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# Radiological Guide for Planners (U)

SAVANNAH RIVER SITE

Savannah River Site
Aiken, SC 29808

## Disclaimer

# Savannah River Site Radiological Guide for Planners

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# Preface

## Department of Energy Radiological Control Policy

## ALARA

Personal radiation exposure shall be maintained As-Low-As-Reasonably-Achievable (ALARA). [835.1003 (a)(3)]

Radiation exposure of the work force and public shall be controlled such that radiation exposures are well below regulatory limits and that there is no radiation exposure without commensurate benefit.

## Ownership

Each person involved in radiological work is expected to demonstrate responsibility and accountability through an informed, disciplined, and cautious attitude toward radiation and radioactivity.

## Excellence

Excellent performance is evident when radiation exposures are maintained well below regulatory limits, contamination is minimal, radioactivity is well controlled, and radiological spills or uncontrolled releases are prevented.

Continuous improvement is essential to excellence in radiological control.

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# Introduction

The Radiological Guide for Planners document was developed to provide consistent guidance to Savannah River Site (SRS) personnel responsible for planning tasks that involve radiological work.

This document is intended to be used in conjunction with and not as a replacement of WSRC-OS-94-14, Rev. 1, *Westinghouse Radiological Containment Guide*. As such, references are made here in to applicable sections of the containment guide.

In addition, this guide for planners is specifically designed to improve the integration of radiological controls into work planning and execution activities. It is imperative that the Integrated Safety Management System (ISMS) core functions (Figure 1) are adequately addressed with the application of the Hierarchy of Controls.

## How to Use this Planning Guide

First, turn to the ISMS flowchart (Figure 2) to begin.

**NOTE**

References to Radiological Controls (RC), Radiological Protection (RP), and RADCON are used interchangeably in this guide in association with action steps.

Secondly, "define the radiological scope" of the job/task being planned by reviewing Section I. Then refer back to Figure 2 and define the radiological scope by selecting one of three choices; Routine Stable Operations, Routine work in Elevated Radiological Conditions, or Non-Routine or Complex Work, and follow that flow path. The flowchart may refer you to the Radiological Containment Guide. Appendix A of the guide should explain or provide additional information to help you understand and then decide which flow path is necessary for the job/task.

Thirdly, according to the flow path taken on the flowchart, other figures and the containment selection process (Figure 3) may also be referenced. Address or complete as appropriate.

Finally, according to the path taken on the flowchart, this guide may reference several Manual 5Q , *Radiological Control*, procedures to aid in the planning process. Address each procedure appropriately.

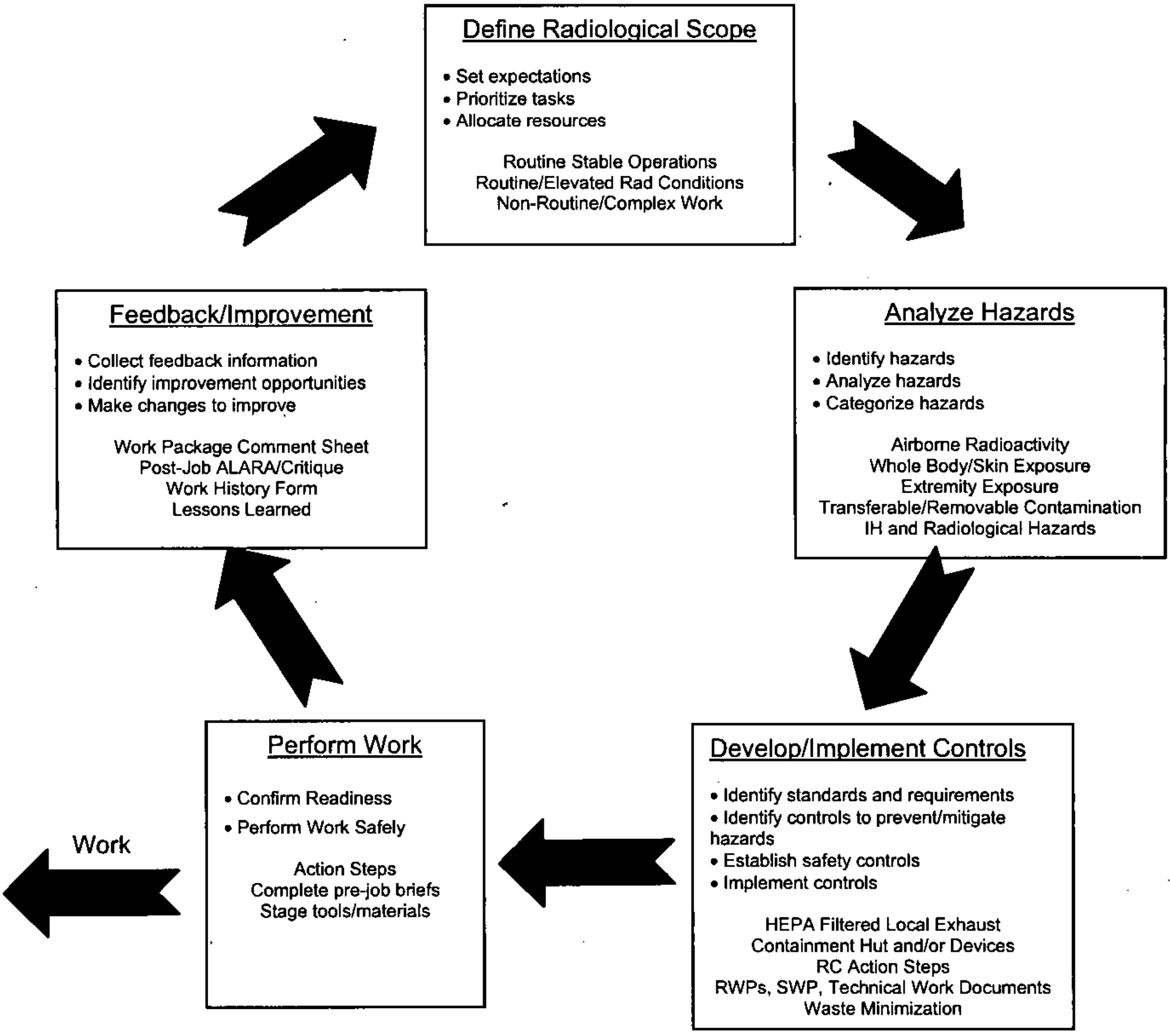
## Responsibilities

**Work Planner:** Responsible for the planning of the activity to be performed. Must be familiar with the job scope, prints, radiological conditions, etc. Information should be obtained by performance of a walkdown of the job and area in which the task is to be performed. The planners' activities include requesting the Radiological Work Permit (RWP), detailing of work steps, quality hold points, Radiological Control Action Steps, etc.

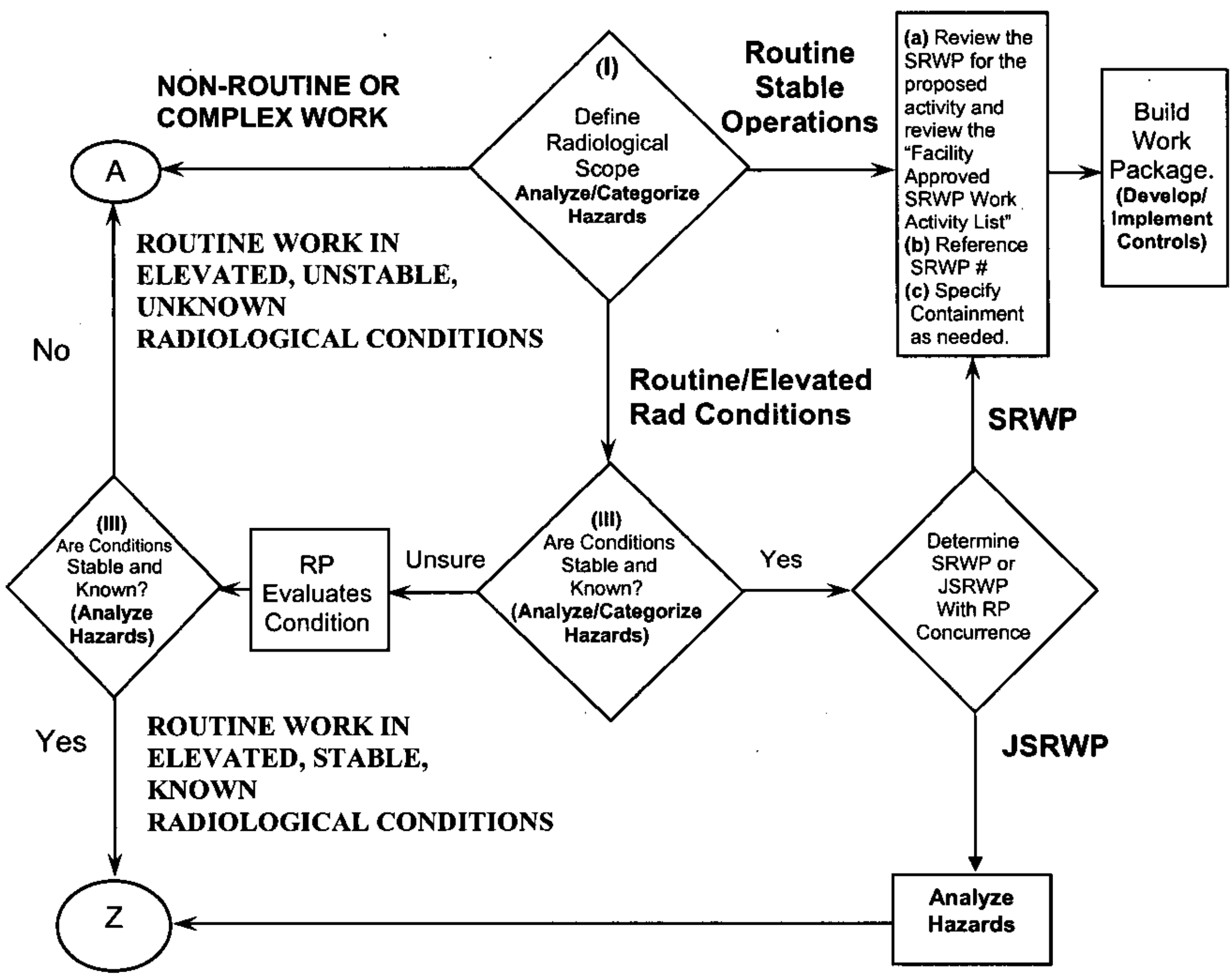
**Radiological Control Work Specialist or RP FLM/RP Designee:** Responsible for generating RWPs and the review of work packages for proper incorporation of radiological controls. Assists the work planner in the establishment and understanding of radiological controls. This includes the review of Radiological Control Action Steps into the work planning process.

# Figure 1
## Radiological Guide for Planners
## Summary Flow Diagram

# The ISMS Functions



# Figure 2
# Integrated Safety Management System Flowchart




*FRAT* - *Facility Radiological Assessment/Action/Assistance Team*

*JSRWP* - *Job-Specific Radiological Work Permit*

*REA* - *Request For Engineering Assistance*

RP - Radiological Protection

*SRWP* - *Standing Radiological Work Permit*

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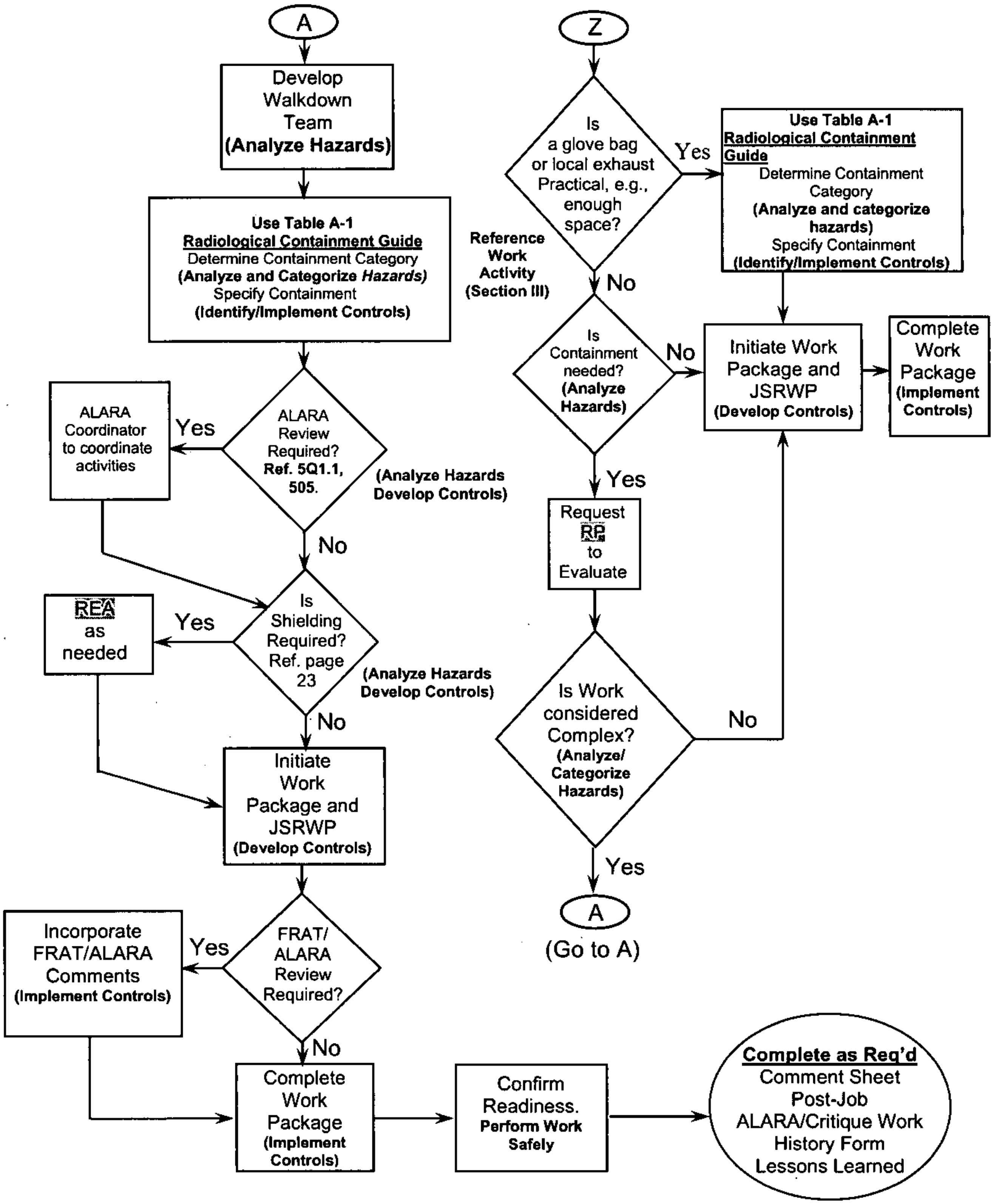
# Figure 2
# Integrated Safety Management System Flowchart, continued



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# Section I – Define Radiological Scope

## Routine Stable Operations

| NOTE |
| --- |
| Above and below grade work (e.g., sump entry) may require a Radiological Protection (RP) evaluation. A RADCON Action Step, requiring RP to perform a radiological survey prior to initiating work to verify initial conditions and/or verify conditions after line breaks, should be added to work package when applicable. |

Routine operations are defined as activities that are regular, normal business; performed by prescribed instructions or a series of steps of a more or less unvarying manner; or repetitive/recurring, customary, usual, or steady. Standing Radiological Work Permits (SRWPs) are used to control routine or repetitive activities in areas with well-characterized and stable radiological conditions.

## Routine Stable Operations - Does Not Include:

- Entry into High Radiation Areas
- Entry into Very High Radiation Areas
- Entry into High Contamination Areas (removable)
- Entry into existing Airborne Radioactivity Areas (in tritium facilities, respiratory protection required)

## Routine/Elevated RAD Conditions

Routine/Elevated jobs are more complex than routine stable operations because of the radiological aspects, and not because of job difficulty. Work under these conditions is considered routine in nature but may pose a potential hazard to radiological workers and to the facility. Activities may involve transferable contamination, personal exposure and airborne radioactivity. RP will determine if job/task requires either a Job-Specific Radiological Work Permit (JSRWP) or a SRWP. Usually, a RADCON Action Step(s) is required.

Examples:

- Sludge/Salt Sounding/Steel Tape
- Repacking valves
- Lead/shielding removal
- Waste transfer line "jacket" line break (w/no contamination history)
- High Efficiency Particulate Air (HEPA) filter replacement
- Special test procedure that requires multiple line breaks
- Cabinet glovebox/waste removal.
- Pump/agitator rebuilding.

Examples in Tritium:

- Line Breaks
- Mag Bed Replacement
- Bagging Radioactive Material Units (RMU)s
- Leak Checking
- Transferring Containers
- U-Bed Replacement.

## Routine/Elevated Conditions - Does Not Include:

- Entry into Very High Radiation Areas.

## Non-Routine/Complex Work

Non-routine/complex work activities are defined as tasks outside the normal work activities; performed by a comprehensive group of instructions consisting of elaborate or interrelated parts or ideas; or unusual or changing conditions. This type of activity can involve high levels of radiation exposure, high levels of transferable contamination, and exposure to Airborne Radioactivity. Complex jobs generally have challenging radiological aspects. A JSRWP is mandatory for complex work along with applicable RADCON Action Step as defined (Reference Manual 5Q1.1, Procedure 530, *Radiological Control Action Steps*). Consult RADCON Work Control for RADCON Action Steps applicability (Section V). For facilities where work control is not in place, consult RP for RADCON Action Steps applicability. Complex jobs require extensive radiological planning. A Facility Radiological Assessment/Action/Assistance Team (FRAT) review may also be required.

Examples:

- Waste tank Slurry pump and jumper removal
- Waste tank Diversion box line break/maintenance
- Entry into High or Very High Radiation Areas
- Waste transfer line "core" line break
- Melter replacement at the Defense Waste Processing Facility (DWPF).
- Slurry mix evaporator (SME) coil repair
- Melter Feed Pump.

Examples in Tritium:

- HEPA filter replacement
- Project work.

| **NOTE** |
|---|
| Incorporate Lessons Learned and Post-Job ALARA/Critique comments from previous job evolution. |

## Section II – Containment Overview

The hazard control process should begin during the work planning process and should involve the application of the Hierarchy of Controls for the full scope of the activity. A concerted effort to eliminate or reduce the radiological hazards should be made. However, in many instances the radiological hazards cannot be completely eliminated and therefore controls are employed.

In the planning of radiological work, hazard control selection is based on the following, listed in order of preference for use:

- Elimination of the Hazard
- Engineered Controls
- Work Practices and Administrative Controls
- Personnel Protective Equipment (PPE).

Containment is an engineered control to prevent the spread of radioactive contamination and can encompass various engineered barriers that can be applied to varying degrees. Containment is not limited to the concept of total enclosure but in many cases multiple controls will be established through a layered approach to maximize contamination controls throughout various aspects of the work evolution. Even in cases where the concept of total containment is applied toward a task, there will be some point in the evolution where the containment must be breached and other mitigating controls established for that time period.

The appropriate hazard control must be applied additionally, through the work planning process to address the end state of the work evolution based upon the scope of the work (i.e., repair of equipment, removal and temporary storage, or disposal). The desired end state can make a difference on the method used to mitigate a hazard based upon the following:

- Directly placed into final storage container for disposal
- Placed in storage for a short period of time and to be retrieved for reuse
- Placed into long term storage with potential reuse.

The utilization of plastic as the primary layer of containment is intended as a single use application based off of the design application and durability of the material. Whether applied as a glovebag or as sleeving, plastic has limitations which must be addressed and managed as part of hazard mitigation during a work evolution.

Lessons learned from the use of plastic barriers are included in Section IV that reflect issues from degradation of the plastic to include damage when handling or positioning equipment in plastic, weather damage from both wear and temperature, and long term exposure to high dose rates.

Two key principals influence the application of containment:

- Establishing the contamination barrier as close to the source as possible.
- Using containment around work areas in order to reduce the level of PPE.

Establishing effective containment involves going through a thought process involving the following general steps:

1. Defining the type of containment needed.
2. Determining that the type of containment is appropriate and adequate for the intended scope.
3. Designing the containment.
4. Obtaining, installing, certifying (when required), and using the containment.

Containment in some form should be the normal thought process for both known and "potentially" contaminated systems and equipment. Consideration must be given to the potential hazard associated with the system being worked verses the risk to the facility and its personnel.

This guide provides a step by step process for the evaluation of the task to be performed. Personnel must be realistic as to the current or "potential" conditions that could exist for a job. In many cases, what may be perceived as the easiest method (i.e., no containment or minimal controls), can pose the highest risk to personnel and the facility. When a realistic approach is taken on a job, measures can be applied that will control the spread of contamination at the worksite, and protect personnel on the job, the facility, and the environment. In some applications, these measures can lead to minimal PPE for personnel while maintaining a safety factor for the job.

Part of this evaluation is determined by the level of removable contamination, the stability of the contamination, and the type of work to be performed. Planning must include assessment of the full potential risk for the task. Aspects of containment revolve around risk and the hazard.

Some secondary considerations in determining the use of containment follow:

- **Surrounding work area contamination levels** – Controlling the spread of contamination in an area by using containment should be performed. The task should include maintaining this condition and minimizing the use of PPE. If conditions in an area will require PPE, then containment should be utilized to keep the area at least to the pre-job conditions.
- **Impact of containment failure during a job** - What will happen if your controls fail? Will a spread of contamination occur that will impact the facility and/or the personnel working the job?
- **Area dose rates at the jobsite** - If dose rates are high, then methods should be considered that take into account both the exposure to personnel as well as the possibility of the spread of contamination due to not being able to adequately survey.
- **Size of the area** - Tailor the containment toward the task being performed. Evaluate various alternatives for performing a job, and apply a method of containment that achieves the desired goal while minimizing waste, time, etc.

Some form of containment should be considered in every instance. If no risk is present based upon the above secondary considerations, then containment may not be necessary. As the risk increases or the potential of risk, contamination controls must be implemented appropriate to the task and hazard, which may include total containment. Total encapsulation or total containment is the standard for contamination levels greater than **2000 dpm alpha/100 cm$^2$** and/or **100,000 dpm beta-gamma/100 cm$^2$** or when the task being performed can generate transferable or airborne radioactive contamination.

When the concept of total containment cannot be utilized or cannot be applied at the source, compensatory actions must be taken during the job to minimize the risk. It is also recommended that contamination controls for levels below 2000 dpm alpha/100 $cm^2$ and/or 100,000 dpm beta-gamma/100 $cm^2$ be detailed so that emphasis is placed on keeping contamination at the source, and reducing its spread and impact to personnel, the facility, and the environment.

Figure 3 shows Table A-1 from the Radiological Containment Guide and it provides direction on how to determine the appropriate type of containment versus the hazard and can also serve as an aid in the planning process.

**NOTE**

Whereas fixative coatings such as Encapsulation Technologies Glycerin Solution 2 (ETGS2) Invisible Blue (blue fog) and similar coatings are considered as a form of contamination containment, caution must be taken to not rely solely on these types of fixative coatings as primary barriers for preventing the release/spread of contamination during intrusive type work. Fixative coatings used in conjunction with primary and secondary levels of containment such as plastic sleeving and containment structures can provide an increased level of control in many intrusive work situations.

## Section III – Containment Selection

The Radiological Containment Guide provides guidance for the evaluation and selection of contamination control methods. Primary and secondary criteria are considered, as well as containment categories broken down by level of "risk". As the level of risk increases, more robust or multi-layered contamination controls must be implemented appropriate to the type of work performed (operation) and the hazard.

- Primary criteria are those general to any work activity, include the level of removable contamination, the stability of the contamination, and the type of work to be performed.
- Secondary criteria are usually area and job specific, include the surrounding work area contamination levels, the impact of containment failure during a job, the area dose rates at the job site, and the size of the area.
- Risk categories include very low, low, moderate and high risk.

Vinyl sheeting/sleeving is the most common containment material due to its low cost, ease of fabrication, flexibility, and resistance to migration of most contaminates. However, vinyl has vulnerabilities which must be considered during planning as appropriate for the degree of the hazard to provide compensatory measures should the containment integrity be lost due to puncture, ripping, or splitting.

Table A-1, of the Radiological Containment Guide, provides recommended containments for specific work activities. Figure 3 of this Radiological Guide for Planners was developed as a tool to assist in the containment selection process and includes the criteria delineated in the Radiological Containment Guide. Figure 3 is recommended for use during radiological work planning.

# Section IV – Containment Lessons Learned

The use of engineered controls to prevent the spread of radioactive materials on surfaces and in the air is the clear expectation for work involving radioactive materials. The use of engineered containments is expected anytime it is necessary to remove materials from waste tanks, pump pits, diversion boxes, or to breach systems which have a radiological history.

The application of plastic as a primary control has been a generally effective method applied in the tank farms, replacing rigid pipe sleeves but entails an assumption of risk. Through the years of successes and failures, RP has learned the importance of protecting the plastic barrier to minimize the risk of failure. Precautions implemented include the covering of sharp edges, restricting work during high wind speeds, and disallowing other actions which might damage the plastic barrier.

The following are number of lessons learned from containment use:

A. **241-96H Glove Failure** - During the draining of an oxalic acid line within an existing glovebag, a leak was observed on the floor underneath the glovebag. The oxalic acid line had previously been flushed with inhibited water and the glovebag was installed to support a wet tap of the line.

Analysis – An improper connection within of the drain hose caused a leak within the glovebag, while leakage from the glovebag was due to deterioration of a glove on the unit.

Lesson – Gloves must be checked closely for degradation prior to the work and during work activities for potential areas of failure.

B. **Tank 40 Thermowell Containment Failure** – Due to previous success in removing two thermowells from waste tanks using sleeving, a determination was made to reduce the layering of protection and to not utilize a full containment hut for management and cutting of the thermowell after removal. Size reduction was to be performed using a certified glovebag on the sleeved thermowell after positioning it on the adjacent asphalt surface.

Analysis – The thermowell was not flushed to minimize residual waste during removal due to the step being optional in the work package. Personnel transitioned the thermowell from a vertical to horizontal position using a tag line around the sleeved component with further efforts by personnel involving a pry bar being applied to obtain the desired final configuration for the size reduction work.

Lesson – Fully flush all components that have been exposed to the waste or the tank vapor space to minimize contaminates, reduce exposure rates, and stabilize contamination. Respect and protect plastic sleeving to maintain the integrity of the barrier when attaching lines, straps, or using tools.

C. **Tank 51 Dip Sample** - During removal of a tank riser plug in preparation for installation of a glovebag for dip sampling, contamination was spread around the tank riser.

Analysis - Personnel failed to take into account the increased thermal conditions in the tank space which had been heated to support aluminum dissolution efforts. This increased temperature caused condensation on the riser plug and degraded tank ventilation at the plug opening.

Lesson – Understand fully conditions of the entire work area and validate that controls are adequate to mitigate the hazards associated with the task. Pay particular attention when abnormal situations are encountered.

D. **Tank 32 Riser Work** – Personnel had to pull 4 large concrete riser plugs to support waste characterization efforts on the tank. Three riser plugs had been pulled without any radiological issues but while pulling the fourth plug, it was determined to be longer than the previous plugs and as such the containment bag did not have enough length available to allow personnel to move away from the higher exposure area of the tank opening.

Analysis – Planning did not detail the plug sizes but left it to the knowledge and familiarity of the facility personnel to apply the appropriate containment bag.

Lesson – Ensure that planning defines the exact specifications of equipment or components to be removed and that containments are designed to meet the planned application.

E. **Tank 30 Jet Replacement** – The fixed length waste transfer jet was removed from Tank 30 to support temporary installation and use of a telescoping transfer jet for more effective waste removal. Due to the potential re-insertion of the fixed length transfer jet into the tank, it was removed using a plastic sleeve with hooped rings at defined intervals to help aid deployment and recovery of the containment bag from the sleeving adapter and was stored in a B-36 waste container. Re-insertion was delayed on the jet for 1 year. Due to this delay, additional personnel exposure occurred due to deformation of the hooped rings as well as contamination issues associated with residual waste crystallizing on the inside of the sleeving.

Analysis – Initial planning defined the jet to be reinstalled within a month of removal and as such the designed containment did not fully meet its final application. Planning also did not fully capture the potential for entrained waste in the lower leg of the jet even after flushing. Upon removal of the jet from the B-36 waste container, the containment sleeve was found to have areas that were brittle and discolored where waste residue had been in direct contact with the bag and crystallized. Cribbing in the waste container was not adequate and allowed the jet to shift in the box potentially damaging the sleeving.

Lesson – Planning must fully address the end state of the task and define controls to both manage the removal of equipment but also address the final end state which may entail immediate repair and re-insertion, storage (short & long term), and disposal. Because plastic degrades when exposed to high radiation dose rates, it is not a reliable containment for long term storage of highly contaminated materials. Based upon the end state, other forms of containment may be required to adequately manage the hazards associated with storage and recovery.

F. **Tank 51 Telescoping Transfer Jet** – The design of the transfer jet on Tank 51 encompassed a shield plate at the upper end which required a different rigging configuration that normal and for the jet to be dispositioned into a SeaLand container rather than a B-36 waste container. During removal from the tank as the jet was approximately 40' in the air, a tear in the containment sleeving was identified near the shield plate. Determination was made to continue movement to the SeaLand to minimize any potential spread of contamination. As the jet was transitioned to a horizontal position with support from a second crane, the contained jet was bumped against the SeaLand Container which resulted in contamination being spread on the SeaLand container and the immediate area.

Analysis – The containment bag was not built to withstand/support the stress of the overall weight of the bag. This placed additional stress on the plastic around the shield plate area. In addition, the shield plate design required the lifting lugs to be external of the containment, thus breaching the designed bag without any additional reinforcing to protect the penetration holes. In addition, the shield plate itself had exposed corners that could potentially cut plastic. The tear occurred near the top of the jet but no contamination spread was observed until the jet contacted the side of the Seal and waste container. Upon further surveys of the jet in the SeaLand, the plastic sleeving was determined to have failed at the point of impact.

Lesson – Containments must be designed to retain their integrity based upon the hazardous areas of the component being removed and to integrate with the rigging needed to lift and lower the component.

# Section V - Administrative Controls/Miscellaneous

## RADCON Action Step Format

RADCON Action Steps are designed to drive an action. They are generally formatted in 3 parts and shall state: a) an RP action to be performed, b) a limit that is being surveyed for, and c) what action is to be taken as a result of the survey. The action may be to institute containment, to add additional shielding, to perform spray misting, or to inform personnel of conditions their personnel may be working in. RP may be required to initial off on actions taken to satisfy the parameters of the step. Action steps may be utilized in various manners (i.e., as awareness step to act as a buffer prior to reaching the RWP suspension limits, or it may direct suspension of activity based upon the reaching of a suspension limit itself).

When using action steps, the planner must realistically assess the real and/or potential hazard associated with the activity to be performed. If the activity is determined to be routine and/or low risk to personnel and the facility, then general action steps are sufficient. If contamination levels are reached, then direction in the action step will allow a path forward without necessarily revising the work package (i.e., decon and/or apply containment). This allows the work to continue based on the RWP suspension guides not being exceeded, but employing proper controls based on containment guides and the level of risk. If RWP suspension guides are reached then the job will be placed in a safe configuration and personnel will halt the activity.

All steps within the package should direct an activity from the Person in Charge, Lead Work Group (LWG), Supervisor, Foreman, etc. In the application of RADCON Action Steps, initiation should be **"ENSURE RP"** performs a task or survey. Since RADCON Action Steps are defined as key information gathering points, we must make sure the person running the job directs and confirms that this task is done.

**Action steps must be worded to ensure personnel have the ability to complete the RADCON Action Step before moving to the next step in the work instruction.**

RADCON Action Steps may be built into a step within the work package that ties directly with a task that is being performed. This would be for actions that are performed **concurrently** such as smearing of a line break on a process system. In other cases to obtain general area survey information the RADCON Action Step may stand alone in the work document such as characterizing the conditions within a hut or work area prior to initiation of the main task or at its completion. When the RADCON Action Step stands alone, it generally is in support of a RP action such as characterization of an area or containment.

**<u>Formats</u>**

### 1. <u>RADCON Work Instructions</u>

Direction for RP to perform a task that does not require radiological survey data such as certify hut, verify wind speed, ensure air flow is down into cell, etc. These types of steps can be found in prerequisites or within the body of the work packages depending upon application to the task. They should not generally be classified nor formatted as an action step.

## 2. RADCON Action Steps – Two Basic Formats

**Format A**

RP action with a "***defined stopping point.***" Use specific numbers that personnel are surveying for and define the type of survey (i.e., probe, smear, exposure rate, air sample, etc.) The RWP suspension guide levels are normally used for Action Step Format A.

*****RADIOLOGICAL CONTROL ACTION STEP*****

**ENSURE** RP performs a ____________ survey of ____________.

**IF** _________________ is detected, **THEN SUPSEND** work, **AND**

**RELOCATE** to an unaffected area, **AND NOTIFY** the ____________.

Initials

**Format B)**

RP action to "***survey to some action level with option to take mitigating action.***" The action level is normally set below the RWP suspension guide.

*****RADIOLOGICAL CONTROL ACTION STEP*****

**ENSURE** RP performs a ____________________ survey of ______________________.

**IF** any of the following levels are detected:

| Contamination | | Probe | | Working Dose Rate | | Airborne | |
|---|---|---|---|---|---|---|---|
| | $\alpha$ | | $\alpha$ | | Extremity | | DAC-hr |
| | $\beta\gamma$ | | $\beta\gamma$ | | Skin | | |
| | | | | | Whole Body | | |

**THEN** *"Define options or actions that can be taken here"* (i.e., take action as directed by supervision, decon/seal to no detectable contamination, decon/fix and/or apply total containment).

Define Action Taken: ______________________________________________________.

LWG _______________

RP________________

Initials

**Format B**

Concurrent actions can be built into the same step or a Note can reference that Steps 1 and 2 will be worked concurrently.

**Note:** (Work Group) and RP will perform the following steps concurrently.

*****RADCON ACTION STEP*****(Work Group):

1.1 (Work Group): **ENSURE** RP performs defined surveys ______________________.

**PERFORM** ________________________________ **AND** *"provide group and task".*

**IF** any of the following levels are detected:

| Contamination | | Probe | | Working Dose Rate | | Airborne | |
|---|---|---|---|---|---|---|---|
| | α | | α | | Extremity | | DAC-hr |
| | βγ | | βγ | | Skin | | |
| | | | | | Whole Body | | |

1.2 **THEN** ________________________________________ *"Define options or actions that can be taken here"* (i.e., take action as directed by supervision, decon/seal to no detectable contamination, decon/fix and/or apply total containment).

1.3 (Work Group): Action taken: ______________________________________ "fill in group and what actions were taken as a result of survey findings".

LWG ________________

RP________________

Initials

Examples of Radiological Control Action Steps are detailed for both general activities and some facility specific types of work. See Figure 4 for examples of Radiological Control Action Steps.

## ALARA Statement

| NOTE |
|---|
| The following ALARA Statement may be used in conjunction with the applicable RADCON Action Steps. |

ALARA – Upon RP initial verification, if radiation or contamination levels exceed 80% of the RWP suspension guide limits during the job/task; suspend work, contact LWG Supervisor & RP Management for a path forward. This should include determination of the cause, decontamination requirements, exposure reduction methods, and possible revision to the RWP for new suspension guides.

If RADCON Action Steps are maintained at levels below the RWP suspension guides, using them as stepping stones toward the suspension guide, then the technical work document should be maintained within acceptable levels that are recognized by all lead supervisors.

## Shielding Requirements

In Non-Routine/Complex Work the use of shielding should be considered. If a source of radiation can be shielded, resulting in an overall person-rem exposure savings of at least one half of the predicted unshielded exposure, or 100 mrem whichever is smaller, the use of shielding should be considered. The use of shielding to reduce exposure to a source of radiation must be approved by engineering. When it is not practical to shield the radiation source, shielding the worker (e.g., lead apron) should be considered.

## 5Q Pre-Job Briefing Requirements

The *Lead Work Group Supervisor or Craft Foreman* is responsible for conducting any pre-job briefings, documenting attendance and topics discussed, and ensuring that this information is maintained with the technical work document (Reference Manual 5Q1.1, Procedure 504, *Radiological Work Permit*).

# Section VI – Dose Targets & Administrative Control Limits/Levels

As defined in Manual 5Q, the site's objective of maintaining individual doses well below regulatory limits is based upon establishing challenging administrative control levels to reduce individual and collective radiation dose. These levels are defined in Manual 5Q1.1, Procedure 507, *Administrative Control Limits Adjustments and Departures.*

While SRS has aggressively established whole body dose administrative control levels as part of the Site's implementation of ALARA, the same practice has not been applied to other exposures such as extremity, lens of the eye, and skin. For these areas, SRS uses the predefined limits established by the Department of Energy (DOE) that are designed to prevent acute effects. As such, the concept of ALARA is not applicable.

**Type of Exposure Limits & Levels**

| | |
|---|---|
| DOE Annual **Limit** – Whole Body | 5000 mRem per year |
| DOE Administrative Control Level – Whole Body | 2000 mRem per year |
| SRS Administrative Control Level – Whole Body | 500 mRem per year |
| DOE/SRS Administrative Control **Limit** – Lens of the Eye | 15,000 mRem per year |
| DOE/SRS Administrative Control **Limit** – Skin & Extremities | 50,000 mRem per year |
| DOE/SRS Administrative Control **Limit** – Any Organ or Tissue (other than lens of the eye) | 50,000 mRem per year |

Due to changing work scopes in our facilities, it seems prudent to define extremity, skin and lens of the eye dose targets for our personnel to ensure that limits are not exceeded. Application of the monthly targets will also assist in maintaining employee availability to support critical work toward year end. In addition, these levels can be used by the facility to protect the work force during planning and execution of work.

**Example:**

**Dose Targets for Defense Waste Processing Facility (DWPF)**

| | |
|---|---|
| DWPF Dose Target – Lens of the Eye | 900 mRem per month |
| DWPF Dose Target – Skin & Extremities | 3,000 mRem per month |

Exposures results are monitored at various intervals depending on the type of exposure and the associated risk of exposure. Whole body dosimetry is generally reviewed on a monthly or quarterly basis with some special job specific sampling performed. Extremity dosimetry is typically monitored per a defined job evolution or on a monthly basis depending on the application and associated risk to personnel exposures.

This information then allows the facility to trend personnel exposures to ensure awareness of current data and how these levels relate to the dose targets in those respective exposure areas. By monitoring personnel exposures in this manner, RP can better evaluate the success or failure of controls that have been implemented to control and minimize exposure hazards during the execution of work.

The dose targets are not limits, but dose budgeting tools. If necessary the targets can be exceeded, but such allowances should be well planned, documented and approved by the facility Safety and Health Manager.

The SRS External Dosimetry Group supports adherence to the targets by providing prompt notification when dosimeter results are elevated. **For reference, the following are SRS review and notification levels for various exposures types. These are found in Manual 5Q2.1, Procedure 234A, *Dose and Update TLDs in the Doctor's Dosimetry System (DDS).***

Review the equivalent dose results for the following:

- Equivalent Dose Whole Body - ≥150 mrem
- Equivalent Dose Lens Of The Eye - ≥1000 mrem
- Equivalent Dose SkinWhole Body - ≥1500 mrem
- Equivalent Dose Skin Extremity - ≥1500 mrem

**Health Physics Services will perform a Dose Assessment review for any single external dose that exceeds an expected exposure by 500 mrem whole body dose or 1500 mrem eye dose or 5000 mrem skin or extremity dose.**

# Figure 3

***Reference: Radiological Containment Guide, WSRC-OS-94-14***

## Containment Selection Process

**Work Package Number**______________________________ Date______________

**Brief Job Description**____________________________________________

General Discussion: This form was developed as a tool to assist in the selection of containment during the early planning stages of work, specifically when performing job walk downs. The document that controls the work should indicate the need for and the type of containment to be used. A walk down should be pre-scheduled, which typically includes a representative from RP, Lead Work Group, Operations, and other affected work groups. One of the key principles in the application of containments is to establish the containment as near to the source as possible.

Good containment selection should accomplish the following:

- Minimize personnel contamination
- Prevent the spread of contamination
- Minimize the use of PCs and PPE
- Minimize generation of waste

**① Select the appropriate block from each of the first three columns, then add the assigned value from each column to determine the containment category.**

| Removable Contamination Level (per 100 cm$^2$) | Contamination Stability | Operations | Containment Category |
|---|---|---|---|
| **<10 times Table 2-2**<br><10,000 dpm $\beta\gamma$; <200 dpm $\alpha$<br><10,000 dpm $H^3$<br>**Value = 6** | **Very Stable**<br>Suspended in liquid, or on a moist or oily surface<br>**Value = 4** | **Simple Material Movement**<br>walking, lifting, carrying<br>**Value = 5** | **Very Low Risk**<br>**Total = 15 - 20** |
| **<100 times Table 2-2**<br>10,000 to 100,000 dpm $\beta\gamma$ or 200 to 2000 dpm $\alpha$<br>10,000 - 1,000,000 dpm $H^3$<br>**Value = 12** | **Moderately Stable**<br>Based on surface texture, weathering, and other factors<br>**Value = 8** | **Vigorous Material Movement**<br>repackaging waste, HEPA filter manipulation, packing replacement,<br>**Value = 10** | **Low Risk**<br>**Total = 21 - 31** |
| **>100 times Table 2-2**<br>>100,000 dpm $\beta\gamma$; >2000 dpm $\alpha$<br>>1,000,000 dpm $H^3$<br>**Value = 18** | **Low Stability**<br>Readily re-suspends in air.<br>**Value = 12** | **Use Of Power Tools**<br>in the area or manual cutting, shaping, or abrading of contaminated material<br>**Value = 15** | **Moderate Risk**<br>**Total = 32 – 45** |
| | | **Use Of Low Velocity Power Tools**<br>to cut, shape or abrade material, i.e., band saws, electric drills operated at low speeds on contaminated components<br>**Value = 20** | **High Risk**<br>**Total > 45** |
| | | **Use Of High Velocity Power Tools**<br>to cut, shape, or abrade material, i.e., grinders, high-speed drills, on contaminated components<br>**Value = 25** | |
| **Value** ________ **+** | **Value** ________ **+** | **Value** ________ **=** | **Total** ________ |

**Containment Selection Process, contd** **Work Package Number**______________

② **Check containment category identified on page 1.**

☐ **Very Low Risk (Total = 15-20)** Small risk of contamination spread - minimal containment, if any (damp rag, sleeving, plastic bag) selection left to workers - skill of craft.

☐ **Low Risk (Total = 21-31)** Risk of contamination spread is low, but containment device is specified. Examples are catch containments, drip pans, windbreaks, sleeving, air curtains, etc.

☐ **Moderate Risk (Total = 32-45)** Risk of contamination spread is moderate - heavy sleeving, glovebags, poly bottles, or non-ventilated huts. Total enclosure.

☐ **High Risk (Total > 45)** Risk of contamination spread is high – glovebags and/or ventilated hut, used independently or in conjunction with each other. Total enclosure.

③ **Check containment selection.**

| Low Risk (Total = 15-20) | Moderate Risk (Total = 21-31) | High Risk (Total > 45) |
|---|---|---|
| ☐ Ventilated Hood | ☐ Glove Bag (HEPA filtered) | ☐ Shielded Containment/Cask |
| ☐ Additional Wall | ☐ Poly Bottle (HEPA filtered) | ☐ Glovebag/Hut (Ventilated) |
| ☐ Plastic Bag | ☐ Hut (Unventilated) | ☐ Special Containment (specify) |
| ☐ Sleeving | ☐ Heavy Sleeving | ☐ Combination Containments (specify) |
| ☐ Drop Cloth/Diaper | ☐ Other (specify)* | ☐ Other (specify)* |
| ☐ Windbreak | | |
| ☐ Lay Down Area | | |
| ☐ Catch Containment/Pan | | |
| ☐ Other (specify)* | | |

*When using "Other" containment, the level of control should meet or exceed the requirements of the Risk Category.

④ **Indicate hut specifications if hut is required (length x width x height). Diagram glovebag or hut if needed for special configuration.**

☐ Ventilation Method: Forced ____ Passive_____ (# ____ air exchanges/hr)
☐ Number of Windows
☐ Number of Airlocks
☐ Removable Roof (for Crane/Lifting Accessibility)
☐ Enclosed Pathways (for entry/egress)

Comments (List Any Special Instructions) ______________________________

Personnel Performing Walkdown

____________________ ____________________

____________________ ____________________

# Figure 4

## Examples of Radiological Control Work Instructions and Action Steps

**RADCON Work Instructions**

The following are examples of work instructions for RP tasks that can be found in prerequisites or within the body of the work packages depending upon application to the activity. They should not be formatted nor classified as an action step.

- RP: **ENSURE** containment hut has been certified (OSR 4-862) and **RETAIN** a copy in the work package.
- Maintenance: **ENSURE** RP verifies that the sustained wind speed at the work site is not greater than 10 mph. If conditions are degrading, then work may proceed to place the job in a more stable condition with concurrence from the Radiological Protection Facility Manager.
- RP: **VERIFY** airflow is DOWN INTO the Tank and NOT OUT to atmosphere after cover plate has been removed.

  **IF** airflow is questionable, **THEN**

  **START** supplemental ventilation unit, **AND**

  **REPEAT** air flow check.

  **IF** the airflow is questionable, **THEN**

  **PLACE** work in a safe condition, **AND**

  **EXIT** hut area at RP and Industrial Hygiene (IH) direction, **AND**

  **CONTACT** Person In Charge (PIC) for path forward.

**Radiological Control (RADCON) Action Steps**

**Example of Format A**

*****RADIOLOGICAL CONTROL ACTION STEP*****

**ENSURE** RP performs a survey for radiation and contamination during the repair of the Thermocouple Junction Box on SMP-3 Tank 4 Riser 3.

**IF** any contamination is detected, **THEN**

**SUSPEND** work, **AND**

**PLACE** system in a safe state, **AND**

**CONTACT** PIC/FLM.

__________
*Initials*

**Example of Format A**

*****RADIOLOGICAL CONTROL ACTION STEP*****

**ENSURE** RP performs a radiological survey of the transmitter air at line break.

**IF** levels exceed 200 dpm/100cm$^2$ alpha, 1000 dpm/100cm$^2$ beta/gamma, or 1 mrem/hr, **THEN**

**SUSPEND** work, **AND**

**NOTIFY** the PIC and RP FLM.

*Initials*

**Example of Format B**

*****RADIOLOGICAL CONTROL ACTION STEP*****

**ENSURE** RP performs survey prior to Glove Bag removal.

**IF** any of the following levels are detected:

| Contamination | | Probe | | Dose Rate | | Airborne | |
|---|---|---|---|---|---|---|---|
| 2000 dpm/100cm$^2$ | α | N/A | α | N/A | Extremity | N/A | DAC-hr |
| 10000 dpm/100cm$^2$ | βγ | N/A | βγ | N/A | Skin | | |
| | | | | N/A | Whole Body | | |

**THEN, DECON** to less than these levels before initiating containment removal.

LWG ______________

RP________________

*Initials*

**Example of Format B**

*****RADIOLOGICAL CONTROL ACTION STEP*****

**ENSURE** RP performs survey of the interior of the hut prior to removing the hut roof and relocating to a prepared area.

**IF** any of the following levels are detected:

| Contamination | | Probe | | Dose Rate | | Airborne | |
|---|---|---|---|---|---|---|---|
| 2000 dpm/100cm$^2$ | α | N/A | α | N/A | Extremity | N/A | DAC-hr |
| 1000 dpm/100cm$^2$ | βγ | N/A | βγ | N/A | Skin | | |
| | | | | N/A | Whole Body | | |

**THEN, DECON** or **FIX** to less than these levels before initiating hut roof removal.

**DEFINE** Action Taken: ______________________________

______________________________.

LWG ______________

RP______________

______
*Initials*

**Example of Format B**

*****RADIOLOGICAL CONTROL ACTION STEP*****

**ENSURE** RP performs survey of work area floors, general area surfaces, and on equipment to be repaired. **REPORT** results to the PIC.

**IF** any of the following levels are detected:

| Contamination | | Probe | | Dose Rate | | Airborne | |
|---|---|---|---|---|---|---|---|
| 20,000 dpm/100cm$^2$ | α | N/A | α | 30,000 mrem/hr | Extremity | >150 | DAC-hr Pu/FP |
| 20 Rad/hr | βγ | N/A | βγ | 12,000 mrem/hr | Skin | | |
| | | | | 250 mrem/hr | Whole Body | | |

**THEN, NOTIFY** the PIC and RP FLM to determine path forward.

**DEFINE** Action Taken: ______________________________

______________________________.

LWG ______________

RP______________

______
*Initials*

**Example of Concurrent Format B**

*****RADIOLOGICAL CONTROL ACTION STEP*****

**Note:** Maintenance and RP will perform the following steps concurrently.

Maintenance: **ENSURE** RP performs survey of work area as valve bonnet is removed.

**IF** any of the following levels are detected:

| Contamination | | Probe | | Working Dose Rate | | Airborne | |
|---|---|---|---|---|---|---|---|
| 1000 dpm/100cm$^2$ | α | N/A | α | 10,000 mrem/hr | Extremity | 150 | DAC-hr |
| 500 Rad/hr/100cm$^2$ | βγ | N/A | βγ | 1000 mrem/hr | Skin | | |
| | | | | 50 mrem/hr | Whole Body | | |

**THEN, DECONTAMINATE, AND/OR, INSTALL** shielding at the direction of the PIC and RP FLM.

**RECORD** Actions Taken: ______________________________________________

______________________________________________________________.

Maintenance: ____________

RP: ___________

_____/____

*Initials*

## Appendix A - Acronyms

ALARA – As-Low-As-Reasonably-Achievable

DOE – Department of Energy

DWPF – Defense Waste Processing Facility

FRAT – Facility Radiological Assessment /Action/Assistance Team

HEPA – High Efficiency Particulate Air

IH – Industrial Hygiene

ISMS – Integrated Safety Management System

JSRWP – Job-Specific Radiological Work Permit

LWG – Lead Work Group

PC – Protective Clothing

PIC – Person In Charge

PPE – Personal Protective Equipment

RC – Radiological Control

REA – Request for Engineering Assistance

RMU – Radioactive Material Unit

RP – Radiological Protection

RWP – Radiological Work Permit

SRNS – Savannah River Nuclear Solutions

SRR – Savannah River Remediation

SRS – Savannah River Site

SRWP – Standing Radiological Work Permit

SWP – Safe Work Permit

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