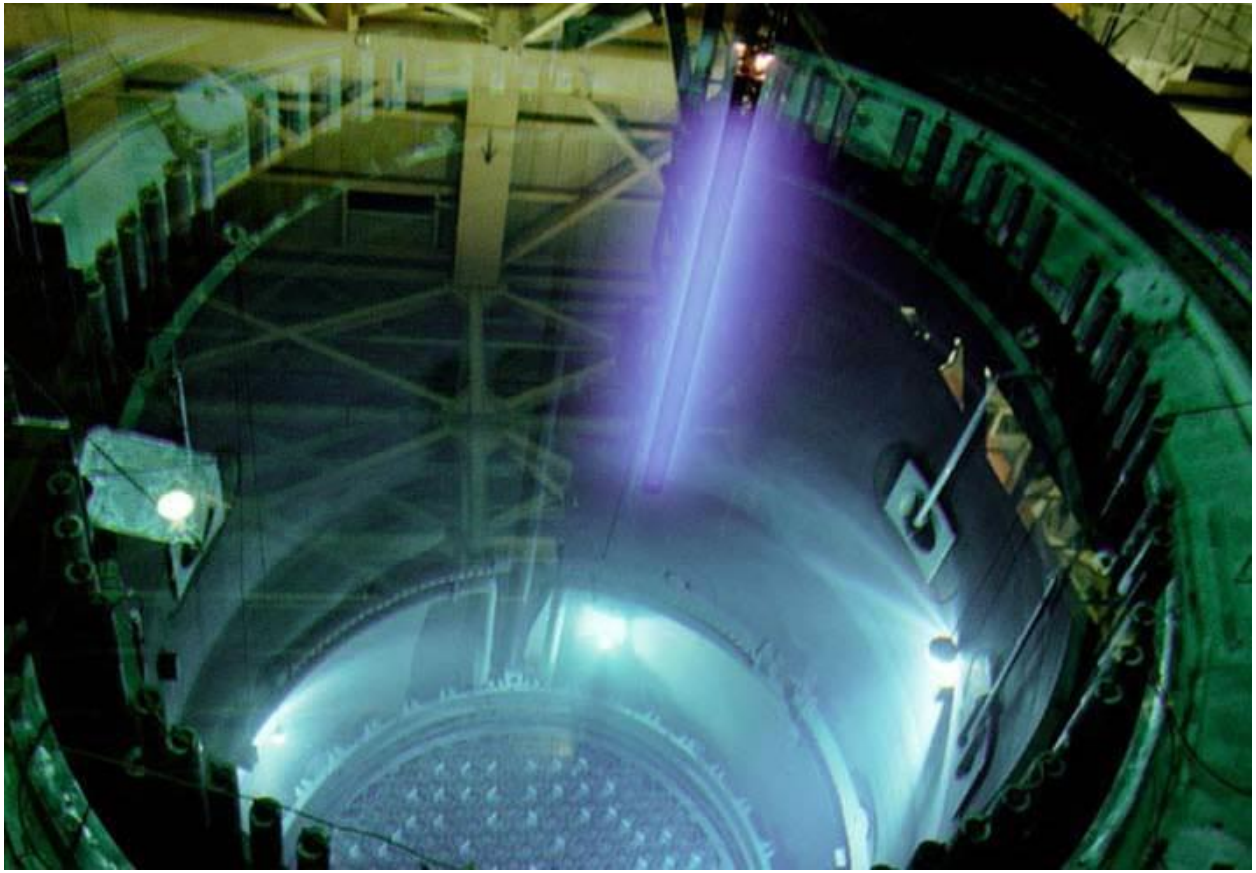
Radiological Job Coverage

STE RP 02.10 and 03.10, Rev #0

Why is this Important?



OPEX

When reviewing Operating Experience (OPEX) consider:

What Happened?

Why did it happen?

How can it happen at my work location?

What are our barriers?

What are the lessons learned?

OPEX – ICES 420919

Workers Enter Incorrect Location Inside of a Locked High Radiation Area

05-17-2017

EVENT:

Four individuals attended a LHRA brief to enter the Drywell and proceed to the bioshield for nozzle inspections.

The supplemental RP technician performing the LHRA briefing did not use the LHRA Briefing Form checklist as required by procedure and instead went from memory during the brief.

The supplemental RP technician briefed the individuals to an incorrect travel path.

The individuals were monitored remotely during the entry with telemetry, communications, and cameras.

OPEX – ICES 420919 (cont.)

EVENT (cont.):

The individuals entered the Drywell which is posted LHRA, on the correct Radiation Work Permit (RWP) and with the correct electronic dosimeter set points.

The individuals then proceeded to the work location via the travel path briefed to them by the supplemental RP technician.

Shortly after arriving at the entrance to the bioshield the individuals entered and began to look for the nozzles to inspect.

Within minutes the individuals realized they were in the wrong location.

Simultaneously, the Radiation Protection technician providing remote coverage identified the individuals were in the wrong location via camera and directed the individuals to exit the area.

Dose and dose rates encountered were within the RWP limits.

OPEX – ICES 420919 (cont.)

Lessons Learned:

The individuals were briefed from memory resulting in a travel path to the incorrect location of the nozzles.

The brief that was required for the RWP was inadequate.

Barriers in Place:

Procedures

Training

Continuous Job Coverage

Terminal Objective – RP02.10

Given a job coverage task involving sources of radiation and/or radioactive material, PERFORM low radiological risk job coverage in accordance with NISP-RP-10, Radiological Job Coverage.

Enabling Objectives – RP02.10

From memory and in accordance with NISP-RP-10, students will:

1. Describe techniques used to reduce radiation exposure, including prefabrication, shielding, special tools, engineering controls, and decontamination.
2. List the requirements for entry into various areas in the plant.
3. Describe the different levels of job coverage.
4. Explain what actions should be taken when monitoring and controlling discrete radioactive particles.
5. List when DAC tracking is required for airborne radioactivity areas.
6. Describe the radiological surveys required for various scenarios.

Enabling Objectives – RP02.10

From memory and in accordance with NISP-RP-10, students will:

7. List the actions to be taken upon completion of radiological work coverage.
8. Describe the requirements for non-standard dosimetry use and placement.
9. Recall techniques for controlling exposure to beta radiation.
10. Explain methods to keep worker and station dose ALARA.
11. Calculate estimated neutron dose when given a mixed neutron and gamma dose rate field.
12. Describe shielding principles, including installation and removal.

Enabling Objectives – RP02.10

From memory and in accordance with NISP-RP-10, students will:

13. State the importance of using body shield vests properly, including precautions and limitations.
14. Explain the responsibility of the RP Technician when covering work, including use of Stop Work Authority.
15. Identify potential warning signs that a radiological incident may occur or is in progress.
16. Recall the expected response to a radiological incident.

Terminal Objective – RP03.10

Given a job coverage task involving sources of radiation and/or radioactive material, PERFORM medium or high radiological risk job coverage in accordance with NISP-RP-10, Radiological Job Coverage.

Enabling Objectives – RP03.10

From memory and in accordance with NISP-RP-10, students will:

1. Describe prejob radiological survey requirements and follow-up actions.
2. Describe how the results of ALARA reviews are implemented.
3. Explain the factors that determine the need for and type of respiratory protection equipment to be used during radiological work.
4. Explain how to determine the type and location of whole-body dosimetry.
5. Identify the criteria that determine the need for multiple badging or extremity monitoring.

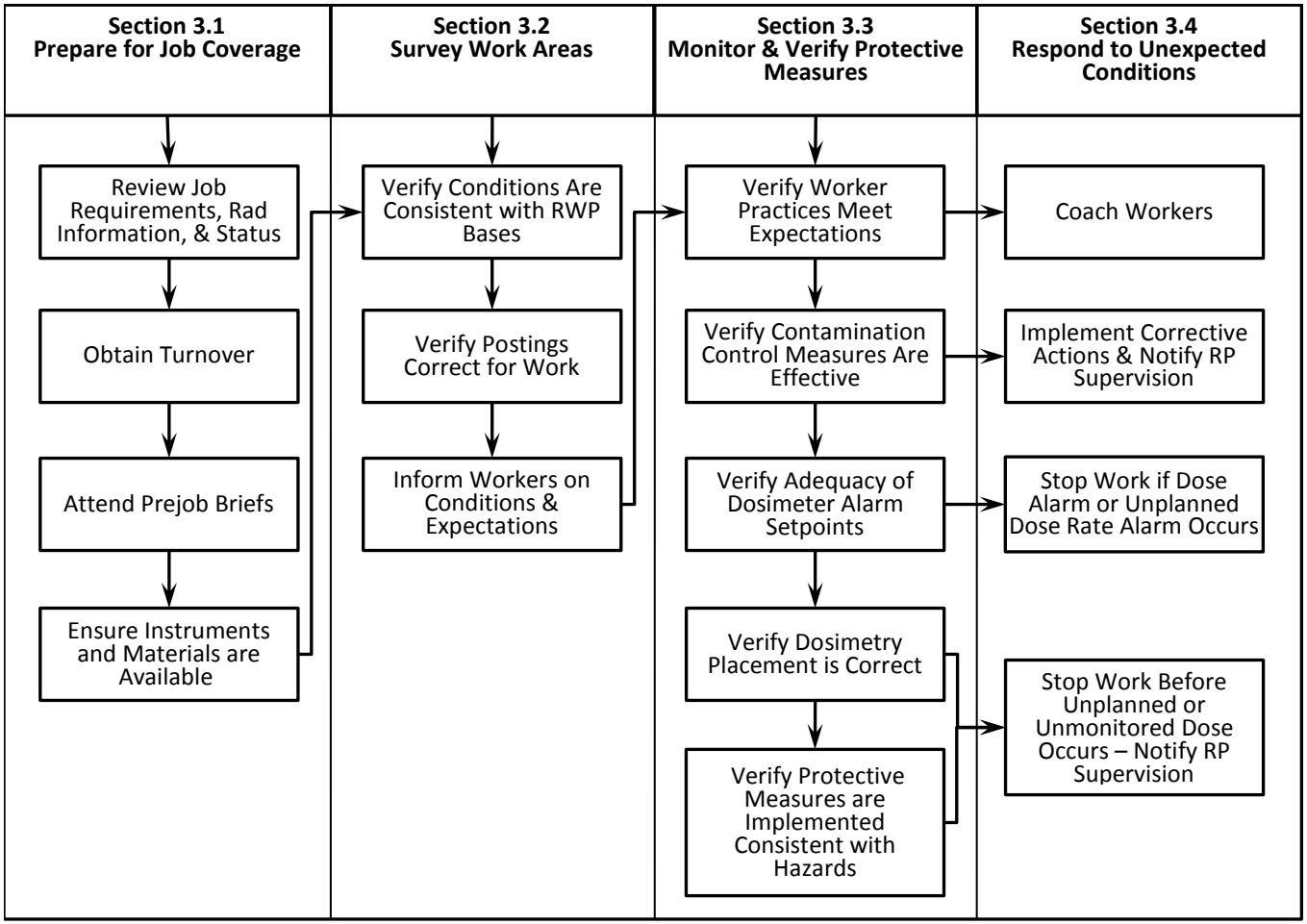
Enabling Objectives – RP03.10

From memory and in accordance with NISP-RP-10, students will:

6. Identify measures that may be taken when using protective clothing in potential heat stress conditions.
7. Describe the process of continuous job coverage, including the use of remote monitoring equipment.
8. Discuss proper job coverage and radiological protection measures for high-exposure jobs and potential high-exposure jobs.

NISP – RP – 10, Radiological Job Coverage

The following diagram shows the key elements in providing job coverage. Arrows are provided to show the relationships among key elements.



Radiological Job Coverage

Actions to be taken in preparation for radiological job coverage.

- Obtain a turnover and/or a prejob brief to review the following information that may be applicable:
  - Most recent radiological surveys.
  - RWPs and allowed scope of work.
  - ALARA Plans.
  - RP logs.
  - Condition Reports.
- Review job coverage requirements on the applicable RWP and ALARA Plan

Radiological Job Coverage

- Determine coverage requirements consistent with RWPs and ALARA Plans, conditions, and work to be performed (e.g.)
  - Continuous v. Intermittent Coverage
  - Stay times
  - Discrete Radioactive Particles (DRPs)
  - Dose gradients
  - PPE requirements
  - Survey frequency
  - Liquid abatement / control
  - Shielding requirements
  - Air sampling requirements and strategy
  - Changing conditions
  - Alpha Area considerations
    - Are alpha emitters present?
    - Will the work likely introduce alpha emitters?
    - Additional needed controls?
- Notify RP supervision if a discrepancy is apparent.

Radiological Job Coverage

- Obtain "face-to-face" turnover when relieving for continuous job coverage.
- Communicate with workers in prejob briefs and during job coverage to ensure they understand radiological conditions, protective requirements, and work restrictions.
  - PPE requirements
  - Remote monitoring
  - Body positioning
    - Dose gradient
    - Hot spots
    - Streaming
  - Dosimetry
    - Telemetry
    - Multi-Badging
    - Extremity monitoring
    - Neutron monitoring
    - Diving monitoring

Radiological Job Coverage

- Ensure the equipment is available, calibrated, source checked and operational as needed to perform surveys and collect air samples.
  - Dose rate meter
  - Contamination meter
    - Frisker – Large area smears, nu-con swipes
    - Scaler
    - Equipment for tritium sampling
  - Air Sampler
    - Filters – particulate, iodine, noble gas
    - Sampler head
    - Tubing
    - Positioning of pump exhaust
  - Lapel samplers

RP02.10 – Objective 1

Describe techniques used to reduce radiation exposure, including prefabrication, shielding, special tools, engineering controls, and decontamination.

- Basic principles for reducing radiation exposure are:
  - Decrease time in a dose field
  - Increase distance from radiation source
  - Increase shielding between personnel and radiation source
  - Decrease source activity

RP02.10 – Objective 1

- Decrease time in a dose field:
  - Plan the work, work the plan
  - Use mock-ups
  - Use experienced personnel
  - Only required personnel in the work area
  - Set-up, assemble and prefabricate equipment to the extent practical before going to the work area
  - Stay in low dose areas unless necessary

RP02.10 – Objective 1

- Increase distance from radiation source:
  - Use long handled reach tools
  - Work equipment at arms distance instead of close to body
  - Use robotic manipulators
  - Use remote monitoring as possible
  - Stay in low dose areas unless necessary
  - Evaluate is equipment can be moved to a low dose area

RP02.10 – Objective 1

- Increase shielding between personnel and radiation source:
  - Work behind installed shielding
  - Evaluate for increasing permanent shielding
  - Use temporary shielding on components
  - Use shield walls around a work area
  - Ensure work groups do not move or remove shielding without proper authorization

RP02.10 – Objective 1

- Decrease source activity:
  - Flush process lines with clean water
  - Decontaminate equipment to be worked
  - Decontaminate work area
  - Decontaminate or cover surfaces that will be contacted
  - Remove source term from work area

RP02.10 – Objective 2

List the requirements for entry into various areas in the plant.

- Entry into radiological areas is governed by RWPs, ALARA Plans, and Plant procedures and requirements.
- Typical requirements for entry into a Radiologically Controlled Area are:
  - Dosimeter of Legal Record – DLR
  - Self Reading Dosimeter – SDR
  - Radiological Work Permit – RWP

Contaminated Areas

Protective measures to be implemented for work in Contaminated Areas.

- Monitor worker practices and contamination levels to determine if protective actions are sufficient to prevent worker intakes, personnel contamination and the spread of contamination.
- Notify RP supervision if protective actions may need to be reassessed.
- Personnel can track contamination to clean areas after leaving a contaminated area. Protective measures include:
  - Ensure a frisker, hand and foot monitor, or a whole body contamination monitor is in close proximity to the Contaminated Area.

Contaminated Areas

- Contamination can potentially pass through coveralls if rubbed on surfaces > 10,000 dpm/100 cm2. Protective measures may include one or more of the following:
  - Place clean coverings on the contaminated surface.
  - Wear knee and/or elbow pads.
  - Wear coveralls made of a material that mitigates the potential for pass through.
  - Use work practices to avoid contact with contaminated surfaces.
  - Decontaminate surfaces that will be contacted.

Contaminated Areas

- Contamination may pass through the clothing due to contact with contaminated water or clothing becomes saturated with sweat. Protective measures may include one or more of the following:
  - Wear clothing that does not absorb water such as plastic or a similar material.
  - If heat exposure and the scope of work limit the use of specialized clothing to prevent skin contamination, protective measures may include:
    - Use air supplied suits to keep the body cool during work.
    - Wear ice vests under the protective clothing.
    - Limit stay times to prevent coveralls from becoming too saturated.
    - Perform an evaluation to determine if the potential risks from skin contamination are acceptable.

Contaminated Areas

- Contamination can become airborne when welding, burning, or grinding surfaces. Protective measures may include one or more of the following:
  - Set up ventilation and/or containment structures to isolate any airborne contamination that occurs.
  - Isolate and post the area potentially affected as an Airborne Radioactivity Area and restrict access.
  - Require the use of respiratory protection in potentially affected areas.
  - Establish a regime for obtaining air samples representative of worker breathing zones and to determine the boundaries of airborne radioactivity.

Contaminated Areas

- Contamination can spread to clean areas when removing Items from contaminated areas. Protective measures may include:
  - Instructing workers to transfer items to clean plastic bags and take the items immediately to an RP technician who will survey, bag, and tag the items per NISP-RP-04, Radiological Posting and Labeling.
  - Provide RP support to survey a large item while in the Contaminated Area and then transfer the large item to a clean plastic sheet or box type container outside the Contaminated Area using lift equipment providing direction to:
    - Provide direction on wrapping or boxing the item without spreading contamination.
    - Exercise precautions to survey and/or decontaminate lifting equipment.
    - Ensure the container is labeled per NISP-RP-04, Radiological Posting and Labeling.

High Contamination Areas

Protective measures to be implemented for work in High Contamination Areas.

Concerns and protective measures for work in a High Contamination Area where the extent and magnitude of the contamination levels require additional protective measures beyond those of a Contaminated Area.

- Follow RWP and ALARA plans for work in High Contamination Areas
- Same concerns exist as for a Contaminated Area. Employ the same protective measures.

High Contamination Areas

- Dry loose surface contamination can become airborne from wind currents or simply walking or rubbing the surface. Protective measures may include one or more of the following:
  - Keep surfaces wet.
  - Set up HEPA ventilation equipment to contain any airborne radioactivity.
  - Use a "fixing" agent on surfaces such as paint or an adhesive.
  - Cover the high contamination with oil cloth or equivalent material.
  - Maintain the integrity of boundary walls or structures to isolate the airborne radioactivity.
  - Wear respiratory protection while in the area as determined by a TEDE ALARA evaluation.
  - Control ventilation flow rates and direction.
  - Decontaminate the surfaces to lower the removable contamination levels.

High Contamination Areas

- Contamination on protective clothing may not be easily contained when exiting the area. Protective measures may include one or more of the following:
  - Contain the high contamination to a small area, e.g. the internal surface of a system component, by wiping down or changing gloves that contact highly contaminated surfaces before contacting surfaces with lower contamination levels.

High Contamination Areas

- Contamination on protective clothing may not be easily contained when exiting the area. Protective measures may include one or more of the following (cont.):
  - Establish a two step-off-pad (SOP) arrangement to remove highly contaminated outer protective clothing prior to traversing to the next SOP to remove the remaining protective clothing. Consider the following when evaluating the use of two SOPs:
    - Maintain a sufficient distance, if available, between the SOP from the High Contamination Area to the SOP for the Contaminated Area to provide containment and routine decontamination in the Contaminated Area.
    - Instruct workers to wear two sets of outer boots, two pairs of coveralls, and two sets of rubber gloves.

High Contamination Areas

- Contamination on protective clothing may not be easily contained when exiting the area. Protective measures may include one or more of the following (cont.):
  - Establish a two step-off-pad (SOP) arrangement to remove highly contaminated outer protective clothing prior to traversing to the next SOP to remove the remaining protective clothing. Consider the following when evaluating the use of two SOPs (cont.):
    - Instruct workers to exit the High Contamination Area by removing, in order, the outer gloves, the outer coveralls, and the outer boots, stepping on the SOP while removing each outer boot. The process for removing protective clothing at the next SOP is the same as taught in radiation worker training.
    - If sufficient room is not available for a two SOP arrangement, decontaminate the area where the protective clothing is removed at a frequency that prevents the spread of contamination outside the posted boundary.

High Contamination Areas

- Removable contamination on items removed from High Contamination Areas may be difficult to contain. Protective measures may include:
  - Wipe down or decontaminate the items inside the High Contamination Area to acceptable contamination levels before they are taken across the boundary to the Contaminated Area. The item can then be removed using normal practices for Contaminated Areas.
  - Use double containers; remove the item to a container in the Contaminated Area and then remove that container outside the Contaminated Area into a container that is clean on the outside.

Alpha Areas

Protective measures and risk levels for work when transuranic nuclides are present at levels that can contribute to a total committed effective dose equivalent (CEDE) greater than 100 mrem.

Mixtures of transuranic nuclides are difficult to evaluate because DAC values are 3 or 4 orders of magnitude less than corrosion and fission products and the gamma spectroscopy systems at power plants are not designed to accurately quantify activities of transuranic nuclides.

Alpha Areas

- The radiological risk of work involving transuranics may be classified as having high or medium radiological risk as follows:
  - Entry into or work in an Alpha Level 3 Area is classified as high radiological risk.
  - Work in an Alpha Level 2 Area is classified as medium radiological risk.
  - Abrasive or aggressive mechanical action on surfaces with any potentially fixed transuranics is classified as medium radiological risk.
- ALARA planning tools and/or the RWP should specify the applicable protective measures.

Activity Ratio ($\beta\gamma/\alpha$)	Designated Level
> 30,000	Level I (Minimal)
30,000 to 300	Level II (Significant)
< 300	Level III (Elevated)

Alpha Areas

- The presence of transuranic nuclides in surface contamination must be measured to understand the potential dose from worker intakes. For protective measures, Alpha Level 1, 2, and 3 Areas are posted per NISP-RP-04, Radiological Posting and Labeling.
- Contamination surveys are needed during job coverage to verify that the transuranic hazards have been properly evaluated. Protective measures include analyzing smears for alpha emitters per NISP-RP-02, Radiation and Contamination Surveys.
  - If a work area has not been characterized properly and the transuranic hazard is greater than posted, the take the following actions:
    - Notify RP supervision.
    - Determine if established radiological controls are adequate to prevent unplanned worker dose and, if not, stop work.

Alpha Areas

- Worker intakes of transuranics cannot be measured using plant equipment for in vivo bioassays. Protective measures to monitor for potential intakes require the use of personal air samplers unless appropriate alternatives are specified in the RWP. Personal air samplers are used per NISP-RP-03, Radiological Air Sampling to identify when in vitro bioassays may be needed.
- Worker intakes of transuranics cannot be measured using plant equipment for in vivo bioassays. Protective measures to monitor for potential intakes require the use of personal air samplers unless appropriate alternatives are specified in the RWP. Personal air samplers are used per NISP-RP-03, Radiological Air Sampling to identify when in vitro bioassays may be needed.

Alpha Areas

- Transuranics may be embedded in lower oxide layers inside piping and components due to fuel failures during earlier fuel cycles. Smears may not collect the transuranics when the system is breached. Protective measures include the following:
  - Plant RP staffs are responsible for characterizing plant areas and systems based on the presence of transuranics and historical fuel performance.
  - Plant RP staffs are responsible for identifying when work will be performed in an Alpha Level 2 Area or Alpha Level 3 Area.
  - Use respiratory protection and lapel air samplers per NISP-RP-03, Radiological Air Sampling when performing aggressive work, e.g. grinding, that could disturb lower oxide layers containing transuranics.

Alpha Areas

- The potential internal dose from transuranics in plant contamination mixtures increases in proportion to the corrosion and fission products as the mixture decays. Protective measures require periodic monitoring of βγ/α ratios to ensure areas are properly posted and evaluated for potential internal dose if surface contamination becomes airborne. NISP-RP-02, Radiation and Contamination Surveys and NISP-RP-03, Radiological Air Sampling provide instructions for determining βγ/α ratios.
- Equipment and materials removed from areas with transuranics may be handled outside the posted Alpha Level Area. As a protective measure, ensure equipment and materials removed from an Alpha Level 3 are packaged and labeled to alert personnel handling the package that significant transuranic contamination may be present. Labeling requirements are described in NISP-RP-04, Radiological Posting and Labeling.

Alpha Areas

- The abundance of transuranic nuclides can be high enough to result in unplanned intakes if personnel and materials are not monitored for alpha radiation. Protective measures include:
  - Require personnel to frisk using an alpha detector when exiting an Alpha Level 3 area where the $\beta\gamma/\alpha$ ratio is ≤ 50.
  - Segregate equipment and materials that have been exposed to contamination with a $\beta\gamma/\alpha$ ratio ≤ 50 until surveys can be performed to release an item from alpha controls.
  - Ensure postings for areas with a $\beta\gamma/\alpha$ ratio ≤ 50 contain the insert "Alpha Frisking/Monitoring Required Upon Exit" per NISP-RP-04, Radiological Postings and Labeling.

Airborne Radioactivity Areas

Protective measures to be implemented when workers may be exposed to airborne radioactivity.

Potential causes of airborne radioactivity include the following:

- System leakage
- Breaching a system component
- Agitating a contaminated surface, i.e. grinding, welding, scrubbing, hammering, etc.
- Air flow over a highly contaminated surface

Airborne Radioactivity Areas

Respiratory protection may be used to prevent worker intakes. Requirements for using respiratory protection equipment are provided in the radiation work permit. The maintenance and use of respiratory protection equipment are not included in the standardized tasks for supplemental RP personnel; plant procedures govern these activities. Knowledge requirements for the use of respiratory protection are included in orientation training.

A planned exposure to airborne radioactivity without respiratory protection may be allowed if a supporting evaluation concludes the Total Effective Dose Equivalent (TEDE) will be lower due to increasing the work efficiency of a worker, i.e. wearing respiratory protection will increase the external dose to the worker causing the TEDE to be higher as compared to the TEDE without respiratory protection. These evaluations are not included in the standardized tasks for supplemental RP personnel; plant procedures specify how these evaluations are performed.

Airborne Radioactivity Areas

- NISP-RP-03, Radiological Air Sampling specifies when air samples are needed, how to evaluate results, and when stop work authority should be exercised.

Airborne Radioactivity Areas

- Work controls should be implemented to minimize the potential for worker intake by using process and engineering controls that negate the need for respiratory protection. Process and engineering controls may include one or more of the following:
  - Decontaminating surfaces to reduce the potential for airborne radioactivity.
  - Install a containment device such as a glove bag.
  - Use portable ventilation to pull airborne radioactivity through a HEPA filter and prevent airborne radioactivity in a worker's breathing zone.
  - Maintain surfaces wet to minimize the potential for contamination to be suspended in the air.
  - Spray adhesive on a surface to prevent contamination from becoming suspended in the air.
  - Use oil cloth or equivalent material in a work area to prevent contamination from becoming suspended in the air.
  - Maintain highly contaminated surfaces covered to prevent air flow over the surface.

Airborne Radioactivity Areas

- Use respiratory protection as specified on radiation work permits and in compliance with plant procedures and the applicable TEDE ALARA evaluation.
- Use DAC-Hour tracking when personnel enter areas with ≥ 0.3 DAC without respiratory protection.
  - DAC-Hours may be calculated using personal air sample results.
  - DAC-Hours may be calculated using work area air samples and the measured stay time for each worker. Use plant-specific forms when recording air sample results and stay times of workers.

RP02.10 – Objective 3

Describe the different levels of job coverage.

DEFINITIONS

Continuous Job Coverage: Continuous coverage does not necessarily mean continuous presence of the radiological protection technician at the work site; rather, it means one or more technicians are given sole responsibility to cover a job. Remote camera surveillance, effective audio communication with the work area, and telemetry can be used to provide continuous coverage and minimize the dose to job coverage technicians.

Intermittent Job Coverage: Intermittent coverage means a job coverage technician may be assigned several jobs to monitor and periodically monitors each activity in progress to provide support as needed.

RP02.10 – Objective 3

The lead job coverage technician and supporting technicians are responsible for the following:

- Ensure technicians assigned to track stay times continuously provide full attention to stay time tracking without ancillary duties other than tracking worker dose using stay time tracking, telemetry, and/or remote monitoring
- Establish a means of communication when required for the following:
  - Instructing a worker to exit an area when approaching a stay time.
  - Informing a worker of accumulated dose when protective clothing requirements or multi-badging prevents the worker from periodically reading issued dosimetry.
  - Informing a worker when body positions are causing increased dose.

RP02.10 – Objective 3

The lead job coverage technician and supporting technicians are responsible for the following (cont.):

- Perform timely surveys when contaminated systems are breached to assess:
  - Contamination levels on exposed surfaces, including the presence of transuranics as required.
  - Shallow and deep dose rates from the exposed surfaces.
  - Airborne concentrations, including the presence of transuranics as required.
  - Potential exposure to discrete radioactive particles.
- Identify work activity evolutions that present a potential for airborne radioactivity and obtain air samples as needed to comply with this procedure and NISP-RP-03, Radiological Air Sampling.

RP02.10 – Objective 3

The lead job coverage technician and supporting technicians are responsible for the following (cont.):

- Implement timely protective measures when contaminated systems are breached as needed to minimize the potential for intakes and personnel contamination. Examples include:
  - Using covers or containment devices.
  - Decontamination.
  - Using substances to fix the contamination in place.
  - Installation of HEPA ventilation per NISP-RP-08, Use and Control of HEPA Filtration and Vacuum Equipment.
- Ensure work area postings are in compliance with NISP-RP-04, Radiological Posting and Labeling during all evolutions of a work activity.

RP02.10 – Objective 3

The lead job coverage technician and supporting technicians are responsible for the following (cont.):

- Establish contamination controls commensurate with the contamination levels in the work area as required for:
  - Contaminated Areas
  - High Contamination Areas
  - Discrete Radioactive Particle Areas
  - Alpha Level 2 or 3 Areas
- Implement measures to maintain work area contamination below levels that present a significant potential for airborne radioactivity. Examples include:
  - Periodic decontamination.
  - Periodically changing floor coverings.

RP02.10 – Objective 3

The lead job coverage technician and supporting technicians are responsible for the following (cont.):

- Perform surveys as items are raised or removed from spent fuel pools or refueling cavities and oversee handling of such items to ensure compliance with this procedure.
- Ensure materials and items removed from a work area are controlled to minimize personnel exposures and prevent the spread of contamination per NISP-RP-07, Control of Radioactive Material and NISP-RP-04, Radiological Posting and Labeling.

RP02.10 – Objective 4

Explain what actions should be taken when monitoring and controlling discrete radioactive particles.

DRPs are small (< 1mm), loose, highly radioactive particles that are very transportable because of their small size and high electrostatic charge. When DRPs are present with an activity greater than 50,000 CPM additional posting is necessary. DRPs from irradiated fuel require special measures since they emit high-energy betas and low-yield photons, resulting in high beta dose rates. DRPs from activated corrosion products emit low-energy betas and high-yield, high-energy gammas, resulting in high gamma dose rates. As a result, DRPs can deliver high localized doses when present on protective clothing or the skin.

RP02.10 – Objective 4

- DRPs can be difficult to locate while scanning a surface due to a rapid increase and subsequent decrease in instrument response when the detector passes over a particle.
- If the count rate exceeds 50,000 ncpm when frisking with a pancake GM detector, determine if the cause is a discrete radioactive particle (DRP) by the following method:
  - Determine if the count rate rapidly drops as the probe is slowly moved approximately 1 inch from the centerline geometry. This is a characteristic of a DRP.
  - Attempt to remove the DRP with tape or other suitable media and repeat the direct frisk after each attempt to determine if it has been removed.
  - Verify if the particle has been isolated with the tape by frisking the tape.
  - Notify RP supervision if a DRP was present.

RP02.10 – Objective 4

- The potential dose to a worker from a DRP requires capture of the DRP to enable additional analyses to determine the potential shallow-dose and deep-dose to a worker. When a DRP is detected on a worker, equipment, or plant surface that has a contact reading > 50,000 ncpm with a pancake GM detector or > 5 mrem/hour with an open window ion chamber (correction factor not applied), capture the DRP using one of the following techniques:
  - Apply the sticky side of tape to the particle, remove the tape, and survey the tape to see if the DRP is captured on the tape. Fold the tape over the DRP to completely encapsulate the DRP.
  - Apply the sticky side of tape to the particle to keep it from being mobile and leave it in place. Take actions as needed to encapsulate the DRP.

RP02.10 – Objective 4

- The potential dose to a worker from a DRP requires capture of the DRP to enable additional analyses to determine the potential shallow-dose and deep-dose to a worker. When a DRP is detected on a worker, equipment, or plant surface that has a contact reading > 50,000 ncpm with a pancake GM detector or > 5 mrem/hour with an open window ion chamber (correction factor not applied), capture the DRP using one of the following techniques (cont):
  - If the DRP is discovered on a worker's clothing or skin, refer to NISP-RP-06, Personnel Contamination Monitoring. Store the particle at the site designated location to enable further analyses as required.
  - Follow site-specific procedures for documenting the required information and initiating further analysis as required.

RP02.10 – Objective 4

- Standard dry-smear techniques are not sufficient to collect DRPs because particles frequently will not adhere to the smear and may be dispersed over a larger area than the area sampled by the smear. Protective measures include:
  - Use large area smears or wipes, tape, tacky rollers, or similar devices.

RP02.10 – Objective 4

- Sources of DRPs must be contained to mitigate the migration of particles into larger areas and increasing the potential dose to workers. Protective measures include:
  - Survey for DRPs when:
    - Systems are breached that contained reactor coolant water.
    - Removing items from a reactor vessel, spent fuel pool, or reactor cavity.
    - Handling irradiated materials.
    - Handling equipment used to work with irradiated fuel.
    - When transporting scaffolding that has been used to access system components containing reactor coolant water.
  - Exercise measures to contain DRPs until surveys confirm the presence or absence of DRPs. Examples of containment measures include:
    - Applying water or an adhesive to the surface.
    - Using wet decon methods to wipe surfaces.
    - Using containments and HEPA ventilation.
    - Restoring containment integrity of the system component or package until smears or wipes have been evaluated.

RP02.10 – Objective 4

- In some cases, DRPs cannot be totally contained at the source due to the work that has to be performed. Examples of protective measures include:
  - Establish a buffer zone to exit the DRP area, i.e. a posted contaminated area that must be traversed after removing an outer set of protective clothing in the DRP area. The outer set normally consists of additional coveralls, rubber shoe covers, and rubber gloves. Disposable coveralls are normally used as outer garments to prevent spreading the particles during laundry operations and to reduce the potential for the entrapment of particles in laundered clothing.
  - Use structural barriers as much as possible to minimize DRP migration out of the DRP area such as walls, glove bags, temporary walls, curtains, etc.

RP02.10 – Objective 4

- In some cases, DRPs cannot be totally contained at the source due to the work that has to be performed. Examples of protective measures include (cont.):
  - Use local HEPA ventilation.
  - Decontaminate potential sources of particles to the extent practical.
  - Use tacky mats for exiting the DRP area and the buffer zone area to provide additional protection against spreading the DRPs.
  - Segregate materials, including respirators, taken from a DRP area and tag the materials to denote:
    - DRPs may be present.
    - The source of the materials, i.e. the area or system.
    - The potential contact radiation levels from the DRPs.

RP02.10 – Objective 4

- DRPs can reside on the outside of a worker's protective clothing and deliver a deep-dose and/or a shallow-dose potentially exceeding 10% of 10 CFR 20 limits, requiring monitoring and recording of the dose. Protective measures include:
  - Establish staytimes in work areas to require periodic surveys on the outer layer of protective clothing. Staytimes are based on the highest known or potential dose rate from a DRP in the work area based on a one inch contact reading with an open window ion chamber without applying a beta correction factor. Staytimes should be established by the RWP and are typically applied as shown below to ensure a potential dose from a discrete radioactive particle does not exceed 10% of 10 CFR 20 limits.

RP02.10 – Objective 4

DRP Stay Times

DRP Dose Rate	Staytime Survey Frequency
≤ 20 mrem/hour	Not Required
> 20 mrem/hour to 1,200 mrem/hour	≤ 3 hours
> 1,200 mrem/hour to 2,500 mrem/hour	≤ 1.5 hours
> 2,500 mrem/hour to 5,000 mrem/hour	≤ 40 minutes
> 5,000 mrem/hour	≤ 10 minutes

RP02.10 – Objective 4

- Track worker staytimes in the DRP area using site-specific forms to ensure each worker is surveyed within the time intervals specified on the RWP and upon exit from the area. Survey workers as follows:
  - Designate a low dose rate area for performing the survey that is accessible from the DRP area without removing protective clothing. Survey areas should be set up and designated by site RP supervision.
  - Using an open window ion chamber, scan the hands, feet, and body areas. Use scanning techniques that will detect a particle with a contact reading > 5 mrem/hour.
  - Capture DRPs > 5 mrem/hour and notify RP supervision for further instructions.

RP02.10 – Objective 5

List when DAC tracking is required for airborne radioactivity areas.

- Use DAC-Hour tracking when personnel enter areas with ≥ 0.3 DAC without respiratory protection.
- DAC-Hours may be calculated using personal air sample results.
- DAC-Hours may be calculated using work area air samples and the measured stay time for each worker. Use plant-specific forms when recording air sample results and stay times of workers.

RP02.10 – Objective 6

Describe the radiological surveys required for various scenarios.

- Survey protocols for radiological work are set by procedures and RP management of each station, it is important to know the expectations and requirements before beginning work.
- Three types of surveys are performed by RP Technicians:
  - Contamination – fixed and removable
  - Radiation
  - Air Samples

Contamination Surveys

- Document all surveys per approved station requirements.
- Adhere to station requirements for contamination surveys.
- Total contamination is the activity of radioactive material found on an item.
- Removable or loose contamination is activity that is easily removed by brushing against a surface of an item.
- Fixed contamination is total contamination minus removable contamination.

Contamination Surveys

- Total contamination is determined by surveying the item itself.
- If the item is small enough to fit, a Small Articles Monitor (SAM) or Large Article Monitor (LAM) may be used to determine total contamination of the item.
  - Article Monitors are Gamma detectors, follow station procedures for Beta and Alpha contamination surveys.
  - Item should be free of removable contamination on external surfaces.
  - Items such as binders and stacks of paper should be divided into a thickness that allows the SAM to efficiently detect the activity in the mass.

Contamination Surveys

Removable or Loose Contamination

- Follow station requirements on surveying for removable contamination.
- Removable contamination is quantified in dpm/100 cm^2.
- Large Area smears may be used to determine the presence of contamination, and give indication to track source of contamination.
- Large Area smears are not a means of quantifying contamination for release of material or area.
- If an item is smaller than100 cm^2, record survey as dpm/item.
- Cotton swaps may be used to survey interiors of tubes, hoses, equipment internals, etc.
- Perform removable contamination survey to determine radiological area boundaries.

Contamination Surveys

Fixed Contamination

- Follow station requirements on surveying for fixed contamination.
- Fixed contamination is quantified in dpm/100 cm^2.
- Determine how much removable contamination is on an item.
- Use a frisker at proper distance and proper geometry to determine total contamination of an item.
- Ensure background radiation is low enough to allow item to be frisked.
- Total Contamination – Removable Contamination = Fixed Contamination.
- If an item has been surveyed to be free of removable contamination, all activity from survey with a frisker will be fixed contamination.

Radiation Surveys

- Adhere to station requirements for radiation surveys.
- Document all radiation surveys per station approved requirements.
- Perform radiation surveys to determine boundaries for radiological areas and to determine sources of radiation in an area.

Air Samples

- Adhere to station requirements for air sampling.
- Document all air samples per station approved requirements.
- Perform air samples to determine boundaries for radiological areas.

RP02.10 – Objective 7

List the actions to be taken upon completion of radiological work coverage.

- Ensure personnel follow station requirements for exiting area following radiological work.
- Survey work area and update postings as applicable.
- Survey and label trash, tools, and equipment for contamination and radiation.
- Document surveys and logs as applicable.
- Discuss any issues with RP Supervision.
- Participate in post-job briefs as applicable.

RP02.10 – Objective 8

Describe the requirements for non-standard dosimetry use and placement.

A significant gradient can result in a higher dose to a portion of the whole body other than the chest area which is normally monitored with dosimetry. A gradient can also result in a higher dose to an extremity, requiring additional monitoring. The protective measures described below provide criteria for determining when dosimetry requirements may need to be altered to ensure personnel exposure is monitored per 10 CFR 20.1502.

RP02.10 – Objective 8

Supplemental personnel must be able to identify when dosimetry requirements may not conform to the protective measures described below and alert RP supervision that additional evaluation may be needed. Identifying the specific body locations where a dosimeter must be placed is the responsibility of plant personnel for inclusion in the radiation work permit and is not included in the standardized tasks for supplemental personnel. The evaluation of dosimetry results to determine the doses to assign to workers is also the responsibility of plant personnel and is not included in the standardized tasks for supplemental personnel.

RP02.10 – Objective 8

- Radiation levels in a work area vary in intensity and may result in non-uniform irradiation of the whole body considering how the worker is positioned in the work area. Protective measures are implemented to reposition or add dosimeters when both of the following conditions apply:
  - Dose rates in the work area exceed 100 mrem/hour at 30 cm.
  - A portion of the whole body is anticipated to exceed the chest dose by more than 50 mrem during the RCA entry.

RP02.10 – Objective 8

- The combined beta and gamma dose rate to the extremities may exceed twice the gamma dose rate monitored for whole body dose. Protective measures are implemented to wear extremity dosimetry when both of the following conditions apply (cont.):
  - The shallow dose equivalent to an extremity is likely to exceed twice the whole body dose.
  - The shallow dose equivalent to an extremity will exceed the whole body dose by more than 500 mrem over the duration of the job.

RP02.10 – Objective 8

- An inaccurate understanding of a worker's body position during prejob planning or a change in a worker's body position once work commences may result in not complying with the above criteria. Protective measures include the following:
  - Ensure workers understand why additional dosimetry is required and why the specific body locations are being monitored with respect to the dose gradient and the expected body positions during the work.
  - Ensure workers understand the need to maintain the body positions assumed during prejob planning and to notify RP if changes in work will invalidate those assumptions.

RP02.10 – Objective 8

- An inaccurate understanding of a worker's body position during prejob planning or a change in a worker's body position once work commences may result in not complying with the above criteria. Protective measures include the following (cont.):
  - Observe worker body positions during the work to ensure the assumptions from prejob planning remain valid.
  - Stop work and notify RP supervision if the assumptions from prejob planning for dosimetry placement are no longer valid.

RP02.10 – Objective 9

Recall techniques for controlling exposure to beta radiation.

- Beta radiation is primarily a skin and eye dose hazard.
- Best technique for controlling beta exposure is to decontaminate and remove the hazard.
- Eye protection is necessary when working in areas with potential of beta exposure.
- DRP is most likely source of beta exposure, follow proper protocols to control DRPs.
- Shield beta radiation with plastic, avoid shielding with high Z materials.
- As appropriate, use gloves, sleeves, containments and reach tools when dealing with materials that have high levels of beta activity.

RP02.10 – Objective 10

Explain methods to keep worker and station dose ALARA.

- Apply ALARA principles of decrease time, increase distance, increase shielding, and decrease source term in all work planning.
- Proper and thorough job planning.
- Clearly identify low dose waiting areas.
- Work area set-up.
- Pre-Job brief to ensure understanding of conditions, work scope, and expectations for radiological worker practices.
- Proper job coverage.
- Identification and correct response to changes in conditions.

RP02.10 – Objective 10

Actions to take to prevent unplanned dosimeter alarms during work activity dose rate monitoring.

If at any time conditions are different than assumptions made in RWPs and ALARA Plans and exceed established limits or present an unevaluated hazard **DO NOT** proceed with the job.

Have workers put the system in a safe configuration and exit the work area **AND**

Immediately notify RP supervision of the situation and conditions.

RP02.10 – Objective 10

- Perform work area radiation and contamination surveys as needed to ensure the radiological conditions during work activities are consistent with worker briefings and within the ranges specified by RWPs and ALARA Plans.
  - Evaluate previous surveys of the area
  - Discuss conditions with other RP personnel who have covered jobs in the area and covered similar jobs for barriers and changing conditions
  - Verify conditions prior to or at start of job if conditions are unknown or potentially unstable
  - Survey on frequency as needed to validate conditions are stable
  - Survey immediately if conditions are suspected to have changed, e.g. system breaches, leaks, unexpected alarms.

RP02.10 – Objective 10

- Monitor dose rates and work activities to assess the potential for unplanned dosimeter alarms to occur. Inform RP supervision about observed conditions that may result in any one of the following:
  - Work area dose rates may exceed 80% of dose rate setpoints and personnel have not been briefed that dose rate alarms may occur.
  - Cumulative dose to an individual may exceed 80% of the dose setpoint.
  - Calculated stay times are not sufficient for the work scope and may be challenged.
- Monitor worker compliance with RWP requirements and coach workers to correct behaviors as needed.
- Verify individual doses are monitored per RWPs and ALARA Plans.

RP02.10 – Objective 10

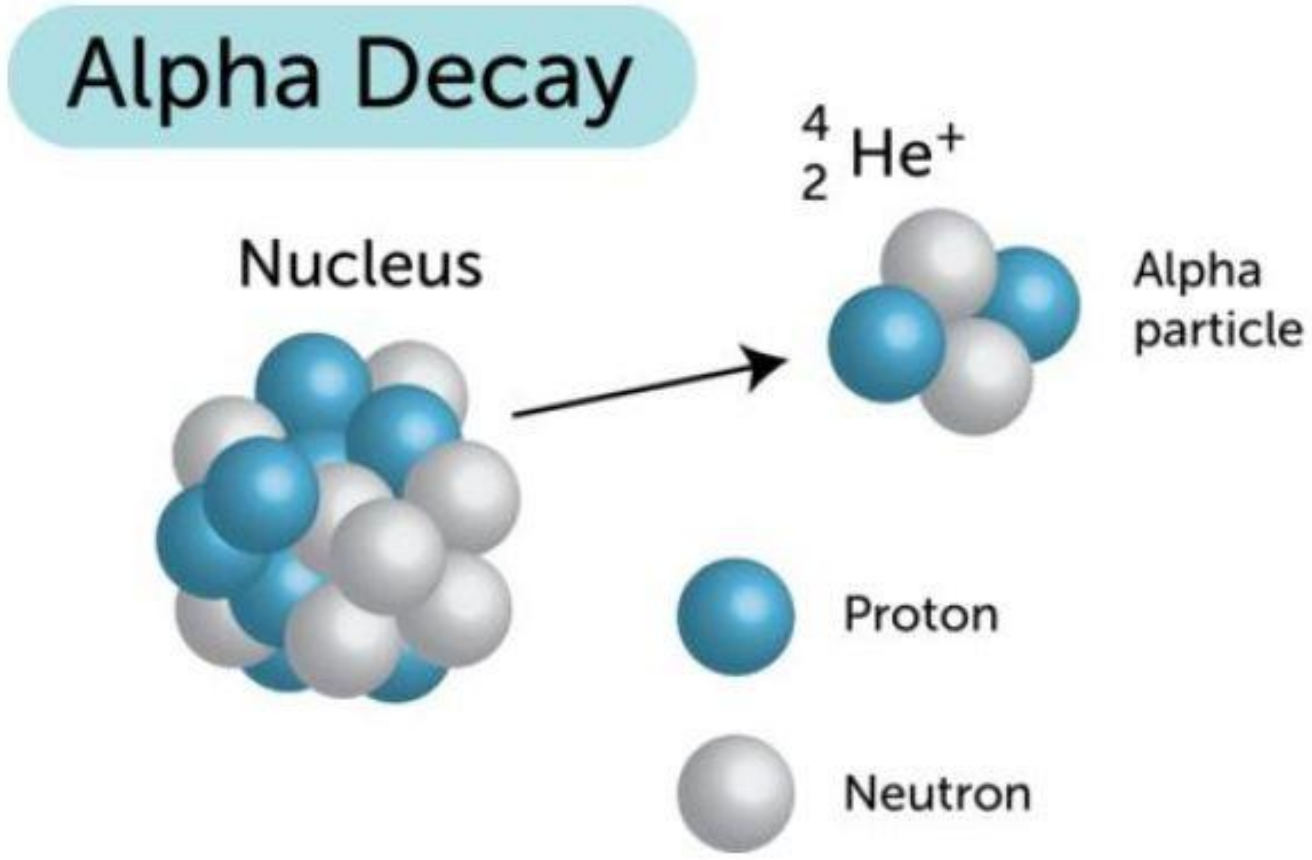
- Instruct a worker to leave the area if the cumulative dose exceeds 80% of the dosimeter dose setpoint or a worker is approaching the maximum calculated stay time.
  - Allow workers to place systems and equipment in a safe condition prior to leaving the area.
- Monitor worker practices in relation to gradients in dose rates to determine if dosimetry requirements need to be reassessed.
- Determine if work activities present a potential for a worker intake of radioactivity that has not been evaluated by RWPs or ALARA Plans.
- Monitor worker practices and contamination levels to determine if protective actions are sufficient to prevent worker intakes, personnel contamination and the spread of contamination.

RP02.10 – Objective 10

- Determine the potential for the work to generate highly radioactive items, e.g. bags of trash or removed system components, and ensure protective measures are in place to maintain worker dose ALARA.
  - Instruct workers not to pick up or handle items in drained pools until RP surveys have been performed and appropriate handling methods have been established.
  - Place highly radioactive items in a shielded or distant location so the items do not contribute to work area dose rates.
  - Survey trash and materials as they are collected and dispose or store the materials to prevent increases in work area dose rates.
  - Ensure area postings and labeling are in compliance with NISP-RP-04.
- Determine if the work will likely generate discrete radioactive particles and monitor the work area for early detection and mitigation.
  - Ensure survey methods and protective measures detect and contain the particles and prevent unplanned skin dose.

RP02.10 – Objective 10

- Determine if exposed surfaces are contaminated with transuranic nuclides at levels that require additional alpha monitoring during contamination surveys and air sample analyses.



RP02.10 – Objective 11

Calculate estimated neutron dose when given a mixed neutron and gamma dose rate field.

- Check with the site for quality factor for calculating neutron dose.
- Dose rate is Total Dose Rate from all sources.
- In a mixed neutron and gamma field both constituents need to be considered for posting requirements, job planning, ALARA, shielding, etc.
- Calculation of a mixed field is:

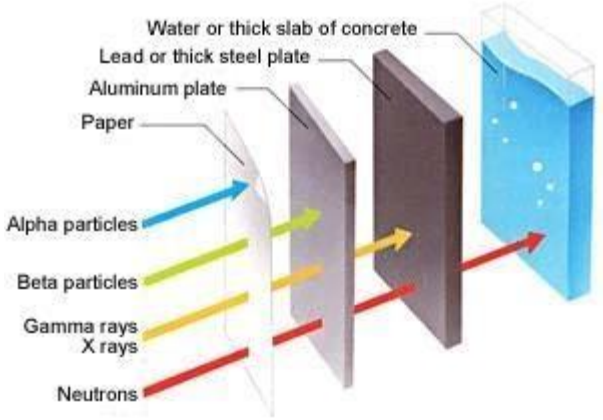
Gamma Dose Rate + (Neutron Dose Rate x Quality Factor) = Total Dose Rate

- Posting an area is based on Total Dose Rate

RP02.10 – Objective 12

Describe shielding principles, including installation and removal.

- Utilize correct shielding for type of radiation source to prevent causing secondary radiation hazards.
  - High energy beta radiation can cause x-rays, called Bremmstrahlung, when it beta particles pass close to high Z nuclei.
  - Beta needs to be shielded first in mixed beta/gamma fields to prevent Bremmstrahlung.



RP02.10 – Objective 12

- Survey before shielding is installed.
- Follow shielding protocols for the station, including engineering evaluations for addition of permanent and temporary shielding.
- Survey after shielding is installed to determine shielding effectiveness, area dose rates, if there are gaps in the shielding and if there is streaming radiation through the shielding.
- When developing a shielding plan consider if the shielding package will have to be adjusted or partially removed to accommodate other work in the area.
- ALARA will determine viability of installing shielding:
  - Dose to install and remove vs. dose savings for work group.
- Notify other work groups in the area when shielding is being installed or removed.

RP02.10 – Objective 13

State the importance of using body shield vests properly, including precautions and limitations.

- Use body shield vests in accordance with manufacturer recommendation and site procedures.
- Using body shield vests will typically decrease heat stress stay times.
- Using body shield vests will typically decrease personnel maneuverability and dexterity.
- The increased weight and bulk may increase chances of joint and back injury to the worker.

RP02.10 – Objective 13

- Ensure vests are stored properly in accordance with manufacturer recommendation.
- Inspect vests in accordance with manufacturer requirement; both before use and periodically as specified.
- Keep vests away from extreme heat.
- Keep vests away from sharp objects.
- Avoid contact with hot surfaces.
- Avoid exposure to direct sunlight.

RP02.10 – Objective 14

Explain the responsibility of the RP Technician when covering work, including use of Stop Work Authority.

- RP Technicians are responsible for all radiological aspects of work coverage, as discussed in RP02.10 Objective 3.
- In addition, RP Technicians are responsible to exercise Stop Work Authority if a situation occurs that warrants using this authority.
- Following is descriptions of situations that require RP Technicians to exercise Stop Work Authority and the process to carry out Stop Work Authority.

RP02.10 – Objective 14

Job site conditions that would require exercising Stop Work Authority.

- Exercise Stop Work Authority by applying one of the actions as described below:
  - Stop the work of an individual due to an anomaly that does not affect the radiological exposures of others in the work area.
  - Stop the work of all individuals in an area due to an unexpected increase in radiological exposures for everyone in the area.
- Instruct a worker to exit the work area if the worker's behaviors or practices result in any one of the following:
  - An unplanned, unanticipated dose rate alarm.
  - An SRD dose alarm.
  - Non-compliance with RWP requirements after being corrected.
  - An increased potential for an intake due to work practices.

RP02.10 – Objective 14

- Stop work in an area when job conditions exist that may result in unplanned or unmonitored dose.
  - Stop Work as specified by RWP.
  - Dose rates exceed the allowable range of expected dose rates when the job was planned.
  - Dose rates have increased to > 50% above the dose rates for which the workers were briefed and the dose rates are > 100 mrem/hour.
  - Unexpected airborne radioactivity occurs that requires a posting change per NISP-RP-04, Radiological Posting and Labeling.
  - Unexpected airborne concentrations occur outside the bounds of the TEDE ALARA evaluation.
  - Multiple workers exiting a work area alarm a gamma sensitive portal monitor.
  - Dosimetry is not in place to measure extremity dose.

RP02.10 – Objective 14

- Stop work in an area when job conditions exist that may result in unplanned or unmonitored dose. (cont.)
  - The whole body compartment that will receive the highest dose is not being monitored when required due to conditions such as:
    - Changes in job scope or work methods have altered worker orientation to radiation sources.
    - Radiation sources have been added or removed from the work area.
    - Telemetry failure.
  - Two or more workers experience dose alarms.
  - A worker refuses to comply with or disregards radiation protection standards and procedures or personnel instructions, either written or verbal.
  - Multiple unplanned personnel contaminations occur on a single job during a shift (e.g. more than three).

RP02.10 – Objective 14

- Stop work in an area when job conditions exist that may result in unplanned or unmonitored dose. (cont.)
  - An EPRI Level 3 personnel contamination event has occurred (non-discrete particle in a clean area) and the cause is unknown.
  - Contamination levels have spread affecting other work groups or activities, e.g. more than 100 square feet in a clean area.
  - Contamination levels have increased such that established controls may not be adequate and are outside the bounds of the TEDE ALARA evaluation.
  - Radiological engineering controls have degraded so the radiological conditions are such that failure could lead to a condition listed above.
- Notify RP supervision if the setpoints on electronic dosimeters are not adequate for the work activities.

RP02.10 – Objective 14

- When stopping work, instruct workers to place systems and equipment in a safe condition prior to leaving the work area and then report to the nearest RP control point.
- Immediately notify RP supervision whenever work has been stopped, a worker has been instructed to leave a work area, or if a worker has been prevented from entering a work area.
  - Provide support as requested by RP supervision for documentation, evaluation, and use of the plant corrective action program.
  - RP supervision is responsible for implementing site administrative procedures for stopping work.

RP02.10 – Objective 15

Identify potential warning signs that a radiological incident may occur or is in progress.

- Always trust the instruments.
- Warning signs of radiological incidents may include:
  - Increase airborne activity on air samples or Continuous Air Monitor (CAM)
  - Dose rates above expected
  - Increasing dose rates on instrumentation including SRDs, Area Radiation Monitors (ARMs) and Process Radiation Monitors (PRMs)
  - Unidentified spread of contamination
  - Water in a line that is supposed to be drained
  - Pressure in a line that has been isolated
  - Loss of ventilation

RP02.10 – Objective 16

Recall the expected response to a radiological incident.

- Notify RP supervision whenever unexpected conditions challenge implementation of requirements established for the radiological protection of personnel.
- Maintain awareness of work area radiation levels and how they could be affected by system operations or maintenance activities. Survey areas whenever dose rates or contamination levels may be potentially affected to provide timely evaluation and intervention if needed.

RP02.10 – Objective 16

- Exercise Stop Work Authority if unexpected dosimeter alarms occur or their work activities are not within the scope of the RWP.
- Stop activities that will lead to unplanned worker dose or an unmitigated spread of contamination.

"Stop Work Authority / Stand Up for Safety"

RP03.10 Objectives

RP03.10 – Objective 1

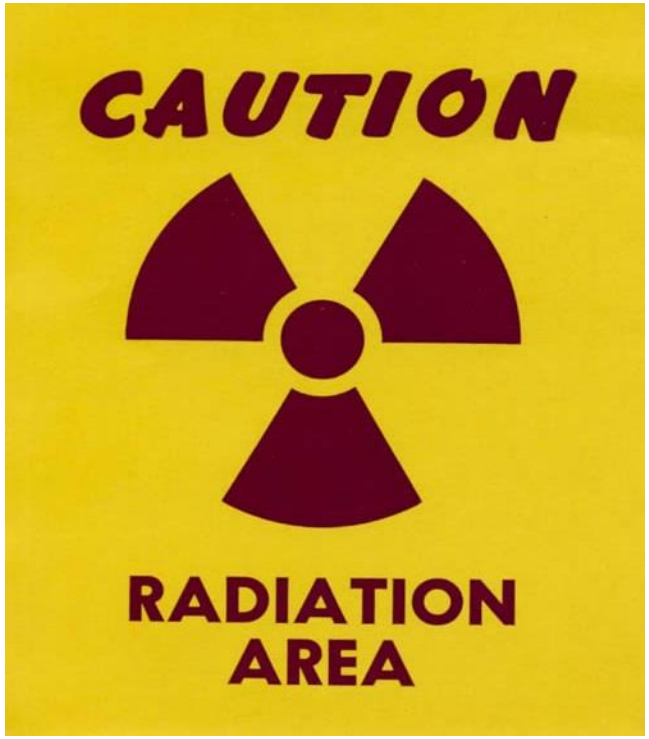
Describe prejob radiological survey requirements and follow-up actions.

Survey Work Areas

- Perform work area radiation and contamination surveys as needed to ensure the radiological conditions during work activities are consistent with worker briefings and within the ranges specified by the RWP and, if applicable, the ALARA Plan.
  - Survey immediately prior to beginning work if radiological conditions are unknown or potentially unstable.
  - Survey on a frequency as needed to validate conditions are stable; comply with survey frequencies in procedures, RWP, and ALARA Plans when a survey frequency is specified.
  - Survey immediately if changes in conditions are suspected due to anomalies from worker activities or plant conditions, e.g. system breaches, leaks, unexpected alarms, etc.

RP03.10 – Objective 1

- Obtain air samples per NISP-RP-03, Radiological Air Sampling.
- Pre-post areas prior to performing work that is expected to increase radiation, contamination, and airborne concentrations in accordance with NISP-RP-04, Radiological Posting and Labeling.



RP03.10 – Objective 1

- Communicate survey results to workers with emphasis on the following elements.
  - Areas where stay time should be minimized.
  - Areas where dose rates are the lowest.
  - Desired body positioning to minimize TEDE while working in areas with high contact radiation levels or elevated radiation levels.
  - Steps or conditions when workers need to stop to allow additional surveys or protective actions before proceeding.
  - Where contamination levels are high enough to challenge the effectiveness of workers' protective clothing and the precautions that need to be taken.
  - Preventative actions and work practices to minimize the spread of contamination and prevent airborne radioactivity.

RP03.10 – Objective 2

Describe how the results of ALARA reviews are implemented.

- Results of ALARA reviews are incorporated into many aspects of the work process.
  - Work classification
  - Engineering controls
  - Dosimetry requirements
  - Stay times
  - Sampling requirements
  - Briefing requirements
  - PPE

RP03.10 – Objective 2

- ALARA reviews are instrumental in preventing over-exposures and maintaining workers dose in accordance with site requirements.
- ALARA tracks work progress in conjunction to dose accumulation to keep work groups on track and identify unanticipated conditions or work plans.

RP03.10 – Objective 3

Explain the factors that determine the need for and type of respiratory protection equipment to be used during radiological work.

- Factors that determine the need for and type of respiratory protection equipment to be used during radiological work include:
  - Derived Air Concentration – DAC – in the work area
  - Type of work to be performed
  - Type of airborne isotopes
  - Duration of work
- Protection factor of respiratory protection equipment should exceed the Total DAC in the work area.

RP03.10 – Objective 4

Explain how to determine the type and location of whole-body dosimetry.

- Unless there is a need to reposition dosimetry, DLR should be worn on the front of the torso between the neck and waist.
- SDR should be worn within a hand width of the DLR.
- Site protocols will determine type of SDR worn. Some work activities will generate Radio Frequency – RF – that may interfere with Electronic Dosimetry

RP03.10 – Objective 4

Protective measures that are to be implemented to reposition or add dosimeters in accordance with NISP-RP-10 identify the conditions which would require repositioning or adding dosimeters.

A significant gradient can result in a higher dose to a portion of the whole body other than the chest area which is normally monitored with dosimetry. A gradient can also result in a higher dose to an extremity, requiring additional monitoring. The protective measures described below provide criteria for determining when dosimetry requirements may need to be altered to ensure personnel exposure is monitored per 10 CFR 20.1502.

RP03.10 – Objective 4

Supplemental personnel must be able to identify when dosimetry requirements may not conform to the protective measures described below and alert RP supervision that additional evaluation may be needed. Identifying the specific body locations where a dosimeter must be placed is the responsibility of plant personnel for inclusion in the radiation work permit and is not included in the standardized tasks for supplemental personnel. The evaluation of dosimetry results to determine the doses to assign to workers is also the responsibility of plant personnel and is not included in the standardized tasks for supplemental personnel.

RP03.10 – Objective 4

- Radiation levels in a work area vary in intensity and may result in non-uniform irradiation of the whole body considering how the worker is positioned in the work area. Protective measures are implemented to reposition or add dosimeters when both of the following conditions apply:
  - Dose rates in the work area exceed 100 mrem/hour at 30 cm.
  - A portion of the whole body is anticipated to exceed the chest dose by more than 50 mrem during the RCA entry.

RP03.10 – Objective 5

Identify the criteria that determines the need for multiple badging or extremity monitoring.

Protective measures that are to be implemented to reposition or add dosimeters in accordance with NISP-RP-10. Identify the conditions that would require extremity dosimetry.

RP03.10 – Objective 5

- The combined beta and gamma dose rate to the extremities may exceed twice the gamma dose rate monitored for whole body dose. Protective measures are implemented to wear extremity dosimetry when both of the following conditions apply (cont.):
  - The shallow dose equivalent to an extremity is likely to exceed twice the whole body dose.
  - The shallow dose equivalent to an extremity will exceed the whole body dose by more than 500 mrem over the duration of the job.

RP03.10 – Objective 5

- An inaccurate understanding of a worker's body position during prejob planning or a change in a worker's body position once work commences may result in not complying with the above criteria. Protective measures include the following:
  - Ensure workers understand why additional dosimetry is required and why the specific body locations are being monitored with respect to the dose gradient and the expected body positions during the work.
  - Ensure workers understand the need to maintain the body positions assumed during prejob planning and to notify RP if changes in work will invalidate those assumptions.

RP03.10 – Objective 5

- An inaccurate understanding of a worker's body position during prejob planning or a change in a worker's body position once work commences may result in not complying with the above criteria. Protective measures include the following (cont.):
  - Observe worker body positions during the work to ensure the assumptions from prejob planning remain valid.
  - Stop work and notify RP supervision if the assumptions from prejob planning for dosimetry placement are no longer valid.

RP03.10 – Objective 6

Identify measures that may be taken when using protective clothing in potential heat stress conditions.

- Work with site safety personnel to determine proper protocols for protective clothing in potential heat stress conditions.
- Monitor heat conditions in accordance with site protocols.
- Additional measures may be taken to help mitigate heat stress conditions, depending on work conditions and site requirements.
  - Ventilation
  - Cooling units
  - Ice vests
  - Drinking stations
  - Stay times

RP03.10 – Objective 7

Describe the process of continuous job coverage, including the use of remote monitoring equipment.

- Continuous job coverage is required when the radiological conditions and work activities present a significant potential for adverse consequences if protective measures are not effectively implemented. Such activities require constant monitoring to:
  - Ensure protective measures are implemented as planned and
  - Identify potential anomalies that may challenge the effectiveness of planned protective measures.

RP03.10 – Objective 7

Describe the process of continuous job coverage, including the use of remote monitoring equipment.

- Continuous coverage does not necessarily mean continuous physical presence of the radiological protection technician at the work site; rather, it means one or more technicians are given sole responsibility to cover a job. If using remote monitoring for continuous coverage, remote camera surveillance, effective audio communication with the work area, and telemetry are required to provide continuous coverage and minimize the dose to job coverage technicians.

RP03.10 – Objective 8

Discuss proper job coverage and radiological protection measures for high-exposure jobs and potential high-exposure jobs.

Monitor and Verify Protective Measures

- Monitor dose rates and work activities to assess the potential for unplanned dosimeter alarms to occur. Inform RP supervision about observed conditions that may result in any one of the following:
  - Work area dose rates may exceed 80% of dose rate setpoints and personnel have not been briefed that dose rate alarms may occur.
  - Cumulative dose to an individual may exceed 80% of the dose setpoint.
  - Calculated stay times are not sufficient for the work scope and may be challenged.

RP03.10 – Objective 8

- Monitor worker compliance with RWP requirements and coach workers to correct behaviors as needed.
  - Exercise Stop Work Authority and notify RP supervision if behaviors are not corrected.
- Fulfill job coverage responsibilities as described in Attachment 1, Job Coverage Responsibilities.
- Verify individual doses are monitored per the RWP and, if applicable, the ALARA Plan.
- Instruct a worker to leave the area if the cumulative dose exceeds 80% of the dosimeter dose setpoint or a worker is approaching the maximum calculated stay time.
  - Allow workers to place systems and equipment in a safe condition prior to leaving the area.

RP03.10 – Objective 8

- Monitor worker practices in relation to gradients in dose rates to determine if dosimetry requirements need to be reassessed. Notify RP supervision if any assumptions used in the RWP evaluation for dosimetry placement appear to be invalid or suspect. Protective measures are discussed in Attachment 8, Protective Measures for Gradients in Radiation Fields.
- Determine if work activities present a potential for a worker intake of radioactivity that has not been evaluated by the RWP or applicable ALARA Plan. Notify RP supervision if protective actions need to be reassessed.3 Protective measures are discussed in Attachment 7, Protective Measures for Airborne Radioactivity.

RP03.10 – Objective 8

- Monitor worker practices and contamination levels to determine if protective actions are sufficient to prevent worker intakes, personnel contamination and the spread of contamination. Notify RP supervision if protective actions may need to be reassessed. Protective measures are discussed in the following attachments:
  - Attachment 3, Protective Measures for Work in Contaminated Areas
  - Attachment 4, Protective Measures for Work in High Contamination Areas
  - Attachment 5, Protective Measures for Discrete Radioactive Particles

RP03.10 – Objective 8

- Determine the potential for the work to generate highly radioactive items, e.g. bags of trash or removed system components, and ensure protective measures are in place to maintain worker dose ALARA such as:
  - Instruct workers not to pick up or handle items in drained pools, e.g. sumps, tanks, cavity, etc., until RP surveys have been performed and appropriate handling methods have been established.
  - Place highly radioactive items in a shielded or distant location so the items do not contribute to work area dose rates.
  - Survey trash and materials as they are collected and dispose or store the materials to prevent increases in work area dose rates.
  - Ensure area postings and labeling are in compliance with NISP-RP-04.

RP03.10 – Objective 8

- Determine if the work will likely generate discrete radioactive particles and monitor the work area for early detection and mitigation. Ensure survey methods and protective measures detect and contain the particles and prevent unplanned skin dose. Protective measures are discussed in Attachment 5, Protective Measures for Discrete Radioactive Particles.
- Determine if exposed surfaces are contaminated with transuranic nuclides at levels that require additional alpha monitoring during contamination surveys and air sample analyses. Protective measures are discussed in Attachment 6, Protective Measures for Transuranic Nuclides.


REVIEW

Review Question #1

What actions should be taken when preparing for job coverage?

A: Air sample the work site

B: Review ALARA Lesson Plan

C: Talk to RPTs who have done work in the same area

D: Maintain Remote Monitoring during work

Review Question #2

What conditions would require stay times?

A: Airbourne >1.0 DAC

B: Contamination >200,000 dpm/100 cm^2

C: DRP >5,000 dpm

D: Dose for single entry >500 mrem

Review Question #3

What additional protective measures are necessary in High Contamination Areas?

A: Place clean coverings on contaminated surfaces

B: Keep surfaces wet

C: Wear ice vests under Protective Clothing

D: Use ventilation

Review Question #4

At what activity is an area required posting as"Discrete Radioactive Particles Present"?

A: >5 mrem/hour open window

B: >5,000 ncpm with GM detector

C: >50 mrem/hour closed window

D: >500,000 ncpm with GM detector

Review Question #5

What condition would require evaluating if dosimetry requirements should be altered?

A: SDE to an extremity will be less than twice the whole body dose

B: A portion of the body may exceed chest dose by more than 50 mrem

C: Dose rates in work area are 80 mrem/hour @ 30 cm

D: DRPs are present in the work area

Terminal Objective – RP02.10

Given a job coverage task involving sources of radiation and/or radioactive material, PERFORM low radiological risk job coverage in accordance with NISP-RP-10, Radiological Job Coverage.

Enabling Objectives – RP02.10

From memory and in accordance with NISP-RP-10, students will:

1. Describe techniques used to reduce radiation exposure, including prefabrication, shielding, special tools, engineering controls, and decontamination.
2. List the requirements for entry into various areas in the plant.
3. Describe the different levels of job coverage.
4. Explain what actions should be taken when monitoring and controlling discrete radioactive particles.
5. List when DAC tracking is required for airborne radioactivity areas.
6. Describe the radiological surveys required for various scenarios.

Enabling Objectives – RP02.10

From memory and in accordance with NISP-RP-10, students will:

7. List the actions to be taken upon completion of radiological work coverage.
8. Describe the requirements for non-standard dosimetry use and placement.
9. Recall techniques for controlling exposure to beta radiation.
10. Explain methods to keep worker and station dose ALARA.
11. Calculate estimated neutron dose when given a mixed neutron and gamma dose rate field.
12. Describe shielding principles, including installation and removal.

Enabling Objectives – RP02.10

From memory and in accordance with NISP-RP-10, students will:

13. State the importance of using body shield vests properly, including precautions and limitations.
14. Explain the responsibility of the RP Technician when covering work, including use of Stop Work Authority.
15. Identify potential warning signs that a radiological incident may occur or is in progress.
16. Recall the expected response to a radiological incident.

Terminal Objective – RP03.10

Given a job coverage task involving sources of radiation and/or radioactive material, PERFORM medium or high radiological risk job coverage in accordance with NISP-RP-10, Radiological Job Coverage.

Enabling Objectives – RP03.10

From memory and in accordance with NISP-RP-10, students will:

1. Describe prejob radiological survey requirements and follow-up actions.
2. Describe how the results of ALARA reviews are implemented.
3. Explain the factors that determine the need for and type of respiratory protection equipment to be used during radiological work.
4. Explain how to determine the type and location of whole-body dosimetry.
5. Identify the criteria that determine the need for multiple badging or extremity monitoring.

Enabling Objectives – RP03.10

From memory and in accordance with NISP-RP-10, students will:

6. Identify measures that may be taken when using protective clothing in potential heat stress conditions.
7. Describe the process of continuous job coverage, including the use of remote monitoring equipment.
8. Discuss proper job coverage and radiological protection measures for high-exposure jobs and potential high-exposure jobs.

Questions?