SANDIA NATIONAL LABORATORIES
NEW MEXICO

WASTE MANAGEMENT AND POLLUTION PREVENTION DEPARTMENT

RADIOACTIVE WASTE/MATERIAL FACILITIES

OPEN CONTAINER OPERATIONS

Replaces: FOP 09-11, *Open Container Operations*, Revision 00, dated February 15, 2010

Effective Date: May 30, 2012

Author:

Leroy Duran, Open Container Project Leader — 5/17/2012 Date

Reviewed By:

Mary Ann Krauss, Waste Certification Official — 05-17-2012 Date

John Longley, Processing Specialist — 5-15-12 Date

Martin Brennan, Radiation Safety Officer — 05/15/12 Date

Nuclear Criticality Safety Engineer — 5/21/2012 Date

Approved By:

Jeffrey F. Jarry — 5-21-12 Date

This page is intentionally blank.

TABLE OF CONTENTS

FORMS:

RF 2042-ALP	*Waste Addition Log for Parcels Containing Compactable Debris*
RF 2042-ATD	*Task Specific Work Plan*
RF 2042-AUL	*Authorized Users List*
RF 2042-CMS	*Conditional Movement Survey*
RF 2042-DPJ	*Pre-Job Briefing Remarks*
RF 2042-DRX	*Radioactive or Mixed Waste Disposal Request Change Form (Approval Sheet)*
RF 2042-FCM	*Field Data Conditional Movement Release*
RF 2042-HSF	*Container Hazard Summary Form*
RF 2042-OMO	*Department On-Site Move Order*
RF 2042-PCH	*Process Chemical Hazards Form*
RF 2042-PGW	*PGW Waste Addition Log*
RF 2042-PSR	*Pre-Start Work Review*
RF 2042-PWR	*Post-Work Review*

RF 2042-RTF	*RMWMF Treatment Form*
RF 2042-SIF	*Source Information Form*
RF 2042-SIS	*Survey Information Sheet*
RF 2042-SWP	*Processing Work Plan*
RF 2042-SWPA	*Processing Work Plan Approvals*
RF 2042-TIC	*Type I Processing Work Plan*
RF 2042-WAL	*Waste Addition Log for Parcels Containing Non-Compactable Waste*
RF 2042-WEF	*Work Evaluation, Acceptance and Authorization Form*
RF 2042-WFI	*Work Plan Feedback and Improvement Form*
SF 2042-LTR	*Accountable Nuclear Material Transfer Request Form*
SF 2042-TRA	*Radioactive or Mixed Waste Disposal Request Form*
SF 2001-BRF	*Pre-Job Briefing Sign-In Sheet*
SF 2001-CLO	*RWP Review and Closeout*
SF 2001-COC	*Contract Laboratory Analysis Request and Chain of Custody*
SF 2001-JSA	*Job Safety Analysis*
SF 2001-RPW	*Accountable Nuclear Material Transfer Request Form*
SF 2001-RWP	*Radiological Work Permit*
SF 2001-SSB	*Technical Work Document Sign-In (Includes Dose Tracking)*

1.0 PURPOSE, SCOPE, AND OWNERSHIP

Open container operations are conducted by the Waste Management and Pollution Prevention Department (WMPPD) to segregate waste into appropriate waste streams for disposal, and to obtain information on the radiological, physical, and chemical characteristics of unknown items in waste or material. Open container operations include treating waste to reduce or eliminate associated hazards, enabling continued storage, facilitating transportation off site, and enhancing disposal options.

1.1 Purpose

This procedure provides the framework for planning, and for analyzing and addressing the hazards (chemical, physical, and radiological) associated with open container operations (waste sorting and treatment, collectively referred to as waste processing). It includes procedural guidance for waste processing and mechanisms for gathering feedback and sharing lessons learned to improve the processes. Open container operations will follow a detailed work plan when required by this procedure.

1.2 Scope

This procedure provides instructions for planning the processing of radioactive waste by the WMPP. Unless otherwise specified, the term waste, as used in this document, refers to low-level, transuranic and mixed waste, and material including accountable nuclear material and items that have not been declared as waste.

Five processing types are defined based on the hazard level of the operation involved. The five types are divided into two groups: non-invasive processing operations and invasive processing operations. Non-invasive processing operations (Types 0 and I) utilize minimal personal protective equipment (PPE) and no engineering controls. Invasive processing operations (Types II, III, and IV) utilize more rigorous PPE, engineering controls such as ventilation systems, and in some cases, respiratory protection.

When required by this procedure, processing activities are defined in a Processing Campaign, which is a project identified for organizational and planning purposes and documented in a Work Plan. Work Plans are divided into tasks and implemented using detailed Task-Specific Work Plans. Work plans communicate hazards, controls, and work instructions to personnel implementing processing operations.

Waste processing entails various activities applied directly to wastes to alter their chemical or physical properties or their groupings with other waste items or to determine their chemical and radiological characteristics.

These may include:

- Neutralization of corrosive waste.
- Stabilization of metal-bearing waste.
- Solidification of liquid waste and fine particulate waste.
- Deactivation of pyrophoric waste, water-reactive waste, and waste oxidizers.
- Deactivation of explosive mixed waste.
- Macroencapsulation of hazardous debris and certain non-debris waste.
- Mechanical processing.
- Segregation of waste items based on regulatory characteristics, chemical characteristics, radiological characteristics, or physical form
- Measurement of chemical and radiological characteristics sometimes including physical sampling.

Treatment of mixed waste that is listed in the SNL/NM RCRA Part A permit application will be performed as an on-site treatment, unless waste treatment is part of a treatability study and the New Mexico Environment Department (NMED) is notified in advance.

Mixed waste to be shipped off site for disposal will be treated to meet land disposal restrictions including standards for underlying hazardous constituents (UHC) prior to shipment, if applicable. In addition, regulators or waste disposal facility personnel will be provided with the necessary authorizations, facilities, and personnel to allow visual verification and chemical screening (sampling) of waste packages, upon request.

General requirements and procedures for handling closed waste containers are described in FOP 00 02, *Waste Handling*.

The activities described in this FOP have been assigned a medium level of rigor. Activities performed under a Work Plan will be analyzed to determine the level of rigor associated with the specific activity per PRG 09-01, *RWNMDD Work Planning & Control Program*. A Work Planning and Control subject matter expert will review and Division 4000 management will approve Work Plan activities identified as low rigor.

1.3 Ownership

The author is responsible for the content of this procedure. Comments or suggestions for improvement regarding this procedure should be forwarded to the author.

1.4 Frequency of Review

This FOP will be reviewed every two years according to AOP 94-12, *Technical Work Document Processing System*.

2.0 RESPONSIBILITIES

Personnel who participate in open container operations and their responsibilities are identified in this section.

2.1 Open Container Project Leader

The Open Container Project Leader is responsible for the following activities:

- Defining long-range waste management goals for open container operations.
- Defining processing campaigns.
- Reporting status of processing campaigns during weekly planning meetings.
- Reviewing and approving Work Plans.
- Authoring open container program documents, including this procedure, the Primary Hazard Screening (PHS), and the Hazards Analysis (HA).
- Leading the open container team project review meetings.
- Ensuring that Radiological Work Permits (RWPs) are in place.
- Ensuring that ALARA reviews are performed, when needed.

2.2 Processing Specialist

Processing Specialists are responsible for the following activities:

- Preparing Work Plans in accordance with this procedure.
- Distributing Work Plans to reviewers.

- Conducting work planning meetings with affected workers and safety support personnel.
- Finalizing Work Plans in consultation with reviewers.
- Performing the Job Coordinator activities described in Chapter 1 of the *Radiological Protection Procedures Manual* (RPPM).
- Preparing a Radiological Planning Worksheet (SF 2001-RPW).
- Submitting the Radiological Planning Worksheet (SF 2001-RPW) and associated technical work documents (TWDs) to Radiation Protection support personnel (RP) for review and issuance of a Radiological Work Permit (SF 2001-RWP) (RWP).
- Providing a pre-job briefing on this FOP, applicable LOPs, the Radiological Planning Worksheet and the RWP to authorized users and documenting the briefing using a Pre-Job Briefing Form (SF 2001-PJC). Briefed personnel will sign in on a Pre-Job Briefing Sign-In Sheet (SF 2001-BRF).
- Preparing a Technical Work Document Sign–In Sheet (SF 2001-SSB) for each Work Plan and ensuring it is filled out before and after each field operation.
- Completing the Work Evaluation, Acceptance and Authorization Form (RF 2042-WEF) to supplement each Work Plan in accordance with PRG 09-01, *RWNMDD Work Planning & Control Program*.
- Calibrating or bump testing field industrial hygiene (IH) instruments (PID, LEL/O2 H2S, etc.) if not performed by a waste handler.
- Providing pre-job briefings prior to performing processing operations and completing the Pre-Start Work Review form (RF 2042-PSR).
- Supervising and participating in processing operations in accordance with approved Work Plans.
- Ensuring that processing is performed in accordance with department quality assurance requirements.
- Preparing documentation from processing activities (forms, campaign notebooks, and processing logbooks). Initialing hold point survey completion entries in the logbook.
- Determining when deviations from Work Plans are needed during processing, notifying the Open Container Project Leader of the deviation, and documenting minor deviations in the processing logbook.
- Notifying RP when there is a need to deviate from the radiological controls imposed by this procedure or the approved Work Plan.

- Providing an in-progress job review at least daily, recorded as a Post-Work Review (RF 2042-PWR), to include feedback and improvements.
- Providing for close-out of Work Plans to include feedback and improvements recorded on the Work Plan Feedback and Improvement Form (RF 2042-WFI).
- Initiating the RWP closeout process by completing the RWP Review and Closeout form (SF 2001-CLO).
- Attending the open container team project review meetings.
- Periodically inspecting the waste characterization team processing requests list for processing assignments.

2.3 Waste Handlers

Waste Handlers are responsible for the following activities:

- Participating in a pre-job briefing before working under this FOP and applicable LOPs, the RPW and the RWP, acknowledged by signing the Pre-Job Briefing Sign-In Sheet (SF 2001-BRF).
- Reviewing draft Work Plans (one Waste Handler per plan will sign the Processing Work Plan Approvals RF 2042-SWPA).
- Calibrating or bump testing field IH instruments (PID, LEL/O2 H2S, etc.) if not performed by the processing specialist.
- Participating in daily pre-job briefings before performing processing operations under Work Plans, acknowledged by signing the Pre-Job Briefing Remarks sign-in sheet (RF 2042-DPJ).
- Signing in/out on the applicable Technical Work Document Sign-In Sheet (SF 2001-SSB) for each processing work shift.
- Performing processing operations in accordance with this procedure and approved Work Plans.
- Complying with the radiological controls identified in this procedure and approved Work Plans.
- Informing the Processing Specialist of activities outside the scope of the planned work, unsafe conditions and methods for improvement.
- Participating in in-progress and task close-out reviews for each Work Plan (RF 2042-WFI, Work Plan Feedback and Improvement Form).
- Participating in annual project review meetings.
- Tracking waste package and parcel movements.

2.4 Radiological Control Technicians

Radiological Control Technicians (RCTs) are responsible for the following activities as appropriate:

- Performing job-coverage, movement, post-job, characterization, and shipment surveys in support of processing operations.
- Performing daily instrument checks for radiological instrumentation.
- Preparing lapel monitors for use.
- Placing/removing lapel monitors on personnel. Turning lapel monitors on.
- Removing respirators from personnel.
- Performing air sampling (CAMs, high-volume, and low-volume).
- Writing RWPs for processing operations.
- Participating in a pre-job briefing before working under this FOP and applicable LOPs, the RPW and the RWP, acknowledged by signing the Pre-Job Briefing Sign-In Sheet (SF 2001-BRF).
- Participating in daily pre-job briefings before performing processing operations under Work Plans, acknowledging by signing the Pre-Job Briefing Remarks sign-in sheet (RF 2042-DPJ).
- Signing in/out before and after supporting processing operations on the Technical Work Document Sign-In Sheet (SF 2001-SSB) for applicable Work Plans.
- Documenting all hold point surveys by initialing log book entries.
- Participating in in-progress and task close-out reviews (RF 2042-WFI, Work Plan Feedback and Improvement Form).
- Attending annual ISMS project review meetings.
- For lead RCT, approving Type I work plans.

2.5 Division ES&H Team and Site Safety Officer

The ES&H support personnel (IH, RP and safety engineering [SE]) and the Site Safety Officer are responsible for the following:

- Reviewing and approving Work Plans, as appropriate.
- Providing guidance, as requested, during processing.
- Providing guidance for prescribing the processing type, engineering and administrative controls, and PPE for processing tasks.

2.6 Radiation Safety Officer

The Radiation Safety Officer is responsible for the following:

- Reviewing and approving Work Plans.
- Evaluating radiological deviations.
- Determining bioassay requirements.
- Tracking dose against ALARA thresholds.

2.7 Non-Nuclear Operations Supervisor

The Non-Nuclear Operations Supervisor (NNOS) is responsible for preparing and obtaining approval for RF 2042-TIC, Type I Processing Work Plan, as necessary, according to this procedure.

2.8 Waste Certification Official

The Waste Certification Official (WCO) is responsible for:

- Reviewing and approving work plans.
- Monitoring processing operations to ensure compliance with acceptance criteria for waste disposal facilities.

3.0 TRAINING AND QUALIFICATIONS

The NNOS and the Open Container Project Leader must meet the training and qualification requirements specified in PRG 00-01, *Department Training Program* and PRG 00-02, *Non-Nuclear Operations Training Program*.

Processing Specialists and Waste Handlers meet the qualification and training requirements for Processing Specialists and Waste Handlers, respectively, in the *Weston Qualification and Training Program*. Processing Specialists and Waste Handlers must read approved Work Plans and sign the Authorized Users List (AUL) for each plan. The AUL serves as evidence that personnel have read, understand, and agree to comply with the work plan.

All users of this FOP and personnel conducting WMPPD radioactive or mixed waste processing must read this FOP and sign an Authorized Users List.

4.0 GENERAL RADIOLOGICAL CONTROL PRACTICES

Planning and control of radiological work performed during WMPPD waste processing operations is conducted in accordance with the RPPM, Chapter 1, *Radiological Work Planning and Controls*. The work planning process specified in this procedure includes radiological work planning. The following subsections address radiological control practices that are common to all processing operations.

4.1 RWP

The Processing Specialist prepares the Radiological Planning Worksheet (SF 2001-RPW) and submits the worksheet to the RP Project Leader. The prepared worksheet encompasses the work addressed under this procedure for Types I through IV processing. A single RWP that addresses the work specified in this procedure for Types I through IV processing will be prepared by RP personnel.

4.2 Bioassay

Processing personnel will participate in bioassay as designated by the Radiation Safety Officer.

4.3 RCT Coverage

An RCT will be assigned to the processing activity each day by the Lead RCT or designee. The designated RCT does not need to be continuously present at the job, provided that the RCT remains in continuous radio contact with the processing personnel, remains at the RMWMF compound and does not cover any other waste management-specific job. The RCT will be notified at the job start, whenever a hold point is reached, when a survey is required, and at job completion.

4.4 Entry Controls

Entry Controls include administrative controls (e.g., signs and barricades). Postings will be initiated based on the Work Plan and updated by the RCT based on the most recent survey, as appropriate for the Work Plan's anticipated conditions, or as changing radiological conditions warrant.

4.5 Monitor Surveys

Monitoring Surveys of Processing Operations will be performed as follows:

- Hot particle surveys will be performed in accordance with RPJA 04-01-11, *Hot Particle Surveys*, when the area is posted as a Hot Particle Area.
- Job coverage surveys shall be performed for all work in Contamination Areas. These surveys will normally be performed at the end of the workday or as soon as possible prior to any work commencing in the affected area. Deviations to this will be considered by the Radiation Safety Officer and documented. If more than one job is planned for a single day, the Radiation Safety Officer shall make a determination as to the need for surveillance between jobs.
- Air sampling will be performed to down-post Airborne Radioactivity Areas.
- Large area masslin wipes shall be collected on the exterior of all containers and tools, and surveyed prior to removal from Contamination or Hot Particle Area. If measureable activity is detected on the large area wipes, decontamination and the large area wipe survey will be repeated. If no activity is detected on the large area wipe, the item will be transferred to the Radiological Buffer Area for movement survey.
- If specified in the Work Plan, Conditional (Rush) Movement surveys will be documented on the Conditional Movement Survey form (RF 2042-CMS) and Field Data Conditional Movement Release form RF 2042-FCM) and approved by both the Line and RP prior to movement.
- Hold point surveys will be conducted as specified in the Work Plan.

4.6 Personnel Frisking Requirements

- When exiting a Contamination Area, personnel will perform a hand and foot frisk before proceeding to the PCM-II or before having a whole body frisk performed by the RCT.
- If the area is posted as a Hot Particle Area, Hot Particle surveys of personnel will be performed by the RCT prior to egress from the area.
- Personnel will perform whole body frisks in the PCM-II after exit from a Contamination Area.
- Personnel exiting a Radiological Buffer Area will survey hands and feet.

4.7 RWP Closeout

The Processing Specialist initiates RWP closeout by completing SF 2001-CLO, RWP Review and Closeout, at the end of the one year lifetime of the RWP or if the previous RWP is voided based on the need to increase Administrative Control Limits (ACLs).

4.8 Sign In/Sign Out

After the initial briefing on an RWP/TWD workers will sign the Pre-Job Briefing Sign-In Sheet, SF 2001-BRF, indicating understanding of the RWP/TWD. Workers will sign in and out of TWDs using the SF 2001-SSB, Technical Work Document Sign-In Sheet, as specified in Section 7.2, Perform Work.

4.9 Personal Protective Equipment

Personal protective equipment is specified in individual Work Plans based on expected radiological and chemical conditions. See 7.1.4, Develop a Work Plan for Each Task, Section C, General Controls.

4.10 Entry Control

Entry control consists of signs and barricades. Radiological postings are specified in Work Plans based on expected radiological conditions. See Section 7.1.4, Develop a Work Plan for Each Task, Section D, Radiological Controls.

4.11 Hold Points

- If any breach in PPE is discovered, exit the area and notify the RCT.
- If a lapel pump stops working or is running erratically, pause work and notify the RCT.
- If a CAM alarms, stop work, place work in a safe condition, alert others, exit the area, and notify RP. If CAM alarm is verified by RP to be a "head" or noise alarm (no indication of airborne radioactivity), work may resume.

Other radiological hold points are specified in Work Plans. See Section 7.1.4; Develop a Work Plan for Each Task, Section D, Radiological Controls. Evidence of completion for hold points requiring RCT surveys is documented in the project log book and initialed and dated by the RCT.

4.12 Void Points

Work shall stop under the current RWP/TWD if a projected individual dose and/or collective dose exceeds the ACL established for the current RWP. In this case, the current RWP for this procedure will be closed and a new RWP prepared with appropriate ALARA considerations and documentation. TWDs will be updated as necessary and revised to reference the new RWP. The RSO will track the sum of dose from the dosimetry project, projected dose for a given campaign (Section 7.1.4, Develop a Work Plan for Each Task, Section D, Radiological Controls), and dose recorded by supplemental dosimetry during the current quarter. These summations will be evaluated and compared to this void point.

5.0 BERYLLIUM CONTROLS

Work Plans addressing the processing of waste from landfills or waste with incomplete, unreliable, or questionable characterization information will be developed with consideration for beryllium controls.

Waste with known beryllium will be processed using beryllium controls specified in PLA 05-08, *Chronic Beryllium Disease Prevention Program Implementation Plan*.

6.0 NON-INVASIVE PROCESSING OPERATIONS

Non-Invasive Processing Operations do not involve direct contact with the waste. Minimal planning is necessary for the two types of Non-Invasive Processing Operations.

Type 0 processing is used to move parcels generated from open container operations with known chemical and radiological characteristics from one staging container to another.

Type I processing is used to move waste parcels other than those generated by processing operations from one container to another, or to examine waste parcels without touching the waste itself. Type I processing is only allowed for waste with known chemical and radiological characteristics and minimal hazard.

6.1 Type 0 Processing

Type 0 processing involves transferring waste parcels that are completely sealed in plastic bags or other stronger containers and have current radiological movement surveys from one staging container to another staging container. Staging containers that may be opened as Type 0 processing are identified by a Survey Information Sheet (RF 2042-SIS) posted on the exterior of the container. These containers only hold parcels that are not restricted as described below (see 6.1.1, Restricted Waste). Type 0 sorting operations are conducted under the base operations RWP (current version) and base operations PHS/HA (973457052- current version).

Waste appropriate for Type 0 processing may be handled with minimal risk to workers. Type 0 processing operations may be performed without a specific Work Plan under the radiological controls identified in PRG 01-03, *Non-Nuclear Operations Safety and Health Program*, Attachment 2, RWNMDD Radiological Protection Practices. The following subsections list waste that is restricted from Type 0 processing and specify the procedural requirements for performing Type 0 processing.

6.1.1 *Restricted Waste*

The following waste types may not be handled as Type 0 processing. To open containers for these types of waste, Work Plans must be developed in accordance with Section 7.0, Invasive Processing Operations, of this procedure. The radiological limits were established to minimize potential doses to workers and to ensure the integrity of plastic bags used as waste containers. The rationale for the restrictions is explained further below.

Waste that may not be processed as Type 0 Processing include:

- Waste containing volatile organic compounds or beryllium.
- Waste that is likely to puncture or abrade the primary bags.
- Waste parcels with removable surface contamination exceeding the free release criteria specified in Chapter 6 of the RPPM, Attachment 6-1, Radioactive Contamination Limits.
- Waste with more than 1 mCi. of ^{3}H. See Rationale 1.
- Waste parcels with shallow dose rate greater than 1 rad/hour on contact. (Measured dose rates shall include applicable beta correction factors.) See Rationale 2.
- Waste parcels with radiological surveys more than two years old. Waste parcels may be resurveyed after two years following an approved Type I plan.

- Waste parcels with a deep dose equivalent rate greater than 5 mrem/hour at 30 cm. See Rationale 3.
- Waste with iodine isotopes.

Rationale 1:

One mCi of ^{3}H (as HTO) coincides with the labeling requirement for ^{3}H waste. If a container with this activity were to leak tritium, the potential dose consequences are minimal. An extreme upper bound intake of ten percent of the contents of the container would only result in a dose equivalent of 6 mrem.

Rationale 2:

The 1 rad/hour criterion will ensure that plastic bags are not degraded over time by radiation exposure. The criterion is based on a 25% loss of effectiveness for polyethylene at 0.9 Mrad (Choppin and Rydberg, 1980). Over two years a waste parcel with a dose rate of 1 rad/hour would deliver a total dose of 0.02 Mrad. This gives a safety factor of approximately 50 before plastic bags may fail from radiolysis.

Rationale 3:

The deep dose equivalent rate limit will ensure that personnel are not inadvertently exposed to radiation fields requiring posting as a Radiation Area.

6.1.2 *Performing Type 0 Processing*

Perform the following steps for Type 0 processing:

- Place all staging containers on a Herculite®-covered space in a building.
- Don lab coats and gloves.
- Transfer waste parcels from one staging container to another or remove parcels from staging containers and set aside as necessary.
- If holes are evident in bags, contact an RCT for surveys and then patch the bag or re-bag the waste. If surveillance indicates the spread of contamination due to a breached waste parcel, pause operations to develop a Work Plan in accordance with Section 7.0.

  Complete a Survey Information Sheet (Form RF 2042-SIS) for each waste container. These sheets include survey numbers, survey dates, dose rates, and contamination levels for each parcel in the container. Each entry is annotated with the initials and date of the person placing the parcel in the container.

- Doff protective clothing and place into an appropriate Project-Generated Waste (PGW) container.
- Perform a whole body frisk using either the PCM-II or portable survey instrumentation.

6.2 Type I Processing

Type I processing includes operations where workers do not come in direct contact with waste. Waste Handlers may handle primary and secondary waste containers; or inspect a waste item without coming in contact with it. Type I processing involves opening outer containers to examine large waste items, or to transfer waste parcels from one container to another. Type I processing differs from Type 0 primarily in that Type I is for waste that is not from an open container operation. Type I processing requires the development of a Type I Processing Work Plan (RF 2042-TIC).

6.2.1 *Restricted Waste*

The following wastes may not be processed under a Type I Processing Work Plan (RF 2042-TIC) because the hazards they present require a more rigorous control and review process:

- Waste restricted from Type 0 processing as specified in Section 6.1.1.
- Waste without an approved Radioactive or Mixed Waste Disposal Request Form (SF 2042-TRA) (DR). A DR is necessary to assess the hazards of particular waste items.

6.2.2 *Performing Type I Processing*

The Processing Specialist or the NNOS will develop the Type I Processing Work Plan (RF 2042-TIC) according to the following instructions:

1. Obtain copies of DRs for the waste to be processed.
2. Complete the Description, PPE, Hold Points, and Instructions sections.
3. Route the Work Plan to the lead RCT or designee, ES&H support personnel from IH representative, the Site Safety Officer or ES&H support personnel from Safety Engineering, and the Open Container Project Leader for review. If there are no chemical hazards, the IH representative does not need to review the Work Plan.

4. Finalize the Work Plan in consultation with the reviewers. Assign the Work Plan with a number TypeI_YYYY-XX where YYYY is the fiscal year and XX is a consecutive number starting with 01. Save the Type 1 Work Plan in RMWMF\common\Processing Operations\Work Plans\FY_\Type 1 using the plan number as the file name. This will ensure redundant numbers are not used.

5. Sign the Work Plan and obtain signatures from the lead RCT, IH representative (if applicable), the Site Safety Officer or Safety Engineering representative, and the Open Container Project Leader. If there are no chemical hazards and the IH representative did not review the Work Plan, enter "no chemical hazards" in the IH signature space.

The team (Processing Specialist and Waste Handlers) will perform Type I processing according to the following instructions.

1. Members of the processing team will read the Type I Processing Work Plan (RF 2042-TIC). Personnel will sign the Pre-Job Briefing Remarks form (RF 2042-DPJ, see No. 2 below) in lieu of an AUL for Type I processing, indicating that they have read and understood the Type I Processing Work Plan and will perform the work according to that plan.

2. Conduct a pre-job briefing and complete a Pre-Start Work Review form (RF 2042-PSR), and a Pre-Job Briefing Remarks form (RF 2042-DPJ). The Processing Specialist will address hazards from the DRs, hold points and controls in the plan, and the operational sequence from the Work Plan.

3. Sign in on the Technical Work Document Sign-In Sheet, SF 2001-SSB. Use the SSB form for activities performed according to Section 7.3 and Type I processing.

4. Don PPE as specified in the Work Plan.

5. Implement the instructions from the Work Plan.

6. Remove PPE into a designated PGW container.

7. Perform a whole body frisk using either the PCM II or portable survey instrumentation.

8. Sign out on the Technical Work Document Sign-In Sheet, SF 2001-SSB.

9. Complete the Post-Work Review form (RF 2042-PWR)

7.0 INVASIVE PROCESSING OPERATIONS

When waste management goals require processing that involves actual contact with radioactive or mixed waste or process chemicals, more detailed planning is warranted. These types of processing are classified as Type II, Type III, or Type IV processing, based on the need for respiratory protection and the level of engineering controls that are implemented. Type II processing involves direct contact with the waste, but respiratory protection is not required because airborne radioactive materials and chemicals are not expected. Type III processing involves direct contact with the waste and the use of respiratory protection because airborne radioactive materials or chemicals are likely. Type IV processing involves processing waste in complete containment (glove boxes or glove bags) because particulates or significant quantities of radioactive materials are present. Glove bags and glove boxes also can be used to provide an inert atmosphere, particularly when treating air or water reactive wastes, or treating wastes that are likely to produce radioactive, noxious, toxic, or explosive/reactive gases. Although the hazards may not require the use of a glove box, many processing operations are performed as Type IV because a glove box provides a convenient work platform.

7.1 Developing Work Plans

The following six subsections specify detailed instructions for preparing the Work Plans necessary to perform Types II, III, and IV processing. Work Plans are prepared after the Open Container Project Leader identifies waste management goals for a particular group of waste containers, or a Processing Campaign.

Once prepared, the Work Plan is the overriding safety document for a Processing Campaign. A Work Plan specifies all necessary safety measures to control the hazards associated with a Processing Campaign. A Work Plan will not override or contradict requirements in other documents such as Primary Hazard Screening (PHS), Corporate Policy documents, or approved procedures.

Work Plans consist of the following:

- Processing Work Plan (RF 2042-SWP).
- Task-Specific Work Plan (RF 2042-ATD), one or more.
- Container Hazard Summary Form (RF 2042-HSF), one or more.
- Processing Work Plan Approvals (RF 2042-SWPA).
- Work Evaluation, Acceptance and Authorization Form (RF 2042-WEF).

7.1.1 *Summarizing Hazards*

Waste hazards are generally summarized on a container-specific basis using the Container Hazard Summary Form (RF 2042-HSF). Hazard information is derived from DRs, radiological surveys, MSDSs, standard texts, and any other available source of information. Additional hazards are documented in Section (F), Job Safety Analysis of the task-specific work plan (see Section 7.1.4) and on the Process Chemical Hazards Form (RF 2042-PCH). The Processing Specialist will enter hazard information on the Container Hazard Summary Form (RF 2042_HSF) as specified below.

- Enter the Campaign Number and Revision.
- Enter the name of the person filling out the form and the date.
- Enter the Container Number (e.g., Cxxxxxx or SNL/NMxxxxxx). Containers should be listed in alpha-numeric order.
- Enter the Parcel Number (e.g., Pxxxxxxx). If multiple parcels distinct hazards, each parcel must be listed on a separate form. Multiple parcels with similar hazards may be placed on one form.
- Enter the DR Form number(s).
- Enter the container type (e.g. 55-gal metal drum, 744 metal box, etc.).
- Enter the container gross weight (lb.).
- Enter the contact, 30 cm, and 1 m equivalent dose rates (mrem/hr).
- Enter the category 3 threshold fraction (%) for the waste package in percent.
- Enter the U-235 mass (g) for parcels containing enriched uranium. If the parcel contains natural or depleted uranium, enter NA.
- Enter all radionuclides with activities (Ci). If necessary, attach a query or spreadsheet.
- Enter all hazardous chemicals present.
- Enter the amount or concentration of the chemical with units.
- Enter any applicable Resource Conservation and Recovery Act (RCRA) codes.
- Enter a brief description of the chemical hazards from the NIOSH pocket guide or MSDS documents. Include the lowest exposure limit values (ACGIH TLV or OSHA PEL), STEL, ceiling concentration, and IDLH with units.
- Enter a brief description of any physical hazards (e.g. sharp objects, biohazards, etc.).

- Enter additional hazard information, if applicable. If surface contamination levels on the actual waste items are known, record them here.
- Include MSDSs for all waste and process chemicals if they are available through the CIS.

Hazards associated with chemicals used in the process are documented on the Process Chemical Hazards Form, RF 2042-PCH. The Processing Specialist will enter hazard information on RF 2042-PCH as specified below.

- Enter the Campaign Number and Revision.
- Enter the name of the person filling out the form and the date.
- Enter all hazardous chemicals that will be used in the process.
- Enter the amount or concentration of the chemical with units.
- Enter any applicable RCRA codes.
- Enter a brief description of the chemical hazards from the NIOSH pocket guide or MSDS documents. Include the lowest exposure limit values (ACGIH TLV or OSHA PEL), STEL, ceiling concentration, and IDLH with units.

Enter additional hazard information, if necessary.

7.1.2 *Dividing the Campaign into Tasks*

Once the hazards have been summarized for all containers and the overall waste management goals are understood, the Processing Specialist will divide the Campaign into a number of tasks. Each task will consist of processing a group of containers with similar hazard characteristics and waste management goals. Defining tasks is an iterative process that may require refinement after the processing type is determined (Section 7.1.3).

The Processing Specialist will complete the Processing Work Plan (RF 2042-SWP) by implementing the following instructions.

- Enter the next available Campaign Number. Campaign Numbers are consecutive numbers through a fiscal year. For example, the fourth processing campaign in fiscal year 2003 will have Campaign Number 03-04.
- Enter the Revision Number for the Campaign. The initial version is revision 0.
- Enter the PHS number that applies to the Campaign.
- Enter a brief description of the overall Campaign.

- Enter a brief description of each individual task in the task summary. Unique tasks are numbered consecutively beginning with 1.
- Enter appropriate information for revision history ("0 – Initial Version" or the new version number with a description of changes).

The Processing Specialist will start a Task-Specific Work Plan (RF 2042-ATD) for each task by implementing the following instructions.

- Enter the Task Number, Campaign Number, and Revision.
- Leave Task Type blank for now (See Section 7.1.3 below).
- Enter the container numbers addressed by the task.
- Enter the task description.

7.1.3 *Determining the Processing Type (II-IV) on RF 2042-ATD*

The processing type for each task is determined by evaluating the hazards of the containers to be processed. If airborne contaminants are not likely, the process will be Type II. Respirators may be worn for worker preference in Type II. If airborne contaminants are likely, the process will be Type III. Activities involving particulate waste of significant hazard or waste that requires processing in an inert environment will be performed as Type IV.

The processing type determination is completed by answering a series of questions in Section B of the Task-Specific Work Plan (RF 2042-ATD) for each task. The following text lists each question from Section B and gives instructions on how to respond. The Processing Specialist will answer these questions based on information in the Container Hazard Summary Form (RF 2042-HSF).

In some cases, it may be advantageous to use the glove boxes for processing waste even though it does not meet the criteria for doing so. In these cases, the Processing Specialist will classify the task as Type IV and note the rationale for using the glove boxes in the comments space of Section B.

Type II Thresholds:

If either of the following questions on RF 2042-ATD are answered yes, the task is Type II or greater. If both questions are answered no, the task should be completed as non-invasive processing, Section 6.0 of this procedure.

1. Waste or Hazardous Material Contact Required?

   If the task requires direct physical contact with waste or process chemicals, answer this question yes. If the task only involves moving closed bags of waste or other closed containers and no exposure to process chemicals, answer no.

2. Waste exceeds the Type 0 and Type I limits?

   If the task involves handling closed bags of waste and the waste exceeds any of the limitations from Sections 6.1.1 or 6.2.1 answer this question yes. This question addresses handling closed bags of waste with characteristics that do not allow it to be sorted as Type 0 or Type I. If the task involves direct contact with the waste, answer NA.

Type III Thresholds:

The following questions on RF 2042-ATD are used to determine if respiratory protection is required when the task will be performed without complete containment in the glove box (Type III). If any of the answers is yes, the task is Type III or greater. Open container processing operations conducted in Building 6921 Room 102 that utilize the fume hood as an engineering control will be conducted with the use of respirators.

1. Will more than 10 mCi of beta activity be processed per day?*

   If greater than 10 mCi of beta activity is present and the Processing Specialist does not wish to perform specific modeling, answer this question yes. This generic threshold assumes a conservative nuclide, Sr-90, Class S (R=0.01, C=1, D=1, D2=20). If a conservative assumption is not made, use NUREG-1400 modeling (Attachment 2) to make a more realistic estimate as described under question 6 below and answer this question NA. If activity is unknown answer this question NA.

2. Will more than 20 µCi of alpha activity be processed per day?*

   If greater than 20 µCi of alpha activity is present and if specific modeling is not performed, answer this question yes. This generic threshold assumes a conservative nuclide, Pu-239, Class M (R=0.01, C=1, D=1, D2=20). If a conservative assumption is not made, use NUREG-1400 modeling (Attachment 2) to make a more realistic estimate as described under question 6 below and answer this question NA. If activity is unknown answer this question NA.

3. Is waste characterization inadequate for health and safety assessment?

   If there is limited or no characterization information available to evaluate respiratory hazards, answer this question yes. Waste with recent (since 1998) approved DRs has adequate characterization. If radiological characterization is uncertain, answer 3, 4, and 6 NA; if chemical characterization is uncertain, answer 7 NA.

   Open container processing operations will be conducted on waste characterized with DRs completed on or after CY 2006. Waste characterized with DRs completed prior to CY2006 will be processed after the DRs have been re-evaluated by the Waste Characterization Team.

4. Is airborne radioactivity expected based on NUREG-1400 modeling?

   Using the methods specified in Attachment 2 (NUREG-1400 Modeling), determine the daily intake fraction for the waste to be processed. If this fraction is greater than 5E-4, answer yes. Otherwise, answer no. If questions 3 and 4 were not answered NA, answer this question NA.

5. Are airborne chemicals expected at concentrations above the minimum TLV?

   If hazardous chemicals are present in the waste or process chemicals will be used, consult with the IH representative to answer this question. Otherwise, answer no.

Type IV Thresholds

If waste contains hazardous particulates or requires an inert environment, processing in a glove box or glove bag is the preferred alternative. However, this may not be feasible in all situations because of the size of waste containers or other restrictions. If it is not feasible to process particulates in the glove box, note this in the comments section (Question 10).

1. Does waste include uncontained hazardous particulates with significant hazard?

   If hazardous particulates are present in the waste, answer yes. Otherwise, answer no.

2. Does waste require processing in an inert environment?

   If the task involves processing air or water reactive wastes or wastes that are likely to produce radioactive, noxious, toxic, or explosive/reactive gases, answer yes. Otherwise, answer no.

Out of Scope Conditions

Some types of waste and activities are not addressed in the PHS for open container operations and are therefore beyond the authorization basis. A list of these waste types and activities is given in Attachment 1 (Hazard Summary and Out-of-Scope Conditions).

1. Does waste present hazards not addressed by the existing PHS?

   If the waste or required operations are listed in Attachment 1 as beyond the scope of the PHS, answer yes. Otherwise, answer no. If the answer is yes, the Processing Specialist will notify the Open Container Project Leader so that the PHS can be revised or a job-specific PHS can be developed.

Once all questions are answered, the type for the task is the highest type indicated by any of the questions or as noted in the comment field. The Processing Specialist will enter the Task Type in Section A of the Task-Specific Work Plan (RF 2042-ATD).

7.1.4 *Develop a Work Plan for Each Task*

This section specifies instructions for completing Work Plans for each task and documenting them on the Task-Specific Work Plan (RF 2042-ATD). Six general areas of the plan are addressed in subsections of the form: Section C - General Controls, Section D - Radiological Controls, Section E - Chemical Controls, Section F - Job Safety Analysis, Section G - Detailed Instructions, Section H - Additional Information.

The Processing Specialist will use the following instructions to complete these sections of each Task-Specific Work Plan (RF 2042-ATD) form.

Section C General Controls:

- Engineering Controls – These controls consist of ventilation and containment systems such as elephant trunks, slot hoods, fume hoods, glove boxes, glove bags, radiological shielding, etc. List all applicable engineering controls in this space.
- Personal Protective Equipment – Specify PPE necessary to control chemical and radiological hazards for the containers to be processed and chemicals to be used in this task. Safety shoes, shoe covers, coveralls, gloves, hoods, hearing protection and eye protection should be addressed in this section. Use Attachment 1-3, Personal Protective Equipment (PPE) Selection, of the RPPM, Chapter 1 as guidance for PPE to protect against radiological hazards. Consult the MSDS and IH representative for guidance on protection against specific chemicals. Specify PPE for personnel entering Contamination Areas as well as support personnel in Radiological Buffer Areas. Minimum PPE for personnel in Radiological Buffer Areas when handling material removed from the radiological area is gloves. Labcoats should be considered for removal of large items from the Contamination Areas that may contact parts of the body other than hands.
- Respiratory Protection – If the type determination for the task resulted in Type III, respiratory protection is indicated. Enter the appropriate type of respiratory protection and associated protections factors (PF): bubble hoods (PF=25), full-face air-purifying respirators (PF=50), powered air purifying respirators (PF=1,000), and full-face air-supplied respirators (PF=1,000). For unknown waste, full-face air-supplied respirators should be used because they provide the greatest protection against unknown conditions. In some cases it may be necessary to use powered air-purifying respirators (PAPRs) with P-100 cartridges to process unknown waste when chemical vapors are unlikely. Based upon the overall characteristics of the waste streams at SNL, “immediately-dangerous-to-life-and-health” conditions are not considered plausible. Selection of respiratory protection to control hazards from known chemical contaminants will be based on NIOSH recommendations in consultation with the IH representative.

Section D Radiological Controls:

- Expected Radiological Conditions – Enter the maximum dose rates for the containers to be processed in the task under radiation. If surface contamination levels in the waste are known, enter them under surface contamination. If contamination levels are unknown, enter the best estimate in terms of multiples of the 6-1 limits. For airborne radioactivity enter the ALARA estimates discussed below in DAC-hr for Type III and some Type IV tasks. If the task is Type II or Type IV below the activity thresholds presented below under ALARA estimates, enter < 0.1 DAC.
- Dosimetry – All personnel participating in waste processing will wear whole body dosimeters at all times. Waste Handlers and Processing Specialists participating in waste processing will wear extremity dosimeters at all times. Self-reading dosimeters must be used if work will involve high radiation conditions (> 100 mrem/hr at 30 cm). Self-reading dosimeters may be used in other situations if necessary to track dose for ALARA and ACL compliance. Check the applicable boxes for the required types of dosimetry.
- Lapel Monitors – Lapel monitors must always be used in Type III processing based on radiological conditions. In Type II processing, use of lapel monitors is based upon the level of activity that will be handled. If NUREG-1400 modeling was performed for the task, lapel monitors are required when the daily intake fraction exceeds 5E-5. If NUREG-1400 modeling was not performed for the task, lapel monitors are required if the alpha activity or beta activity to be processed in a day exceeds 2 μCi or 1 mCi, respectively. Lapel monitors will be used for Type IV operations. In addition, lapel monitors will be worn if recommended by RP.
- CAMS – Both alpha and beta CAMs should be used for all Type II, III, and IV operations, if feasible. For areas where respiratory protection is in use, CAM set-points shall be based on a respiratory protection factor of 25 (high set-points). For areas where no respiratory protection is being utilized, CAM set-points shall be based on no respiratory protection (low set-points). List the locations of CAMs to be used and whether they will have high or low set-points. If the beta CAMs are disabled due to gamma radiation levels causing false alarms, increasing airborne conditions will be determined, if feasible, based on the alpha CAM reading.

- Initial Postings – All areas where invasive processing will be performed shall be posted at a minimum as Contamination Areas and Radiation Areas. If the hazard summary information indicates that there will be High Radiation Area or High Contamination Area conditions, these postings shall also be used. If waste is from the hot-cell facility or may contain hot-particles, the processing area shall be posted as a Hot Particle Area. If the task is Type III for radiological conditions, the area shall be posted as an Airborne Radioactivity Area. Check the boxes for all applicable initial postings.
- ALARA Estimates – If dose rates greater than 5 mrem/hr at 30 cm are anticipated, estimate the maximum individual dose and collective equivalent dose for all workers and enter those values. If the task is Type III, estimate the exposure in DAC-hour for the maximally exposed individual and for the collective group of workers and enter those values. DAC-hour estimates should be based on most probable conditions not unrealistic assumptions. Inhalation exposure shall be estimated for Type IV sorting if the alpha activity exceeds 30 mCi or the beta activity exceeds 20 Ci (R=0.01, C=0.01, D=1, D2=1, Pu-239 M, Sr-90 S). See Attachment 2 for formulas necessary to compute exposure in DAC-hr. If necessary, contact RP to obtain assistance with these computations.
- RWP – Specify the RWP number for the RWP that applies to the processing task.
- Radiological Hold Points – Specify radiological hold points where changing conditions require additional radiological controls, radiological surveys, or further evaluation.

Section E Chemical Controls:

- Personnel Monitoring – If any chemical monitoring is necessary for personnel, list it in this section. Lapel air monitors are often required for processes involving beryllium, asbestos, or heavy metals. Contact the IH representative if the processing task involves hazardous chemicals.
- Chemical Hold Points – Specify chemical hold points where changing conditions require additional chemical controls such as an upgrade to respiratory protection. Hold points should be specified for each type of IH measurement performed (e.g. PID, LEL, and O2). Specify the technical basis for each chemical hold point developed specifically for the Work Plan and include it in Section H, Additional Information. The basis shall address the characteristics of the particular chemicals, applicable engineering controls, and personal protective equipment.
- Work Plans will include hold point(s) for the identification of unanticipated or extraneous particulates or other material during processing operations that are not described in the DR, Work plan, or pre-job meeting.

Section F Job Safety Analysis

- Step - List the broad steps of the task. These may roll up multiple steps from the detailed instructions.
- Hazard – List the hazards that apply to the broad step. Hazards should address all possible sources (radiological, chemical, physical, electrical, etc.) Note: A step may contain multiple hazards.
- Control – List the control measures that curtail the listed hazards. Note: A hazard may contain multiple controls.

Section G Detailed Instructions:

- Specify the step-by-step instructions for completing the task. These instructions should specify all waste management, hazard control, and monitoring steps. When monitoring instructions are specified, the plan should include cross-links to hold points for elevated levels. All absorbent materials specified in the detailed instructions shall be non-biodegradable. Attachment 3 gives an example of the level of detail necessary in this section. These plans may be used as templates for development of Work Plans.
- Once the Work Plan is completed, enter the portable monitoring instruments that are required in Section A.

Section H Additional Information

- Specify any additional information necessary to support the Work Plan. Basis for chemical hold points and more detailed chemical exposure health effect and first aid measures may be specified here.

7.1.5 *Finalize the Processing Work Plan*

The Processing Specialist will assemble the components of the draft Work Plan:

- Processing Work Plan (RF 2042-SWP)
- Task-Specific Work Plan(s) (RF 2042-ATD)
- Container Hazard Summary Form(s) (RF 2042-HSF)
- Process Chemical Hazards Form (RF 2042-PCH)

The Processing Specialist will then route the draft Work Plan for review by the Open Container Project Leader, the Radiation Safety Officer, the IH and Safety representatives (Site Safety Officer may review in lieu of Safety representative), the Waste Certification Official, and a Waste Handler. The development of Work Plans requiring input and approval from the ES&H support personnel will include planning meeting(s) with workers, RP support personnel (e.g., RCTs) and ES&H support personnel in attendance. For specialized Work Plans it may be necessary to include additional reviewers (e.g. nuclear criticality safety or explosives safety). After a review period, the Processing Specialist will meet with the reviewers, resolve their comments, and finalize the Work Plan. The Processing Specialist will sign the Processing Work Plan Approvals (RF 2042-SWPA) form and obtain approval signatures. Once all the forms are complete, the Processing Specialist will assemble them into a single paginated document. The Processing Specialist will complete the Work Evaluation, Acceptance and Authorization Form (RF 2042 WEF). Based on the rigor level, the Processing Specialist will obtain approval from the appropriate level of management.

7.1.6 *Change Control*

It may be necessary to revise a Work Plan. The Processing Specialist will enter a brief description of the changes with the new revision number in Section III of the Processing Work Plan (RF 2042-SWP) form. The Processing Specialist will make the necessary changes to the Work Plan and update the revision number on the forms. After all changes are completed the Processing Specialist will finalize the revised plan as specified in Section 7.1.5, Finalize the Processing Work Plan.

7.1.7 *Processing Fissile Material (Important to Nuclear Criticality Safety)*

This section implements the requirements of ESH100.2.SB.2, *Ensure Nuclear Criticality Safety* and GN470072, Nuclear Criticality Safety, for processing operations. The following sections specify controls for processing fissile material and storing fissile material in a Criticality Safety Index (CSI) array. If a violation of Nuclear Criticality Safety (NCS) controls is discovered, implement the following actions:

- Evacuate the facility.
- Report the violation to the Department Manager and the Nuclear Criticality Safety Engineer.
- Re-enter the facility only under controls approved in accordance with *Nuclear Criticality Safety*, GN470072.

7.1.7.1 Processing Fissile Material Less than Threshold Quantities

Processing fissile material in quantities less than the threshold limits specified in Table 2, Threshold Limits for Fissile Inventories, of GN470072, *Nuclear Criticality Safety*, shall be accomplished by implementing the following controls:

- Work plans shall include instructions for maintaining the mass of fissile material less than the thresholds and shall document fissile masses in the process.
- Fissile material not included in a CSI array shall be handled or stored more than six feet from any CSI array.

7.1.7.2 Storing Material in a CSI Array

If necessary, CSI arrays may be used to store material in quantities greater than the threshold limits in accordance with the Special Case, Generic CSA for CSI Arrays (NCS-CSA-001). Approved postings shall be placed on all CSI arrays clearly stating the required nuclear criticality safety controls. CSI inventory shall be tracked using the Criticality Safety Index Tracking Form (RF 2042-CIT). The following controls from NCS-CSA-001 apply:

- Each package shall have a label showing the CSI value before the package enters the CSI array. A Criticality Index (CI) label is an acceptable alternative.
- Packages shall not be opened.
- Any package with a CSI exceeding 10.0 shall be stored as a single item CSI array.

- Each CSI array shall be maintained with the sum of the CSIs from the individual packages at ≤ 50.
- A logging system that incorporates independent verification shall be used to track the summed total CSI for all packages in each CSI array.
- A clear boundary shall demarcate each CSI array.
- At least 6 feet separation shall be maintained between any CSI array and other fissile materials.
- At least 6 feet separation shall be maintained between all pairs of CSI arrays.

7.1.7.3 Sorting Fissile Material Greater than Threshold Quantities

Processing fissile material in quantities greater than the threshold limits specified in GN470072, Table 2, Threshold Limits for Fissile Inventories, shall be implemented by developing a PHS and a Criticality Safety Assessment (CSA) for the operation. Controls from the CSA shall be incorporated in the Work Plan. Fissile material to be processed shall not be handled within six feet of a CSI array. The Work Plan shall be reviewed by the Department Manager and a Nuclear Criticality Safety Engineer in addition to the normal review team. Both the CSA and Work Plan shall be reviewed by the Sandia Nuclear Criticality Safety Committee in accordance with GN470072.

7.2 Perform Work

When performing processing activities, the processing team (Processing Specialist, Waste Handlers, and RCTs) shall complete the following steps:

- Distribute the approved Work Plan to all personnel who will be involved.
- Sign the AUL for the applicable version of the Work Plan.
- Obtain signoff approval on the Plan-of-the-Day (POD) (FOP 95-32, *Formality of Operations*).
- Calibrate IH field instruments as necessary (PID, LEL/O2, etc. FOP 00-06, *Measuring and Testing Equipment Calibration*). See Section A of the Task Specific Work Plan.
- Conduct a pre-job briefing and complete RF 2042-PSR, Pre-Start Work Review and RF 2042-DPJ, Pre-Job Briefing Remarks. Ensure that the pre-job briefing covers the hazards of the job, the hold points that apply, and the sequence of actions to be performed. If planned activities involve more than one task or shift, complete RF 2042-PSR, Pre-Start Work Review immediately prior to each task or shift.

- Don appropriate PPE, dosimetry, and if required lapel monitors. Have the RCT verify that lapels are turned on and initial on the RF 2042-PSR Form.
- Sign in on the TWD (SF 2001-SSB, Technical Work Document Sign-In Sheet). Record initial SRD reading if applicable.
- If the task is Type III, measure initial pulse rates to evaluate heat stress.
- Implement the processing task as specified in the Task-Specific Work Plan (RF 2042-ATD).
- Document all readings, activities, observations, and decisions in the Project Logbook and/or project forms such as Waste Addition Logs and Treatment Forms.
- Have the Processing Specialist and the RCT initial the log book to indicate completion of hold point surveys.
- Document package and container movements with paperwork and/or the barcode reader.
- Ensure that all containers are closed and labeled.
- If the operation creates a waste container that comprises 10% or more of the threshold for a Category 3 nuclear facility, or 10% or more of the U-235 limit for non-nuclear facilities, apply a 10% label. See FOP 00-02, *Waste Handling*, for details.
- After completion of work ensure that the area is returned to a clean, organized condition.
- Ensure that all portable instruments are turned off and staged for release.
- If the task was Type III, measure exit pulse rates to evaluate heat stress.
- Perform a whole body frisk.
- Sign out on the TWD (SF 2001-SSB, Technical Work Document Sign-In Sheet). Record self-reading dosimeter results if applicable.
- Complete RF 2042-PWR, Post-Work Review, and address any items identified during the review.
- Upon completion of the Work Plan, perform a closeout/review of the job, centering on feedback and possible improvements. Document the review on the Work Plan Feedback and Improvement Form (RF 2042-WFI).

7.3 General Housekeeping and Decontamination Activities

During the performance of work, general housekeeping and decontamination may be performed. Decon activities may be performed using wet wipes, masslin mops, sticky rollers and HEPA vacuums. No sweeping will be performed in Contamination Areas. Larger decon activities such as the semi-annual decon of Room 103 may be performed using FOP 09-11 as the TWD. In these cases, the job supervisor will conduct pre and post-job briefings (RF 2042-PSR, DPJ, and PWR). These briefings will address controls necessary to safely complete the job (e.g. PPE requirements, lapel monitors, extremity dosimeters, etc). Personnel will sign in and out using the Technical Work Document Sign-In Sheet, SF 2001-SSB, for general activities and Type I processing.

8.0 DEVIATIONS FROM THE APPROVED WORK PLAN

It may be necessary to deviate from the Work Plan because of unforeseen circumstances. In most cases, it is acceptable for the Processing Specialist to approve minor deviations from the Work Plan, provided the deviation and its rationale are noted in the Project Logbook and the Open Container Project Leader is notified and concurs. However, when a member of the field team indicates the hazard envelope of the job has changed, the Processing Specialist will pause operations and contact the appropriate ES&H representative(s) before proceeding. If criticality safety reviewed the Work Plan, contact the nuclear criticality safety engineer regarding any changes to fissile material handling. In consultation with the ES&H representative, the Processing Specialist may determine that it is appropriate to proceed with verbal confirmation and possible minor changes to the plan. This will be fully documented in the Project Logbook and the Open Container Project Leader will be notified. In cases when the hazards of the operation have changed significantly, the Processing Specialist and the ES&H representative(s) may determine that the change warrants a formal revision to the Work Plan. In this event, the Processing Specialist will pause the operation until the Work Plan has been formally revised. Examples of deviations requiring the different responses are given below.

Example 1: The Work Plan prescribes a task where radioactive material will be handled and there is a potential respiratory hazard from airborne radioactive particulates. The Work Plan calls for using bubble hoods with a protection factor of 25 for particulates. That day the Processing Specialist learns that there is insufficient breathing air to support all of the personnel at one time. The Processing Specialist may opt to use air-purifying respirators with a protection factor of 50 for particulate hazards, notify the Open Container Project Leader, and note the change in the Project Logbook.

Example 2: The Work Plan prescribes a task where radioactive material with dose rates of 20 mrem/hr at 30 cm will be handled. Upon opening the package, the Processing Specialist measures the dose rate and finds it to be 120 mrem/hr at 30 cm. The Processing Specialist notes that the change in dose rate results in the area being classified as a High Radiation Area and pauses the operation to contact RP. The Processing Specialist and RP agree that the job may proceed safely if the workers utilize self-reading dosimeters to track personnel exposure on a real-time basis and upgrade the postings to include a High Radiation Area. After noting the change and confirmation in the Project Logbook and notifying the Open Container Project Leader, the Processing Specialist completes the task.

Example 3: The Work Plan prescribes a Type II task where an electrical motor will be removed from a drum of compactable waste. Upon opening the container, the PID alarms at 1,000 ppm and the Processing Specialist notices a beryllium warning label. The Processing Specialist immediately closes the container and contacts the IH representative. The Processing Specialist and the IH representative agree that the plan should be formally revised to address the hazards posed by unknown organic chemicals, beryllium, and other unknowns because the waste does not agree with the original hazard summary information.

The processes for pausing, halting, suspending, stopping, and restarting work as provided in FOP 95-32, *Formality of Operations*, are applicable to open container operations. The conditions requiring a work plan deviation should be evaluated for the need to pause, halt, suspend, or stop work, with associated criteria followed.

9.0 FEEDBACK AND IMPROVEMENT

The Open Container Team uses several methods to make improvements to the open container operations. Team members (Waste Handler, RCT, or Processing Specialist) suggest improvements to the process. These are discussed at the daily close-out meeting and documented on the Post-Work Review form (RF 2042-PWR) and may be incorporated into the Work Plan within the constraints of acceptable deviations (See Section 8.0), if applicable. If the improvements are relevant to other operations they are presented at the POD meeting as a process improvement.

At the completion of each Work Plan, a review meeting is held to obtain feedback from the team. This is documented on the Work Plan Feedback and Improvement Form (RF 2042-WFI), included with the close-out documentation, and managed as records in accordance with AOP 94-19, *Records Requirements*.

Once a year, the Open Container Project Leader schedules a meeting to discuss improvements to the open container process. Processing Specialists, Waste Handlers, RCTs, the Open Container Project Leader, the Site Safety Officer, RP, safety and IH representatives are invited to attend this meeting. The Open Container Project Leader summarizes improvements developed over the one year period, discusses the status of previous suggestions for improvement, and gives a broad overview of open container activities scheduled for the next year. Then the floor is opened to suggestions for improvement by any member of the Open Container Operations Team. Minutes from this meeting are distributed to all attendees. These meetings serve as post job reviews in accordance with Chapter 1, *Radiological Work Planning and Controls*, of the RPPM.

If procedural violations or omissions occur, the Processing Specialist submits a Nonconformance Corrective Action Report (NCAR) in accordance with AOP 94-18, *Nonconforming Processes and Items*. NCARs require formal corrective actions to prevent recurrence of an error.

10.0 EMERGENCY PROCEDURES

The open container team observes the following emergency procedures:

- Respond to emergencies in accordance with FOP 95-31, *Responding to Emergencies*.
- If a worker becomes contaminated, pause work and immediately notify the RCT so decontamination procedures can be implemented as quickly as possible. All personnel must remain in the area and await further instructions from the RCT.
- If a worker is contaminated with a chemical, pause work, and place operations in a safe condition, if possible. Call the RCT to facilitate the exit from the work area. Administer first aid, as described in the Work Plan, Material Safety Data Sheet (MSDS), or as instructed by on-site safety personnel. Notify the EC.
- Spills:
    - If a small spill (<1 quart) occurs during processing, pause work and contain and isolate the spill from nearby wastes. Before cleaning a spill, don additional PPE if necessary to protect yourself from contact and inhalation exposures. Prior to re-start, ensure chemical and radiological conditions have not changed.
    - Spills or releases of radioactive or other materials beyond approved or permitted amounts shall be reported as described in Corporate Procedure: ESH100.3.1, *Prepare for and Manage Emergencies*.
- Brief the Department Manager and Open Container Project Leader so they may make a determination if further notifications are necessary.
- If any facility alarms activate, pause work and follow the guidance in FOP 95-26, *Non-Routine Conditions*.

No job is more important than your health, your safety, and the protection of our environment.

11.0 MANAGING OPEN CONTAINER DERIVED WASTE

The following subsections describe how waste generated through open container operations is segregated, documented and tracked.

11.1 Segregation

Processing personnel segregate waste into waste streams based on physical and chemical characteristics in accordance with PLA 06-06, *Sorting Plan for Uncharacterized Wastes*, and based on types of treatment performed. After waste parcels are released from processing, they are placed in appropriate staging containers by waste stream for future sampling, storage, or disposal.

Project-generated waste (PGW) created through processing activities includes:

- PPE
- Decontamination debris
- Empty containers, bags, other wrapping, tape, etc.

When processing involves low-level waste only, processing personnel may dispose of this PGW in general PGW containers available in the work area. Project-generated waste that is wet or contaminated with mixed wastes will be returned to the mixed or treated waste containers or segregated for disposal as mixed waste. When processing involves mixed waste, processing personnel will place only PPE that is unstained by the waste and includes no free liquid waste in the general PGW containers.

11.2 Documentation

Each waste parcel generated through processing activities is accompanied by a Waste Addition Log: PGW Waste Addition Log (RF 2042-PGW), Waste Addition Log for Parcels Containing Compactable Debris (RF 2042-ALP), Waste Addition Log for Parcels Containing Non-Compactable Waste (RF 2042-WAL), Source Information Form (RF 2042-SIF), or RMWMF Treatment Form (RF 2042-RTF). Source parcel and/or source DR numbers are entered on the waste addition logs where applicable to maintain traceability to historical information. Data from the waste addition log are entered into the sorting or treatment sections of the RadTrack database to provide automated data retrieval.

Once processing operations are complete, the waste is documented on a Radioactive Or Mixed Waste Disposal Request Form (SF 2042-TRA) (DR) or a Radioactive or Mixed Waste Disposal Request Change Form (RF 2042-DRX) which is submitted for review by the characterization team. When the DR is approved, waste is picked up for base operations handling, tracked in

RadTrack, and marked for logical deletion in the sorting or treatment section of the RadTrack database.

11.3 Tracking

Open container derived waste, including PGW, requires adequate tracking to maintain traceability to project field notes and forms, characterization data, and current and historic waste information. Each parcel generated is assigned a unique parcel ID with barcode label. This barcode is used to track the location of the parcel and link to applicable characterization information in the RadTrack database.

Waste that is in RadTrack and is not significantly altered by processing operations will continue to be tracked in RadTrack using parcel or container move functions on the barcode reader as applicable (see Barcode Reader User's Guide, FOP 00-02, *Waste Handling*).

11.4 Labeling

Each waste parcel is labeled with:

- A unique parcel ("P") number barcode label. The outside container will be labeled with this number upon release from the work area.
- A radiological survey sticker.
- A 10% label if parcel equals or exceeds 10% of the lower category 3 threshold limit or U-235 threshold quantity for criticality safety.
- A completed radioactive waste or mixed waste label:
    - If mixed waste with RCRA waste codes D001-D003 was successfully treated for these characteristics the waste will be managed and labeled as radioactive waste.
    - If mixed waste with RCRA waste codes D004-D011 (metals) or metal Underlying Hazardous Constituents (UHC) was stabilized but analytical results are pending, the waste will continue to be managed and labeled as mixed waste with the original waste codes assigned to the waste prior to treatment. Upon receipt of analytical results showing successful stabilization of the metal(s), the waste label will be changed to radioactive waste.

- If mixed waste debris with RCRA waste codes D004-D011 (metals) was treated by macroencapsulation, all original waste codes continue to apply and must appear on the completed mixed waste label. If non-debris mixed waste sources were treated by macroencapsulation under the Site-Specific Treatability Variance from the Hazardous Waste Land Disposal Restriction Standards for Spark Gap Tubes and Manufactured Radioactive Sources, both the original waste codes (e.g., D004-D011) and any UHCs applicable to the sources must appear on the completed mixed waste label.

The correct labeling also depends on the presence of UHCs. The presence of any untreated UHC in a characteristic mixed waste requires that the waste continue to be labeled as mixed waste. The untreated UHCs should be listed on the label, even if the constituent(s) that originally made the waste a characteristic mixed waste was successfully treated.

If parcels are overpacked in containers, applicable labels reflecting information for all contained parcels will be applied to the container and not to each inner parcel.

11.5 Samples

Processing personnel collect and prepare samples for shipment as required by PLA 96-02, *Sampling and Analysis Plan for Characterization of Low-Level Radioactive and Mixed Waste*. Off-site analysis is facilitated by the Sample Management Office (SMO). Processing personnel prepare SF 2001-COC, Analysis Request and Chain of Custody form that lists each sample and required analyses. Processing personnel prepare a Radiation Protection Sample Diagnostics (RPSD) Sample Analysis Request Form, for samples prepared for on-site radiological analysis.

11.6 NNSS Waste Preparation

Processing personnel ensure that waste destined for disposal at the Nevada National Security Site (NNSS) meets the requirements specified in the NNSS Waste Acceptance Criteria (NNSSWAC), including criteria regarding:

- Low-level waste containing regulated asbestos (NNSSWAC, Section 3.1.15)
- Beryllium contaminated waste (NNSSWAC, Section 3.1.17)
- Use of non-biodegradable sorbents in mixed waste (NNSSWAC, Section 3.3.5.2)
- Mixed waste container void space limitations (NNSSWAC, Section 3.3.6.2)

12.0 PROJECT DOCUMENTATION

The Open Container Operations Team will observe the following reporting and documentation requirements:

- This FOP and associated AUL shall be maintained according to AOP 94-12, *Technical Work Document Processing System*.
- Project-generated documentation shall be managed according to AOP 94-19, *Records Requirements*. Project records can include a Type I Processing Work Plan (RF 2042-TIC). When applicable, records can be assembled into Campaign notebooks that may include the following:
    - Processing Work Plan (RF 2042-SWP)
    - Processing Work Plan Approvals (RF 2042-SWPA)
    - Container Hazard Summary Form (RF 2042-HSF)
    - Task-Specific Work Plan (RF 2042-ATD)
    - Work Evaluation, Acceptance and Authorization Form (RF 2042-WEF)
    - Authorized Users List (RF 2042-AUL)
    - Pre-Start Work Review (RF 2042-PSR)
    - Pre-Job Briefing Remarks (RF 2042-DPJ)
    - Post-Work Review (RF 2042-PWR)
    - Copies of Applicable Log Book Pages
    - Technical Work Document Sign-In Sheet (SF 2001-SSB)

The Open Container Project Leader will ensure that copies of open container records are managed according to AOP 94-19, *Records Requirements*. Waste addition logs, treatment forms, and sampling data are maintained with Disposal Request Records.

13.0 REFERENCES

AOP 94-12, *Technical Work Document Processing System*

AOP 94-18, *Nonconforming Processes and Items*

AOP 94-19, *Records Requirements*

Barcode Reader User's Guide

Brodsky, Allen, Resuspension Factors and Probabilities of Intake of Material in Process (Or "Is 10-6 a Magic Number in Health Physics?"), Health Physics, Vol. 39, pp. 992-1000, 1980.

ESH100.2.SB.2, *Ensure Nuclear Criticality Safety*

ESH100.3.1, *Prepare for and Manage Emergencies*

FOP 00-02, *Waste Handling*

FOP 00-06, *Measuring and Testing Equipment Calibration*

FOP 09-03, *Controlled Atmosphere Glovebox Operations*

FOP 95-26, *Non-Routine Conditions*

FOP 95-31, *Responding to Emergencies*

FOP 95-32, *Formality of Operations*

FOP 97-08, *Shredding Compactable Mixed and Low Level Radioactive Waste Using an AMS-750 Light Industrial Shredder*

FOP 99-04, *Glovebox Sorting Operations*

GN470072, *Nuclear Criticality Safety*

LOP 95-03, *Neutralization of Liquid Wastes*

LOP 95-04, *Solidification and Stabilization of Radioactive and Mixed Low-Level Wastes*

LOP 02-01, *Depressurization of Aerosol Cans*

LOP 04-01, *Inerting Radioactive Explosives and Explosive Components*

NCS-CSA-001, *Special Case, Generic CSA for CSI Arrays*

NNSSWAC, *Nevada National Security Site Waste Acceptance Criteria*

NIOSH Pocket Guide to Chemical Hazards

NUREG-1400, Air Sampling in the Workplace, U.S. Nuclear Regulatory Commission, 1993.

G. R. Choppin and J. Rydberg, Nuclear Chemistry Theory and Applications, Pergamon Press, 1980.

PLA 06-06, *Sorting Plan for Uncharacterized Wastes*

PLA 96-02, *Sampling and Analysis Plan for Characterization of Low-Level Radioactive and Mixed Waste*

PRG 00-01, *Department Training Program*

PRG 00-02, *Non-Nuclear Operations Training Program*

PRG 01-03, *Non-Nuclear Operations Safety and Health Program*

PRG 09-01, *RWNMDD Work Planning & Control Program*

Primary Hazards Screening (PHS) Open Container Operations, and Hazards Assessment (HA)

RPJA 04-01-11, *Hot Particle Surveys*

Radiological Work Permit (RWP) for Open Container Operations

SNL/NM General Part B Permit Application, SNL/NM

U.S. Environmental Protection Agency, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion, EPA-520/1-88-020, 1988.

Weston Qualification and Training Program

29 CFR 1910.119, Appendix A, List of Highly Hazardous Chemicals, Toxics and Reactives

Attachment 1 - Out-Of-Scope Conditions

This attachment summarizes standard industrial hazards identified in the PHS (SNL- current version) for open container operations and identifies the mechanisms that are used to control them. In addition, hazardous conditions that are beyond the scope of open container operations are listed. The following two tables shall be reviewed when developing a Work Plan to ensure that hazards are not inadvertently omitted and that processing operations beyond the authorization basis are not performed. The hazards from Table 1 should be addressed in the job safety analysis section(s) of the Work Plan.

Table 1: Standard Industrial Hazards

Hazard	Control Measures
Electrical Hazards from Extension Cords Portable Power Tools	Power tools are inspected on an annual basis. Workers inspect cords prior to use. Workers use GFI circuits.
480 V Switchgear	Workers wear cotton clothing and leather gloves and face away from the switch when operating. (FOP 97-08).
210-220 Switchgear	Turn off switchgear before plugging in or unplugging the MACRO control (power) unit.
Waste Batteries and Capacitors	If large capacitors or batteries are encountered, processing personnel contact electrical safety personnel to ensure that they have been discharged.
Mechanical Hazards from Machine Shop Equipment and Portable Power Tools	Workers use manufacturers' safety guards. Workers use safe work practices when operating equipment. Workers wear safety glasses, safety shoes, and leather gloves when appropriate. Maintenance and servicing is limited to that of a normal user, except when intrusive maintenance has been authorized by Open Container Project Leader or Department Manager
Mechanical Hazards from Servicing and Maintaining Equipment	Disconnect (unplug or remove from compressed air supply) prior to maintenance activities (e.g., FOP 97-08).
Mechanical Hazards from Maintaining the Light Industrial Shredder	Workers follow lockout/tagout procedures prior to maintenance activities (FOP 97-08).

Table 1: Standard Industrial Hazards	
Hazard	**Control Measures**
Forklifts	Workers follow safety instructions per required training, e.g., FKL153.
Motorized Handtrucks	Workers follow safety instructions per required training, e.g., FKL110.
Overhead Hoists	Workers inspect lifting equipment, ensure that lifting equipment is appropriately sized, and use rigging techniques per required training, e.g., RGH100.
Propane Torch for HazCat	Hot work permit obtained for specific operations with propane torch. Fire extinguishers present in work area during hot operations. Fire extinguisher training is required.
Heat Sources – Exothermic Reactions, Hot Plate, R45632 cylinder (boom box), electrical firing boom box	Mitigation or safety warnings included in LOPs and Work Plans. Reaction monitoring using thermometer. Posting and signage on major equipment. PPE to include leather gloves, long-sleeved coveralls or lab coat.
Critical or Pre-engineered Lifts	Workers consult with the safety representative ES&H support team prior to performing pre-engineered or critical lifts.
Morse Model 400 A-84-110 Hydra-Lift Drum Karrier	Workers follow the manufacturer's instructions and weight limitations as specified in FOP 99-04.
Breathing Air System	Pressure System Data Package available (Base Operations). Pressure safety training is required (e.g., PRS150, PRS250).
Calibration Gases	Workers store the gas bottles horizontally and use care in handling them. Pressure safety training is required.
Entering 744 Boxes, Non-permit Required Confined Spaces	Workers implement the controls from Attachment 1 to PRG 01-03 (RWNMDD Confined Space Program). Workers monitor the box for hazardous conditions to ensure that it remains a non-permit required confined space, when necessary.

Table 1: Standard Industrial Hazards	
Hazard	**Control Measures**
Argon and Nitrogen Gas Supply for Inerting Treatment Atmosphere	Pressure System Data Package available (Base Operations). Pressure safety training is required (e.g., PRS150, PRS250).
Noise –Machine Shop Equipment, Air Compressors, Vacuum Pump, Hammer Mill, etc.	Hearing protection available in work areas. Use of hearing protection specified in Work Plans or by signage. Worker empowered to pause work and/or improve operational health and safety.
Eye, Face, Hand, and Foot Hazards	Use of safety glasses, face shield/bubble hoods, gloves, and safety shoes. Good housekeeping, planning treatment tasks, pre- and post-job work area inspections.
Aerosol Cans in Waste	Inspection of cans prior to treatment. LOP 02-01 and Work Plans discuss safe handling of aerosol cans.
Oil in Waste; Oil used in Equipment	Waste oil containers opened in specific work areas with secondary containment, spill control equipment or spill control in the facility design. Equipment oil is used sparingly according to manufacturers' instructions.
Bloodborne Pathogens	Workers follow precautions recommended in MED113 when handling waste potentially contaminated with bodily fluids.
Ladders	Workers use caution when using ladders to enter 744 boxes for other needs such as work space wipe downs, handling tarp on Room 103, or placing weight on 63" macro tubs.
Heat Stress	Work areas generally have temperature-controlled environments. Workers monitor pulse rates (Type III) to look for signs of heat stress and adjust work schedules if necessary.
Biotic Hazards: poisonous/harmful animals and insects	Pre-job inspection of work area. General warning through POD safety topics.

Table 1: Standard Industrial Hazards	
Hazard	**Control Measures**
Over-pressurized Drums	Workers open 55-gal. drums with a safety web or slowly open bungs to vent pressure. For other size drums one Waste Handler holds down the lid while the other loosens the closure mechanism.
Sharp Items in Waste	Workers wear leather or cut resistant gloves when sharp objects are present in the waste. Workers place sharp objects in rigid containers to alleviate the hazard.
Gas Cylinders in Waste	Workers examine the condition of gas cylinders prior to handling.
Transportation of Radioactive/Hazardous Material	Workers attend required training, PKX100, 111, 112, and 115 and follow the precautions described therein.

Table 2: Activities Beyond the Authorization Basis
Using a radiation-generating device.
Handling fissile material exceeding 700 g U-235.
Handling radioactive material in quantities above 1.0 of the threshold for a category 3 nuclear facility.
Operations involving a very high radiation area (500 rad/hr at 1 meter).
Operations involving lasers other than barcode readers.
Handling highly hazardous chemicals in quantities greater than 25% of the process safety management standard threshold quantities (29 CFR 199 App. A).
Operations involving powder actuated tools.
Operations involving non-ionizing radiation.
Handling cryogenic fluids.
Handling biomedical waste and microorganisms. (Bloodborne pathogens are addressed in the PHS) NOTE: Biohazardous and infectious waste may be handled (treated) in some rare instances, as described in the open container PHS/HA.
Handling oils with volume greater than 55 gallons.
Maintaining or servicing equipment, including electrical, mechanical, and thermal equipment, in a manner that exceeds the normal-user degree of maintenance or servicing that is allowed by applicable FOPs or LOPs.
Entering into permit-required confined spaces.
Handling unbound engineered nanoscale particles.
Working on elevated work surfaces.
Welding brazing torch cutting.
Handling toxic gases > threshold quantities.
Operating machine shop equipment.
Operating equipment or tools outside of manufacturer's recommendations.
Generating acutely hazardous waste.
Handling explosives in quantities greater than storage facility limits.

Attachment 2 - NUREG-1400 Modeling

NUREG-1400 provides a method for predicting intakes of radioactive material by inhalation considering the characteristics of the material to be handled and the engineering controls implemented. Use the following equation to compute the potential daily intake of radioactive material.

$$DI_f = \frac{Q\,10^{-6}\,R\,C\,D\,D2}{DAC\;2.4E3}$$

Where:
DI_f is the daily intake fraction (dimensionless).
Q is the total activity for all nuclides to be processed in a day (Ci).
R is the release fraction for the material (10^{-2} for powders, 1 for gases or volatile materials, 10^{-3} for solids, and 10^{-2} for liquids).
C is the confinement factor (10^{-2} for a glove box, 10^{-1} for a fume hood, and 1 for all other applications).
D is the dispersibility factor. A factor of 10 is applied for operations that may entrain material in the air such as cutting, grinding, heating, or chemical reactions.
D2 is an additional dispersibility factor used to account for greater or less dispersion in historical operations of the same nature. In the absence of data from the specific process, this factor should be set equal to 20 based on scenario 2 in Table 1 of Brodsky, 1980.
DAC is the minimum derived air concentration for the nuclide being processed (uCi/mL) from 10CFR835.
2.4E3 is a conversion factor from DAC to ALI given a breathing rate of 2.4E3 m^3/y.

For a mixture of radionuclides, use the following equation to compute a single DAC value.

$$DAC_m = \frac{\sum A_i}{\sum \frac{A_i}{DAC_i}}$$

Where:
DAC_m is the derived air concentration value for the mixture of radionuclides.
A_i is the activity of nuclide i (Ci).
DAC_i is the minimum DAC from inhalation for nuclide i (Ci).
The summations are performed over all nuclides that will be processed.

Estimate inhalation exposure in DAC-hour using

$$DAC\ hours = \frac{2000\ DI_f}{PF}$$

Where:
2000 is a conversion factor from ALI to DAC-hours,
PF is the respiratory protection factor, and all other factors are defined above.

ATTACHMENT 3
Change History – Revision 00 to Revision 01

Throughout/ Editorial (may not be indicated with rev-bar in document)	Accept changes made to Rev 00 through Procedure Changes. Document control (pagination, section numbering) and editorial changes (styles, formatting, grammatical and spelling corrections, reorganization of text) are not all identified individually in this Change History. Revise Header and Change History to indicate full revision. Update TOC, lists of Attachments and Forms, hyperlinks and cross-references. Change department name to Waste Management and Pollution Prevention and acronym to WMPP. Department is also referred to as "Department." Remove department name/acronym from form names. Add footer to indicate that the official version of the document is on the web. *A printed copy of this document may not be the most current version.* *A controlled version of this document is at* http://info.sandia.gov/esh/c_docs/index.htm. Change NTS to NNSS. Change reference "~~Division ES&H Team~~" to RP, safety engineering and IH representatives" or similar. Change title of FOP 95-26, *Non-Routine ~~Occurrences~~ Conditions* Remove references to ~~sorting~~ and ~~treatment~~ and replace with open container operations, as appropriate.
Section 2.2	Add to responsibilities for Processing Specialist, 3rd bullet: • Conducting work planning meetings with affected workers and safety support personnel.
Section 2.3	Revise Waste Handler's responsibilities, 2nd bullet: • Reviewing draft Work Plans (one Waste Handler per plan will sign the Processing Work Plan Approvals RF 2042-SWPA). 10th bullet: • Participating in ~~bi-~~annual project review meetings.
Section 2.4	Revise 4th bullet: • Placing/removing lapel monitors on personnel. Turning lapel monitors on.
Section 2.5	The Division ES&H Team (IH, RP and safety engineering [SE]) and the ~~WMPP~~ Site Safety Officer are responsible for the following:

ATTACHMENT 3
Change History – Revision 00 to Revision 01

Section 2.7	Revise paragraph: The Non-Nuclear Operations Supervisor (NNOS) is responsible for ~~the following:~~ ~~• Signing RF 2042-SWPA, Processing Work Plan Approvals, indicating receipt of work plan notification.~~ • ~~P~~preparing and obtaining approval for RF 2042-TIC, Type I Processing Work Plan, as necessary, according to this procedure.
Section 3.0	Remove 3rd paragraph: ~~Personnel entering RWNMDD WMPP radiological controlled/radioactive material/radiological buffer areas must have current General Employee Radiological Training. Personnel who perform radiological work must have at least Radiological Worker I (RAD210). Radiological Worker II (RAD230) is required for work in High Radiation Areas, Contamination Areas, or Airborne Radioactivity Areas. If necessary, escort may be used in lieu of training as specified in Chapter 3, Section 3.4.4, of the RPPM and as described in FOP 94-80, Visitor Control.~~
Section 4.3	Revise 1st sentence (RP comment): An RCT will be assigned to the processing activity each day by the Lead RCT or designee.
Section 4.6	Revise 3rd bullet (RP comment): • Personnel will perform whole body frisks in the PCM-II after exit from a Contamination Area ~~or Airborne Radioactivity Area~~.
Section 4.13 and Section 5	Make Section 4.13 Section 5.0 and renumber sections thereafter. Add second paragraph. **~~4.13~~5.0 Beryllium Controls** Work Plans addressing the processing of waste from landfills or waste with incomplete, unreliable, or questionable characterization information will be developed with consideration for beryllium controls. Waste with known beryllium will be processed using beryllium controls specified in PLA 05-08, Chronic Beryllium Disease Prevention Program Implementation Plan.
Section 6.1	Remove document number for the RWP and version numbers for referenced PHS/HA's.

ATTACHMENT 3
Change History – Revision 00 to Revision 01

Section 7.1	Remove 4th paragraph: ~~If the waste management functions to be performed only involve contact with radioactive waste and there is no potential for chemical exposure and there are no unusual physical hazards, the work may be performed using a Work Plan for Limited Waste (Attachment 3). Attachment 3 provides complete instructions for implementing processing operations using a Work Plan for Limited Waste.~~
Section 7.1.1	Revise 1st paragraph: Waste hazards are generally summarized on a container-specific basis using the Container Hazard Summary Form (RF 2042-HSF). Hazard information is derived from DRs, radiological surveys, MSDSs, standard texts, and any other available source of information. Additional hazards are documented in the Job ~~Physical Hazard Controls~~ Safety Analysis Section 7.1.46.1.4 (F) and on the Process Chemical Hazards Form (RF 2042-PCH). The Processing Specialist will enter hazard information on the Container Hazard Summary Form (RF 2042-HSF) as specified below. Revise18th bullet: • Include MSDSs for all waste and process chemicals ~~or ensure~~ if they are available through the CIS.
Section 7.1.4	Revise 1st paragraph: …Six general areas of the plan are addressed in subsections of the form: Section C - General Controls, Section D - Radiological Controls, Section E - Chemical Controls, Section F - ~~Physical Hazard Controls~~Job Safety Analysis, Section G - Detailed Instructions, Section H - Additional Information. Section D – First bullet, remove last sentence: ~~Under additional notes, state that current area conditions are discussed at the pre-job meeting based on the most recent Job Coverage Survey.~~ Section D – 3rd bullet, add sentence before last sentence: If NUREG-1400 modeling was not performed for the task, lapel monitors are required if the alpha activity or beta activity to be processed in a day exceeds 2 µCi or 1 mCi, respectively. Lapel monitors will be used for Type IV operations. In addition, lapel monitors will be worn if recommended by RP. Section E – 1st bullet, 2nd and 3rd paragraphs Chemical Hold Points – Specify chemical hold points where changing conditions require additional chemical controls such as an upgrade to respiratory protection. Hold points should be specified for each type of IH measurement performed (e.g. PID, LEL, and O2). ~~Examples are given~~

ATTACHMENT 3
Change History – Revision 00 to Revision 01

	~~in the Work Plan for Limited Waste in Attachment 3.~~ Specify the technical basis for each chemical hold point developed specifically for the Work Plan and include it in Section H, Additional Information. The basis shall address the characteristics of the particular chemicals, applicable engineering controls, and personal protective equipment. Section H - Delete last sentence • Specify any additional information necessary to support the Work Plan. Basis for chemical hold points and more detailed chemical exposure health effect and first aid measures may be specified here. ~~Equipment lists for complicated plans may also be specified in this section.~~
Section 7.3 and Section 10	Delete requirement to complete a Work Evaluation Acceptance, and Authorization Form (RF 2042-WEF) and Job Safety Analysis form (SF 2001-JSA prior to initiating general housekeeping (7.3) and spill cleanup.(10.0). Activity hazards are covered under a general JSA and a WEF is not required for these activities. Complete the general housekeeping and decontamination activities.
Section 8.0	Revise 1st paragraph: It may be necessary to deviate from the Work Plan because of unforeseen circumstances. In most cases, it is acceptable for the Processing Specialist to approve minor deviations from the Work Plan, provided the deviation and its rationale are noted in the Project Logbook and the Open Container Project Leader is notified and concurs.
Section 11.3	Revise 2nd paragraph: Waste that is in RadTrack ~~(WMPP radioactive waste/material tracking database)~~ and is not significantly altered by processing operations will continue to be tracked in RadTrack using parcel or container move functions on the barcode reader as applicable (see Barcode Reader User's Guide, FOP 00-02, Waste Handling).
Section 12 and other	Revise requirement to send records to record center to state that records will be managed in accordance with AOP 94-19, *Records Requirements,* to allow for changes in records management practices.
Task Specific Work Plan for Limited Campaign	Delete

ATTACHMENT 3
Change History – Revision 00 to Revision 01

Attachment 1	Revise **Attachment 1 - ~~Hazard Summary and~~ Out-Of-Scope Conditions** Revise 1st paragraph, add last sentence. The hazards from Table 1 should be addressed in the job safety analysis section(s) of the Work Plan.
Over-pressurized Drums	Workers open 55-gal. drums with a safety web or slowly open bungs to vent pressure. For other size drums one Waste Handler holds down the lid while the other loosens the closure mechanism.
Sharp Items in Waste	Workers wear leather or cut resistant gloves when sharp objects are present in the waste. Workers place sharp objects in rigid containers to alleviate the hazard.
RF 2042-PSR	Change to Revision 04. Insert a number 4. "Have all workers signed the applicable TWD (SF 2001-SSB)?