDANCE WITH APPROPRIATE REGULATIONS.

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Some common Appendix C quantities:
Cs-137: 10 microcuries
Tc-99: 100 microcuries
Co-60: 1.0 microcurie

Recognize the level of approval needed and the requirements for transporting radioactive material that has been temporarily released from an RCA. – EO8 - Senior

What criteria must be met?

- There is no potential for spills or leaks.
- NISP-RP-04 requirements satisfied.
- Logged in on the appropriate RWP.
- The dose rate on the item is < 2.0 mrem/hr at 30 cm.

With RP Supervisor approval, items which have been surveyed and found to be radioactive can be conditionally released based on the following criteria:

There is no potential for spills or leaks.

The item is being transported to an area that satisfies NISP-RP-04 requirements and proper radiological controls have been established.

The individual transporting the material is logged in on the appropriate RWP and understands the requirements of transporting the radioactive material directly to the radioactive materials area.

The dose rate on the item is < 2.0 mrem/hr at 30 cm.

Explain the potential impacts and their consequences related to the movement and storage of radioactive material. – EO9

Impacts must be considered with the movement and storage of radioactive material.

- How much material is being moved?
- What is the radioactivity levels of what is being moved?
- Can the movement change the background dose rates in the old AND new area?

Go over Radioactive Material Area definition
Ask students what they would consider for a RAM movement
Go over impacts listed.

Amplifying information:
If the amount of licensed material stored in an area or room exceeds 10 times the quantity specified in 10CFR20, Appendix C, then the area is required to be posted in accordance with NISP-RP-04.

If the potential exists for the movement of radioactive material to change the dose rates at the boundary of the storage area, then RP will perform a survey and document the radiological conditions.

Consider the following potential impacts before radioactive material is stored inside the RCA:

Impacts on low dose waiting areas.
Impacts on ALARA estimates.
Impacts on plant operating systems such as Area Radiation Monitors.
Potential for contamination spread.
Potential for spill of liquids into clean areas or clean systems.

Impacts on fire loading and fire zones.
General housekeeping.

Contact appropriate site personnel for instructions for storage of mixed hazardous waste or material. Common mixed waste hazards include batteries, chemicals, and combustible liquids.

Explain the potential impacts and their consequences related to the movement and storage of radioactive material. – EO9

Items placed in storage should be clearly labeled in accordance with NISP-RP-04, showing all radiological hazards and contents of the package. The label should be attached in a manner to be easy to read.

State the requirements for storing radioactive material within buildings or in outside areas. – EO10

Requirements exist for the storage of radioactive material depending on where you put it!

- Within buildings
- Outside

Go over listed requirements below with the slide:

Items must be stored in containers suitable to prevent the spread of contamination. The package/container design should take into consideration the expected duration the item is projected to be in storage. Containers should be subjected to periodic inspections to ensure they do not degrade over time.

Radioactive material stored in outside areas where the material is subject to exposure to weather hazards should meet the following requirements:

1. Be contained in water tight containers with lids secured in place. If the size of the object is too large to fit inside a manufactured container, then contact RP Supervision for direction on a proper storage method.
2. Boxes or containers are inspected for leaks prior to being loaded.
3. Containers are staged/stored in areas that are not subject to flooding.

State the requirements for moving radioactive material. – EO11

When moving radioactive material consider that:

- Material must be labeled.
- Individual responsibility is key!
- Plant impact.
- Will surveys need to be complete?
- 10CFR37 Security requirements.

Ask the students what they must keep mind while moving radioactive material.
Go over listed requirements below:

All radioactive material shall be properly labeled in accordance with NISP-RP-04 prior to being transported from one location to another.

The individual transporting the radioactive material has the responsibility to ensure it reaches its final destination and is inside a properly posted area. Be aware of all radiological and industrial hazards associated with it.

The potential impact on plant operating equipment must be considered when transporting radioactive material. Radiation and process monitor alarm set points should be understood before transporting radioactive material in close proximity to them.

If the potential exists for the movement of radioactive material to change the dose rates at the boundary of a storage area, then RP will perform a survey and document the radiological conditions.

The movement of highly radioactive material can impact the site's 10CFR37 Security requirements. Prior to movement, contact RP Supervision to determine the potential

impacts to the station’s 10CFR37 implementation plan.

State dose rates requiring RP escort for moving radioactive material. – EO12

Some radioactive material movements require escorts.

Radiation workers may transport a RAM within in a RCA if:

- Dose rates are < 100 mrem/hr contact and < 4 mrem/hr at 30 cm
- Labeled.
- Properly contained.

Radiation workers may transport a RAM within in a RCA if:
Dose rates are < 100 mrem/hr contact and < 4 mrem/hr at 30 cm
The RAM package/container has been labeled in accordance with NISP-RP-04.
The RAM package/container is properly contained to prevent the spread of contamination.

State dose rates requiring RP escort for moving radioactive material. – EO12

Radiation workers may transport a RAM within in a RCA if:

- Dose rates are < 100 mrem/hr contact and > 4 mrem/hr at 30 cm.
- Labeled.
- Properly contained.
- RP approval.
- The new storage area is properly posted.

Radiation workers may transport a RAM package/container inside the RCA when dose rates are > 4 mrem/hr at 30 cm but < 100 mrem/hr at 30 cm, as long as the following conditions have been met:

The RAM package/container has been labeled in accordance with NISP-RP-04.

RP approves the movement of the RAM package/container to the new storage location, agrees to the transport route, and determines the radiological controls.

The storage area is properly posted and the addition of the item will not affect the posting at the radiological boundary.

The RAM package/container is properly contained to prevent the spread of contamination.

State dose rates requiring RP escort for moving radioactive material. – EO12

RP personnel must escort all RAM package/containers with a dose rate > 100 mrem/hr at 30 cm.

State dose rates requiring RP escort for moving radioactive material. – EO12

Radiation workers may transport a RAM between RCAs if:

- Dose rates are < 100 mrem/hr contact and < 4 mrem/hr at 30 cm.
- Radiation Protection approval.
- Labeled.
- Properly contained.

Radiation workers may transport a RAM between RCAs if:
Dose rates are < 100 mrem/hr contact and < 4 mrem/hr at 30 cm.
Notify Radiation Protection for approval prior to transport.
The item has been labeled in accordance with NISP-RP-04, Radiological Posting and Labeling.
The item is properly contained to prevent the spread of contamination.

State the requirements to unconditionally release liquids. – EO13 - Senior

- Site specific procedures will provide guidance for sample methods for liquids including the sample container and volume requirements.
- Liquids can only be released after a review of all analysis has been completed.
- Liquids should be analyzed for tritium if there is the potential for tritium activity to be present.
- Ensure a representative sample of the liquid is obtained. This may require the liquid to be mixed or recirculated to ensure some contaminates have not separated in the liquid.

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Ensure a representative sample of the liquid is obtained. This may require the liquid to be mixed or recirculated to ensure some contaminates have not separated in the liquid.
Control the liquid as radioactive material until the sample indicates it can be free released.
Liquids can be free released once the analysis indicates the activity is below the environmental LLD values (i.e. no detectable activity) for both gamma emitters and tritium (as applicable) or contains only naturally occurring isotopes.
Once the sample analysis has been reviewed and indicates the liquid is releasable, survey the exterior container to ensure it is free of radioactive material by completing a smear and direct frisk.
Consider other controls which may be required for the liquids such as flammable, safety, or environmental toxic hazards.

State the requirements to unconditionally release liquids. – EO13 - Senior

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- Consider other controls which may be required for the liquids such as flammable, safety, or environmental toxic hazards.

State the requirements to unconditionally release bulk or aggregate materials. – EO14- Senior

- Site specific procedures will provide guidance for sample methods for bulk or aggregate materials including the sample container and volume requirements.
- Bulk or aggregate material can only be released after a review of all analysis has been completed.
- Ensure enough samples are taken of the bulk or aggregate material to determine the radiological characteristic of the overall volume. The sample plan should be approved by RP Supervision.
- Examples of bulk or aggregate materials are sand, soil, concrete rubble, gravel, resins or other types of material where the concentration of radioactive material is expected to be uniform if present.

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Bulk or aggregate materials

Site specific procedures will provide guidance for sample methods for bulk or aggregate materials including the sample container and volume requirements.

Bulk or aggregate material can only be released after a review of all analysis has been completed.

Ensure enough samples are taken of the bulk or aggregate material to determine the radiological characteristic of the overall volume. The sample plan should be approved by RP Supervision.

Examples of bulk or aggregate materials are sand, soil, concrete rubble, gravel, resins or other types of material where the concentration of radioactive material is expected to be uniform if present

State the requirements to unconditionally release bulk or aggregate materials. – EO14- Senior

- If the bulk or aggregate material is concrete, or from a location where a radioactive liquid spill could have occurred, consider the need for sampling for tritium contamination.
- Bulk or aggregate materials should be controlled as radioactive material until sample results indicate it can be free released.
- Bulk or aggregate material can be released once sample analysis indicates only the presence of naturally occurring radioisotopes or all isotopes is below environmental LLD values

Describe methods used for decontamination of areas within a plant. – EO15

What can we do if something is radioactive material and we would like for it not to be?

Decontamination!

– The process of removing radioactive material from surfaces or areas where it is not desired.

Why is it done?

– To reduce overall risk and radioactive exposure.

Describe methods used for decontamination of areas within a plant. – EO15

In order to ensure a good decontamination program, efforts are tracked:

- Surveys are performed after each decontamination attempt to verify a decrease in contamination from previous levels. This process continues until either the contamination is removed, or, it becomes apparent that the present decontamination technique being used may be ineffective.
- Maintain ALARA by verifying the effectiveness of the decontamination activities.

Describe methods used for decontamination of areas within a plant. – EO15

Three classifications of chemicals are used in decontamination:

- Acids/Alkalis
- Oxidizers/Reducers
- Complexing or Chelating compounds

They work by:

- Emulsifying the contamination
- Capturing dirt and preventing redisposition
- Forming a compound with the contaminant

Describe methods used for decontamination of areas within a plant. – EO15

What are the two types of contamination?

Loose Surface Contamination
- Easily washed.
- Airborne hazard.
- Easily transferred or tracked.

Fixed Contamination
- Very difficult to remove.
- Considerable time, effort, and cost.
- Loose contamination problem in future.
- Airborne hazard.

Ask the students for the

Loose Surface Contamination
Can be decontaminated by wiping or light washing
Can be an airborne hazard
Can be easily transferred or tracked to different areas

Fixed Contamination
Very difficult to remove
Considerable time, effort, and cost to decontaminate
Can become a loose contamination problem in future
Can become airborne when mechanically disturbed
two types of contamination and then go over the details below:

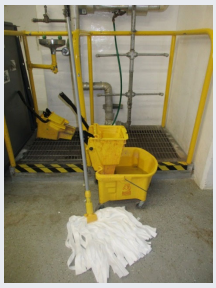
Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

Loose Surface Contamination	Fixed Contamination
Mopping/Brushing	Hydrolasing
Wiping	CO2 blasting
Vacuuming	Grit Blasting
Taping	Strippable Coating
Spray washing	

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

Loose Surface Contamination	
Mopping/Brushing 	Advantages • Effective for large areas • Brushes can work well on fixed contamination Disadvantages • Potential for cross contamination • Not effective on porous surfaces • Can become source term

Often used for large areas where washing with a decontamination agent would be effective.

When using mops for large areas, move the mop in a figure eight pattern or small and frequent thrusting motions. The mop head should be changed often to minimize cross contamination. Whenever changing a mop head, leave the mop down on the floor (keeps contamination such as particles, dirt, paint chips, etc. from spreading due to extra handling)

When using brushes in certain instances, approval may be required due to FME concerns.

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

Loose Surface Contamination	
Wiping	Advantages • Simplicity • Low Cost • Readily Available Disadvantages • Ineffective on porous materials • Can become source term • Generates radioactive waste

A good technique to use is blotting dry a surface with an absorbent cloth if there is any free standing liquid.

Disposable rags are used in conjunction with water/decontamination solution mixture to wipe down components

After dampening the cloth with the agent to be used, wipe the surface, frequently folding the cloth in on itself to trap and pick up loosened particles of contamination.
When wiping is complete, if practical, rinse the surface with clean water, and then allow it to dry.

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

Loose Surface Contamination	
Vacuuming	Advantages • Good performance on porous materials • Minimizes Waste • Relatively inexpensive • Practical for large and small areas Disadvantages • May become a radiation source • Vacuums become radioactive material • Works for loose contamination only

Industrial canister type vacuum cleaners equipped with a High Efficiency Particulate Air (HEPA) filter on the exhaust is very efficient for decontamination of various surfaces.

Use caution when using electrically powered tools in an area where water is present. If the floor is wet, take precautions to prevent shock (i.e. run extension power chords over head, don't stand in water, use appropriate power strips and electrical safety equipment).

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

Loose Surface Contamination	
	Advantages • Simple • Effective on porous and nonporous surfaces Disadvantages • Chlorides in tape can be corrosive to metal • Inefficient for large areas • Can become a Contamination trap • Excessive waste generation
Taping	

Adhesive tape can be a simple, quick and productive method for lifting loose surface contamination off of material surfaces.

Do not use adhesive tape on Stainless Steel or other sensitive equipment.

Not only can the adhesive leave a residue that could gum up or interfere with sensitive equipment, but also the adhesive of most tapes contains a large amount of Chlorides.

Also the residue left behind can become a trap for contamination leading to increased dose rates and difficulty in decontaminating items.

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

Loose Surface Contamination	Fixed Contamination
Advantages • Effective on small and large areas/items • Effective on porous materials • Only waste generated is water	Hydrolasing
Spray washing	Disadvantages • High pressure and electrical safety hazards • Necessity of waterproof protective clothes • Can spread contamination without proper planning • Can cause airborne radioactivity

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This is spray washing AND hydrolasing.

The units use a positive displacement pump to raise the pressure of a water source up to several thousand PSI.
Hydrolasers can be used effectively to decontaminate tools, installed equipment, or small and large areas.
Because of the extremely high pressures and water velocities, these units can be an extreme safety hazard if used incorrectly.
Some of the high pressure sprays discharge at a high enough energy to cut through wood or even concrete.

Hydrolasing is considered a form of spray washing. Spray Washing is utilizing water, with or without a detergent, to wash/decontaminate items. Hydrolasing is considered High Pressure Spray Washing. There is also low pressure spray washing.

Low Pressure spray washing also has similar advantages and disadvantages. The use of pressure washers for example during cavity decontamination, is considered a low pressure spray washing (by comparison to the hydrolaser). Using hoses with the same rated pressure as roughly a garden hose, is also a good example of low pressure spray washing. By utilizing a lower pressure, contamination is less likely encapsulated in the water and

more likely to get washed off of walls and floors, as opposed to high pressure spray washing which can create airborne radioactivity.

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

	Fixed Contamination
Advantages • Can use on electrical components • Leaves no waste other than what was removed on material surface • Effective on porous surfaces • Completely contained therefore minimizes spread of contamination • CO2 beads are not very abrasive so surface erosion is minimal	CO2 blasting

The cleaning process of this system is a unique, dry cleaning operation that does not use liquids of any type.

Solid carbon dioxide particles propelled by dry compressed air, shatter upon impact with the surface of the material to be cleaned.

As soon as the solid pellet shatters, it flashes into dry CO2 gas.

Flashing into a gas results in a rapid volume increase of approximately 10 to 1.

Achievement of the decontamination process is by the rapid expansion of the gas into the small imperfections in the materials surface that holds the contamination.

The blasting is performed inside a containment designed for the unit.

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

	Fixed Contamination
Disadvantages • Only items that can be moved into the CO2 blaster booth can be cleaned • Requires a large HEPA ventilation system to draw off the CO2 gas from the work area.	CO2 blasting

The cleaning process of this system is a unique, dry cleaning operation that does not use liquids of any type.

Solid carbon dioxide particles propelled by dry compressed air, shatter upon impact with the surface of the material to be cleaned.

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Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

	Fixed Contamination
Advantages • Very Effective in removing fixed contamination • Protective Clothing Not required	
Disadvantages • Dust, Grit Waste • Waste filter becomes radioactive waste • Items need to be resilient; i.e. cannot use on more sensitive pieces of equipment	Grit Blasting

The decontamination process does not require any liquid.

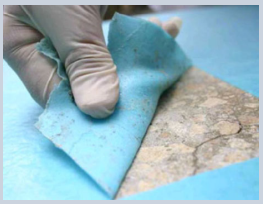
Aluminum oxide is used via supply air to decontaminate.

Blasting is performed in containment.

Pressure can be adjusted with the regulator to decontaminate delicate items.

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

	Fixed Contamination
Advantages • Can be effective on porous materials like concrete • Useful for large flat areas Disadvantages • Area inaccessible while drying • Fumes while applying • Removed coating can become a source term • Difficult to remove if not applied correctly	 Strippable Coating

Special, strippable coating can be applied to contaminated surfaces and allowed to dry.

Coating should be sufficient and thick. If too thin, can be very difficult to remove.

Once the coating has dried, it can be pulled off, pulling up contamination that has adhered to it.

Describe methods used for decontamination of areas within a plant. – EO15

Methods Used for Decontamination

Loose Surface Contamination	Fixed Contamination
Mopping/Brushing	Hydrolasing
Wiping	CO2 blasting
Vacuuming	Grit Blasting
Taping	Strippable Coating
Spray washing	

Instructor: Using your experience, put students in a few scenarios and have them pick what method they would use to decontaminate and why.

Describe methods used for decontamination of areas within a plant. – EO15

Chemical control is a vital part of decontamination as well!

- Chemical Storage Area
- Safety Data Sheets
- OSHA Labeling

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Chemical Storage Area
(a) Includes most areas where chemicals are stored (lockers, cages (stationary or portable), trailers, general work areas, office areas, vehicles/carts).
(b) Approved by the Site Chemical Control Coordinator (SCCC) and others if applicable. (Chemistry Manager, Safety, Radiation Protection, Security, Fire Protection).
(c) Is selected or requested by the Department Chemical Control Coordinator (DCCC) or responsible individual
(d) Refer to Section 5.8 for complete details. Note- Portions of storage with regards to Section 5.8 will be covered in the following slides

Safety Data Sheets
An information sheet describing the chemical and physical characteristics of a substance or a mixture of substances.
(a) Safety Data Sheets can be found in your site's chemical control database.
(b) IF the SDS is not available contact RP supervision.

OSHA Labeling
Product identifier means the name or number used for a hazardous chemical on a label or in the SDS. It provides a unique means by which the user can identify the chemical. The product identifier used shall permit cross-references to be made among the list of

hazardous chemicals required in the written hazard communication program, the label and the SDS. As it applies to this procedure, all chemicals or products controlled by this procedure shall be labeled as follows:
(a) A Chemical Use Label or Sticker with the above information
(b) Original manufacturer/ supplier labeling when no Chemical Use label is used
(c) Handwritten identity of the chemical(s) or product(s) and appropriate hazard warnings, and Chemical Use number.

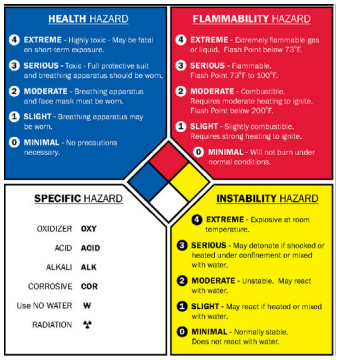
Describe methods used for decontamination of areas within a plant. – EO15

Storage Colors	Storage Code	Chemical Type
Red	FL	Flammable
Green	CA	Corrosives/Acids
White	CB	Corrosives/Bases
Yellow	OX/RX	Oxidizers/Reactives
Gray	GS	General Storage

Store chemicals together based on:
- Unless otherwise specified, no other chemical other than some gray labeled chemicals may be stored in a flammable locker with flammable products.
- The storage code or background color of the chemical label
- Guidance on the Chemical Use Data Sheet on the SDS, as applicable to each site.

Describe methods used for decontamination of areas within a plant. – EO15

- The NFPA Diamond is designed to give general hazard information for chemicals. Each section represents a particular hazard.
- Health, Flammability, and Instability are rated 0-5 (with 0 being a minimal hazard to 5 being an extreme hazard).
- The specific hazard will be labeled with the corresponding abbreviation or symbol for that hazard Chemical Storage Area.



Review

1. Define the following terms:
   - Conditional Release
   - Detectable Radioactivity
   - Personal Clothing
   - Personal Items
   - Radioactive Material Area
2. Items may be considered to be free released as long as which criteria are met?
3. Are personal items required to be monitored using the Tool and Equipment monitor (TEM) prior to leaving the RCA? If so, when?
4. Who may unconditionally release items from the RCA?
5. What are the minimum protective gear requirements when working with objectives that alarmed the TEM?
6. All Radioactive Material must be stored in containers that are what?

These are just a list of sample questions. Other review questions should be made considering how the class went. Focus on what the class had the most questions about.

Reference the previous slides for the correct answers.

Terminal Objective - Review

Given radioactive material, move, store, and recognize the need to release by a senior RP technician in accordance with NISP-RP-07, Control of Radioactive Material.

Control of Radioactive Material Within an RCA Training Conclusion:

- Questions:
- Feedback:
- Conclusions:

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Provide course feedback to EPRI STE program: clear@epri.com