

Course Title: Radiological Control Technician
Module Title: Radiological Work Coverage
Module Number: 2.11

Objectives:

- 2.11.01 List four purposes of job coverage.
- 2.11.02 Explain the differences between continuous and intermittent job coverage.
- 2.11.03 Given example conditions, identify those that should require job coverage.
- 2.11.04 Identify items that should be considered in planning job coverage.
- 2.11.05 Identify examples of information that should be discussed with workers during pre-job briefings.
- 2.11.06 Describe exposure control techniques that can be used to control worker and technician radiation exposures.
- ⇒ 2.11.07 Describe the in-progress radiological surveys that should be performed, at your site, under various radiological conditions.
- ⇒ 2.11.08 Describe site requirements for documentation of in-progress radiological surveys.
- ⇒ 2.11.09 Explain actions that should be taken if surveys show radiological conditions significantly different from that expected.
- 2.11.10 Describe contamination control techniques that can be used to limit or prevent personnel and area contamination and/or reduce radioactive waste generation.
- 2.11.11 Describe job coverage techniques that can be used to prevent or limit the spread of airborne radioactive material.
- 2.11.12 Describe overall job control techniques in maintaining control of radiological work.
- 2.11.13 State the reasons to stop radiological work activities in accordance with the DOE RCS.

References:

1. "DOE Radiological Control Standard," DOE-STD-1098-99 (1998)

Instructional Aids:

1. Overheads
2. Overhead projector/screen
3. Chalkboard/whiteboard
4. Lessons learned

I. MODULE INTRODUCTION

A. Self Introduction

1. Name
2. Phone number
3. Background
4. Emergency procedure review

B. Motivation

The purpose of job coverage by RCTs is to assist workers in keeping their radiation exposures ALARA.

C. Overview of Lesson

1. Explanation of job coverage
2. Conditions requiring job coverage
3. Prerequisites for planning job coverage
4. Job coverage techniques

D. Introduce Objectives

II. LESSON OUTLINE

A. Explanation of Term "Job or Work Coverage"

1. Purposes

- a. Radiation exposure control
 - 1) Keep ALARA
 - 2) Keep within limits

O.H.: Objectives

Ask students what is meant by job or work coverage.

Modify their answers for correctness.

Objective 2.11.01
Ask students for the purposes of job coverage. Modify their answers for coverage and list on blackboard.

- b. Contamination control
 - 1) Reduce creation
 - 2) Reduce spread
 - c. Airborne radioactive material control
 - 1) Reduce creation
 - 2) Reduce spread
 - d. Radioactive waste
 - Reduce creation
2. Types
- a. Continuous
 - Technician remains at the job site during entire job and covers only that job
 - b. Intermittent
 - Coverage of more than one job or periodic checks for job coverage
- B. Conditions Requiring Job Coverage
- 1. Workers doses near limits
 - 2. Radiation levels increase significantly
 - 3. Entry to some high radiation levels
 - 4. Spreading contamination or airborne
 - 5. Contamination or airborne levels increase significantly
 - 6. Questions regarding the adequacy of personnel dosimetry being used
 - 7. Inexperienced workers

Objective 2.11.02

Objective 2.11.03
Ask the students for conditions that could require job coverage. Modify their answers and write on the board. After you write on the board, give an example of each condition.

C. Prerequisites for Planning Job Coverage

1. Detailed job description
2. Review past problem areas
 - a. Review surveys
 - b. Talk with technicians
 - c. Review applicable Post Job ALARA Reviews
3. Review system
 - a. Effects of opening
 - b. Effects of welding, cutting, grinding
4. Detailed survey
 - a. Job site

High and low dose rate areas

 - Extremity dose rates
 - Beta dose rates
 - Hot Spots
 - Other possible hazards
 - b. Pathways to site
 - c. Identify
 - 1) Contamination levels
 - 2) Airborne levels

Objective 2.11.04
 Ask student what items should be planned before going on to the job site. Modify their answers for correctness. Write their answers on the board. Explain why each item must be considered. (See appropriate site document)

Explain that by knowing the dose rate, individuals can avoid areas of highest dose rate and wait in low dose rate areas.

<p>5. Record workers' allowable exposures</p> <p>6. Communications with workers</p> <ul style="list-style-type: none">a. Face-to-faceb. Hand signalsc. Remote headsetsd. Safety linese. Portable radios <p>7. Communications with lab</p> <ul style="list-style-type: none">a. Transferring air samplesb. Results of surveys, samples	<p>Explain that these limits should be written down and taken to the job site. Do not trust memory.</p> <p>Ask students how communications can be achieved. Write their answers on the board.</p>
<p>8. Equipment at job site</p> <ul style="list-style-type: none">a. Dosimetersb. Chargerc. Air samplerd. Survey instrument(s)e. Respirator (if needed)f. Watch or clockg. Emergency Actions and Emergency Exits	<p>Ask the students what equipment should be available at the job site. List the equipment on the board. Explain why each could be needed.</p>

<p>9. Pre-job Briefings</p> <ul style="list-style-type: none"> a. Radiological conditions b. Effect of job on conditions c. Communications method d. Special dosimetry e. Special protective clothing f. RCT functions g. Importance of following the RWP and its specific directions 	<p>Objective 2.11.05 Explain that by keeping the workers on the job informed, communications will be improved. Ask the students what information should be given to the workers. Write the information on the board.</p>
<p>D. Job Coverage Techniques</p>	<p>Objective 2.11.06 Explain that the exact techniques used will vary depending on the job, radiological conditions, and worker experience. For each of the following techniques, state the technique and <u>why</u> it is necessary. Teach as a discussion.</p>
<p>1. Exposure Control</p>	<p>Write "Exposure Control" on the board. List the techniques under this heading. Leave these techniques under this heading. Leave these techniques on the board. Use the same method for Sections 2-4, so that at the end of the lecture all four headings and the respective techniques will be on the board.</p>

- a. Perform frequent surveys during job performance
 - 1) Purpose and types of surveys
 - 2) Base on probability of conditions changing
 - 3) Required by operational procedures
 - 4) Document Surveys
 - a) Purpose
 - b) Requirement
 - 5) Report unusual conditions to management
 - 6) Verify dose rates remain as posted
- b. Wait in low dose rate areas
 - 1) Purpose
 - 2) Identify from survey
 - 3) Reduces time in radiation area
- c. Check dosimeters
 - 1) Purpose

Accumulated dose
 - 2) Technician reads
 - 3) Have workers read
 - 4) Reduce contamination of dosimeter
 - a) Remove outer glove
 - b) Use clean glove

For examples of when surveys are required during job performances, refer to site procedures.

Ask students how this can reduce dose received. Modify answers for correctness.

- d. Determine time allowed in areas

$$\text{Time} = \text{Authorized Exposure} / \text{Dose Rate}$$

- e. Workers location vs. dose rate

- 1) Purpose

Determine dose received

- 2) $\text{Dose} = \text{Dose Rate} \times \text{Time}$

- f. Document workers' locations and times

Purpose

- Prevent reliance on memory
- Inaccurate dose estimates

- g. Workers dosimetry location vs. dose rate

- 1) Purpose

Dose estimation

- 2) May require special dosimetry

a) Finger badges

b) Extremity

c) Head

- h. Modify temporary shielding

- 1) Purpose

Prevent un-evaluated exposure rates

- 2) Must have Rad Con approval

- i. Modify temporary shielding - Rad Con

Must evaluate before moving

Explain that not all of the time can be allowed for performing the job. Workers may receive significant exposure going to and leaving the job.

Ask the students why this is an important concept. Use a drawing to illustrate an example if necessary.

<p>j. In-progress radiological surveys <i>(Insert site specific information here)</i></p>	Objective 2.11.07
<p>k. In-progress radiological survey documentation <i>(Insert site specific information here)</i></p>	Objective 2.11.08
<p>l. Unexpected radiological conditions <i>(Insert site specific information here)</i></p>	Objective 2.11.09
<p>2. Contamination Control</p>	Objective 2.11.10
<p>a. Watch workers</p>	Write "Contamination Control" beside "Exposure Control." List each technique beneath Contamination Control.
<p>1) Purpose</p>	Ask the Students what actions they should be looking for.
<p>Lessen personnel and area contamination</p>	
<p>2) Look for</p>	
<p>a) Hand to face movements</p>	
<p>b) Dropping tools</p>	
<p>c) Hammering</p>	
<p>d) Scuffing feet</p>	
<p>e) Wire brushing</p>	
<p>b. Transferring material</p>	
<p>1) Bagging</p>	Thoroughly cover all of the correct practices in bagging tools, trash or equipment.
<p>2) Plastic sheets</p>	
<p>3) Floor cover for pathway</p>	

<p>c. Tools and equipment</p> <p>Methods</p> <ul style="list-style-type: none"> • Taping • Using previously contaminated tools <p>d. Equipment going from contaminated to clean areas</p> <p>Examples</p> <ul style="list-style-type: none"> • Crane rigging • Air and water hoses (secure hoses/lines) <p>e. Reduce radioactive waste</p> <p>1) Purpose</p> <ol style="list-style-type: none"> a) Reduce contamination b) Reduce costs c) Reduce processing time d) Reduce dose <p>2) Techniques</p> <ol style="list-style-type: none"> a) Remove packing material b) Minimize water for decon <p>3. Airborne Radioactivity Control</p>	<p>Ask students what steps can be taken to lessen the probability of contaminating tools and equipment before use.</p> <p>Ask the student for examples of equipment that may go from contaminated to clean areas.</p> <p>Write "Airborne Radioactivity Control" on the board. List the techniques beneath this heading.</p>
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- a. Actions creating airborne
 - 1) Actions causing
 - a) Opening systems
 - b) Welding, grinding, cutting
 - c) Hammering
 - d) Wire brushing
 - e) Sweeping
 - f) Leaks and sprays
 - g) Air hose systems/tools
 - 2) Corrective actions
- b. Portable air samples
 - 1) Purpose
 - Identify problem
 - 2) Analyze in lab
 - Time delay
 - 3) Corrective measures
- c. Continuous air monitors (CAMs)
 - 1) Purpose
 - Identify problem
 - 2) Immediate indication

Objective 2.11.11
Ask the students what actions could create airborne. modify their answers for correctness.

Ask students for a disadvantage of analyzing the sample in a lab.

Ask the students for an advantage of CAMs vs. portable air samples.

<p>3) Corrective measures</p> <p>d. Ventilate enclosed areas</p> <p>1) Purpose</p> <p>a) Remove airborne</p> <p>b) Contain airborne</p> <p>2) Installed ventilation</p> <p>3) Temporary Ask students for examples of temporary ventilation.</p> <p>a) Fans with hose and HEPA filters</p> <p>b) Hose from installed duct of HVAC</p> <p>c) Tents</p> <p>4. Overall Job Control Techniques</p> <p>a. Establish worker trust and confidence</p> <p>1) Purpose</p> <p>Improve communications</p> <p>2) Earned not given</p> <p>3) Techniques</p> <p>a) Reliable</p> <p>b) Realistic</p> <p>c) Credible</p> <p>d) Consistent</p>	<p>Ask the students for the disadvantages of CAMs compared to portable samplers.</p> <p>Objective 2.11.12 Write "Overall Job Control" on the board. List the techniques beneath this heading.</p> <p>Ask students for characteristics of people they trust. Point out that they should develop the same characteristics to earn worker trust.</p>
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- b. Keep workers in sight
 - 1) Purpose
 - a) Identify poor work habits
 - b) Correct poor work habits
 - 2) Sometimes impossible
- c. Keep contact with workers
 - 1) Purpose
 - a) Improve rapport
 - b) Alleviate worker apprehension
 - 2) Techniques
 - a) Face to face
 - b) Remote communications
- d. Workers' Notification to RC
 - 1) Purpose
 - Prevent un-evaluated radiological conditions
 - 2) Before opening systems
 - 3) Before changing work techniques
- e. Correct poor work habits
 - 1) Purpose
 - a) Prevent contamination of workers and area
 - b) Keep doses ALARA

Explain that most workers are apprehensive when using remote communications. Staying in contact alleviates their concerns.

State that even though RWP's usually require workers to notify RC, the technician should remind the workers of the requirement and explain the reasons why to the workers.

- 2) Techniques
 - a) Offer as advice
 - b) Explain consequences
 - c) Explain proper method
- f. Show a positive, helpful attitude toward co-workers
 - Purpose
 - Improve communications
 - Improve credibility
 - g. Don't overreact
 - 1) Consequence
 - 2) Remain calm
 - h. Stop Work Authority
 - 1) Purpose
 - 2) Maintain Control
 - 3) Reevaluate situation
 - 4) Correct problem before allowing work to continue
- 5) Stop work when:
 - a) Inadequate radiological controls
 - b) Radiological controls not being implemented
 - c) Radiological hold point not being satisfied

Objective 2.11.13

Teach as a discussion. Present the students with the problem area and ask for the consequences of the problem and how the problem could be solved. Note that more than one answer could be correct. Encourage student participation by asking if there are more ideas or if they are all in agreement with the solution.

- d) Any workers dosimeter alarms or exhibits unexpected readings
- 6) Example situation of when to use stop work authority
- 5. Common problem areas
 - a. Remaining in work area, not lower exposure area.
 - b. Leaning or sitting on high contact dose rate equipment.
 - c. Not using existing shielding to full advantage.
 - d. Improperly handing item out of controlled area.
 - e. Not catching radioactive liquids (if applicable).
 - f. Creating unnecessary radwaste.
 - g. Improperly ventilating areas.
 - h. Removing high dose rate items from work areas.
 - i. Moving crane rigging in and out of contaminated areas.
 - j. Improperly controlling hot sparks and burning slag when welding.
 - k. Remaining in high dose rate areas beyond time allowed.
 - l. Opening systems or containers before notifying RC.
 - m. Changing work methods before notifying RC.

III. SUMMARY

- A. Review major points
 - 1. Explanation of job coverage
 - 2. Conditions requiring job coverage
 - 3. Prerequisites for planning job coverage
 - 4. Job coverage techniques
- B. Review learning objectives

IV. EVALUATION

Evaluation should consist of a written examination comprised of multiple choice, fill-in the blank, matching and/or short answer questions. 80% should be the minimum passing criteria for examinations.