

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

SM-40.404, RADIOLOGICAL CONTROLS MANUAL: RADIOACTIVE MATERIALS, July 13, 2012, JAMES BARNES

DOCUMENT CHANGE SUMMARY – This document replaces issue dated January 16, 2004. Implements revised SOP C-401.

TABLE OF CONTENTS

<u>PART 1 - Radioactive Material Identification, Storage and Control</u>	2
411 Requirements	3
412 Radioactive Material Labeling	3
413 Radioactive Material Packaging	4
414 Radioactive Material Storage	5
<u>PART 2 – Release of Materials from Radiological Controls</u>	6
421 Materials Release from Radiological Controls	6
422 Effluent Release to Environment or Uncontrolled Areas	7
423 [MOVED]	8
424 Recycling of Metals from DOE Radiological Areas	8
425 Guidance for Surveys of Soils and Grounds in Non-Radiological Locations of Area IV, SSFL	10
426 Release of Radiological Facilities and/or Land for Unrestricted Use	10
<u>PART 3 – Transportation of Radioactive Materials</u>	11
431 Transportation and Transfer of Radioactive Material	11
<u>PART 4 - Radioactive Source Controls</u>	12
441 Radioactive Source Controls	12
<u>PART 5 - Solid Radioactive Waste Management</u>	13
451 Requirements	13
452 Waste Minimization	13
453 Mixed Waste	14
<u>PART 6 - Control of Radioactive Liquids and Airborne Radioactivity</u>	14
461 Minimization and Control of Radioactive Liquid Wastes	14
462 Control of Radioactive Drains	15
463 Control of Airborne Radioactivity	16
<u>PART 7 - Support Activities</u>	17
471 Personal Protective Equipment and Clothing	17
472 Laundry	17
473 Decontamination	18
474 Vacuum Cleaners and Portable Air-Handling Equipment	19

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

APPLICABILITY

This procedure applies to radiological activities conducted at the Boeing Santa Susana Field Laboratory (SSFL) campus ("Boeing - SSFL").

The terms "shall," "should," "may," etc. indicate procedural requirements or suggestions for good practices. These terms are intended to convey meanings typically used in quality assurance or standards documents (e.g., ANSI).

- "Shall" in this procedure denotes a mandatory requirement.
- "Should" denotes a recommended practice, but which is not required. "Should" is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required.
- "May" denotes an option. "May" indicates a course of action permissible within the limits of the procedure.

This procedure implements the requirements of SOP C-401, *Radiation Safety Program*. This procedure is intended to provide additional guidance to the requirements of the SOP. Stipulations of this procedure are to be interpreted in light of the SOP C-401 requirements.

Note that DOE dosimetry terminology has been changed. This procedure utilizes the former terminology. SOP C-401, Table 8 describes terminology equivalency.

PART 1 - Radioactive Material Identification, Storage and Control

Radioactive material is any substance that spontaneously emits ionizing radiation during the process of nuclear decay. Radioactive material includes activated material, sealed and unsealed sources, and naturally occurring radioactive materials (NORM).

For the purposes of applicability of procedures, any material, equipment or system component determined to be contaminated with such isotopes is considered to be radioactive. Items located in known or suspected Contamination, High Contamination, or Airborne Radioactivity Areas are considered radioactive material, until surveys indicate otherwise.

Controls for sealed sources are described in Article 431.

Notwithstanding the above, radioactive materials that are available through unrestricted over-the-counter purchases (e.g., smoke detectors, lantern mantles, low-sodium salt substitutes, etc.), or are specifically exempted from controls by the State of California (e.g., small quantities of source materials, NORM, etc.) are not subject to the controls specified by this Manual. Generally Licensed materials ARE subject to the requirements of SOP C-401.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

411 - Requirements

1. Materials in Contamination, High Contamination, or Airborne Radioactivity Areas **shall** be considered radioactive material until surveyed and released. These survey and release requirements do not apply to Airborne Radioactivity Areas where only gaseous, short-lived (half-life of 1 hour or less) activation products are present.
2. Except for sealed and unsealed sources subject to the controls of Article 431, radioactive material located within Contamination, High Contamination, or Airborne Radioactivity Areas does not require specific labeling or packaging.
3. Radioactive material may be capable of generating a High Radiation Area. These areas **shall** have special controls in accordance with SM-40.403, Article 334.
4. Radiation Safety **shall** be notified in the event of a loss of radioactive material. Responses to such an event **shall** be appropriately guided by Boeing's Enterprise Incident Reporting System (IRS) and QA-00003, *Occurrence Reporting*.

If unattended radioactive material is found outside a Radioactive Materials Area, contact the cognizant Facility HP. If the material is located in a public area (such as a parking lot or open office area), contact Security and Fire Services. Security and Fire Services will, in turn, contact Radiation Safety for response.

412 Radioactive Material Labeling¹

1. Radioactive material outside Contamination, High Contamination, or Airborne Radioactivity Areas **shall** be labeled in accordance with SOP C-401, Table 2.5; "Labeling Requirements for Radioactive Materials."

Packaged radioactive material *should* have adequate trefoil warning labels visible through the package or affixed to the outside to ensure that the package will be readily identified as radioactive. Labels **shall** have a yellow background with a magenta or black standard radiation symbol. Lettering **shall** be magenta or black, magenta being the preferred color.

At least one label *should* include contact radiation levels, removable surface contamination levels (specified as alpha or beta-gamma), date surveyed, surveyor's name and description of items. In lieu of labeling, this information may be placed in a weather-resistant holder attached to the package to reduce fading or damage due to exposure to the elements.

¹ For consistency in the program, NRC/California guidance is used for labeling of radioactive materials.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

2. The following are not subject to labeling requirements²:
 - A. Items or materials surveyed and determined to have contamination levels lower than "free-release" values (See SOP C-401, Table 2.2; "Surface Contamination Values in dpm/100 cm²").
 - B. Radioactive material or containers packaged and labeled for off-site shipment in accordance with Department of Transportation Regulations
 - C. Individual articles of personal protective equipment and clothing
 - D. Radiological control samples such as air, process and soil samples or swipes that are in the custody of Radiation Safety personnel or personnel properly trained in the handling, packaging and transport of these samples
 - E. Installed system piping and components of a radioactive process system when such a system is located within a Controlled Area.
 - F. Portable tools and equipment with fixed contamination, permanently marked with yellow or magenta, and maintained in a contaminated tool program.
 - G. [DELETED]
 - H. [DELETED]
 - I. Quantities of radioactive materials are less than the values provided in SOP C-401, Table 2.4; "Criteria for Labeling and Posting Radioactive Material Areas for Common Isotopes at Boeing—SSFL."
 - J. Inaccessible, or accessible only to individuals authorized to handle or use them, or to work in the vicinity.

413 Radioactive Material Packaging

1. Radioactive material that is outside Contamination, High Contamination, or Airborne Radioactivity Areas and is confirmed or suspected of having removable radioactive contamination levels greater than free-release values **shall** be securely wrapped in plastic or placed in a container.
2. Radioactive material with sharp edges or projections *should* be taped or additionally protected to ensure package integrity.

² NRC/California and DOE provide for some additional exemptions to labeling. These exemptions are generally not used at Boeing Canoga Park, but may be applied with the case-by-case permission of the Radiation Safety Officer.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

3. Radioactive material with removable or potentially removable contamination levels in excess of 100 times free-release values *should* have additional packaging controls such as double-wrapping or the use of plastic bags inside containers.
4. Yellow is the traditional color for wrapping material used to package radioactive materials. Within a Controlled Area, yellow materials *should not* be used for non-radiological purposes.

Wrapping materials labeled "Radioactive Materials", or marked with the ANSI trefoil, **shall not** be used for non-radiological purposes.

5. The amount of combustible material used in packaging *should* be minimized.

414 Radioactive Material Storage

1. Radioactive material *should* be stored in a designated Radioactive Material Area.
2. Long-term (more than 60 days) storage of radioactive material *should* be in the Radioactive Materials Handling Facility (RMHF). Notwithstanding the above, certain materials may be stored for more than 60 days at locations other than the RMHF when authorization is granted as a condition of a Use Authorization or the Radiation Safety Officer provides written permission for such storage.

Decontamination or disposal of radioactive material is the preferred alternative to long-term storage.

3. Radiation Safety **shall** be informed of any Radioactive Material Area being established in a non-radiological Area. The Radiation Safety Officer (or designee) **shall** approve of such areas where it is anticipated that storage in a non-radiological area will be required for more than 48 hours.
4. Responsibilities of Principal Users for radioactive material storage are described in SOP C-401, Radioactive Materials and Ionizing Radiation. [See SOP C-401, Appendix 1; "Management of Use Authorizations."]
5. [DELETED]
6. [DELETED]
7. Storage of nonradioactive material in a Radioactive Material Area is discouraged.
8. Outdoor storage of radioactive material that may be susceptible to deterioration from sun exposure or exposure to the elements is discouraged. In cases where outdoor storage is necessary, weather-resistant protective containers **shall** be utilized.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

When required by Use Authorization, the cognizant Principal User **shall** ensure that container integrity is periodically checked (nominally monthly) at outdoor Radioactive Material Areas. These checks *should* be documented.

9. Where flammable or combustible radioactive materials are placed in storage, Security & Fire Services personnel **shall** be consulted to ensure that the material is stored in such a location and in such a manner as to mitigate the potential for fire (e.g., proper containers, adequate brush clearance, etc.) Fire protection measures, such as smoke detectors, water sprinklers and fire extinguishers **shall** be provided as directed by Security & Fire Services.

Radioactive material *should* be stored in a manner that reduces combustible loading and that facilitates fire prevention.

The use of cardboard containers for storage is discouraged.

Flammable or combustible materials *should not* be stored adjacent to Radioactive Material Areas.

10. [DELETED]

PART 2 – Release of Materials from Radiological Controls³

421 Materials Release from Radiological Controls

1. Material and items in Contamination, High Contamination, or Airborne Radioactivity Areas **shall** be surveyed prior to release into a Controlled Area or Unrestricted Area.

Radioactive material to be released from controls **shall** be demonstrated to have contamination levels less than the applicable free-release values (See SM-40.402, Article 222). Free release values for recycled metals are described in Article 424 (below).

Radioactive material being released **shall** also be evaluated for contamination under any coatings.

2. Material with contamination levels greater than free-release values **shall** be appropriately labeled and packaged prior to removal from the boundaries of the posted contaminated area.
3. Material and equipment with fixed contamination levels that exceed the total surface contamination values specified in SOP C-401, Table 2.2, may be released for use in *controlled areas* outside of radiological areas only under the following conditions:
 - Removable surface contamination levels are below the removable surface contamination values specified in SOP C-401, Table 2.2; and

³ The regulatory basis for release of materials is described in NRC Regulatory Guide 1.86 and in DOE Order 5400.5.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

- The material or equipment is clearly marked or labeled to alert personnel of the contaminated status; and
 - The material or equipment is routinely monitored.
4. Radioactive material not immediately released after survey **shall** be controlled to prevent recontamination while awaiting release.
 5. Records for release of potentially contaminated materials **shall** be maintained. These records *should* describe the property, date of last survey, identity of the person who performed the survey, type and identification number of the survey instrument used, and survey results.
 6. Building materials, process equipment, and construction debris that are released from licensed facilities that are subject to the license requirements of the California Broad Scope "A" License (0015-19), **shall not** be released from Boeing -- SSFL possession until a confirmatory survey has been performed by the State of California. Metals from DOE projects intended for recycling must meet the requirements of SM-40.404, Article 424 (below).

Material subject to these stipulations **shall** be sequestered within a designated Material Holding Area pending release. Material may be removed from this area only with the written permission of the Radiation Safety Officer.

7. Labels shall be removed or completely defaced prior to release of radioactive material for unrestricted use.

422 Effluent Release to Environment or Uncontrolled Areas

1. In routine operations, radioactive liquid wastes **shall** be evaporated or solidified. In routine operations, release of radioactive effluents to the environment is not required.
2. In special circumstances, radioactive liquid wastes may be discharged to the environment. The following regulations describe when such discharges may occur and the requirements for such discharges:

DOE Orders 458.1 and 5400.5 describe criteria for releasing radioactive material in effluents to uncontrolled areas. This Order **shall** be applied to release of radioactive effluents from DOE facilities.

Radioactive effluent releases from State of California licensed facilities **shall** be controlled in accordance with 10 CFR 20.1302, Compliance with Dose Limits for Individual Members of the Public" and 10 CFR 20.2003, Disposal by Release into Sanitary Sewerage," (incorporated by citation into CCR Title 17).

In addition, effluent releases shall comply with all other applicable regulations (e.g., NESHAPS, NPDES, Water Quality Board, etc.)

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

3. Radioactive liquid waste discharges **shall** be analyzed prior to release, monitored during release, and the release terminated before exceeding predetermined limits. "Batch" discharges enhance monitoring capability and reduce the potential for inadvertent release. Where such release processing is feasible, batch releases **shall** be utilized.

423 [MOVED]

424 Recycling of Metals from DOE Radiological Areas

Note: This Article does NOT apply to release of decontaminated or non-radioactive materials to landfill disposal, or to release of facilities, equipment and materials from radiological controls that are not destined for recycling. These materials may be released if they meet appropriate release limits published by cognizant regulatory agencies. In general, metals are NOT recycled from DOE radiological facilities. However if metals were to be recycled, the following steps will be taken.

1. If a determination is made that the metal is not radioactively contaminated by DOE activities or operations (e.g., contamination levels are considered to be indistinguishable from background⁴), then scrap metals from DOE radiological facilities may be released from radiological controls, without restrictions, for recycling)
2. For metals to be released, a reasonable expectation **shall** be established that the metals have not been radioactively contaminated by DOE activities or operations at levels greater than background levels normally associated with such materials. Process knowledge, operational records, operating history, and any other relevant information (including radiological surveys; see Article 424.3) may be used, as available, to determine if any potential for radioactive contamination exists for the metals being recycled.

Scrap metals having inaccessible suspect surfaces **shall not** be considered for unconditional release, unless:

- a) the history (process knowledge) of the metal indicates that there is no potential for contamination; or,
 - b) the inaccessible regions can be modeled by suitable quantitative and/or other analytical means with a determination that there is no radioactivity present.
3. As necessary, confirmatory radiological release surveys **shall** be performed to support the process knowledge that the metals have not been radioactively contaminated as a result of DOE operations or activities.
 4. Confirmatory surveys shall be conducted in accordance with RS-00012, *Methods and Procedures for Radiological Monitoring*. Such surveys **shall** be designed to verify that there is no detectable residual radioactivity on the metal.

⁴ See definition in SM-40.408.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

For the purposes of these surveys, "indistinguishable from background" is defined as:

For portable count rate meters: 2X ambient background (as established by the low-point of meter response fluctuation in a known background field)⁵.

For "integrated count" survey systems, including low background laboratory counters for counting removable contamination wipes: The Lower Limit of Detection Count Rate ("LLDCR") and Lower Limit of Detection Activity ("LLDA") such that the Type 1 ("false positive") and Type 2 ("false negative") errors are both $\leq 5\%$.

Instructions for the determination of these values are provided in RS-00012. Note that low background counting systems may require the use of poisson calculations to establish the appropriate LLDCR and LLDA.

Note that LLDA's shall be at least as low as the values described in USNRC Regulatory Guide 1.86, *Termination of Operating Licenses for Nuclear Reactors*, or as stipulated by USDOE regulatory guidance. If an instrument LLDA is not sufficient to determine by direct measurement that these guidelines are met, then a combination of survey techniques may be used to establish that no detectable radioactivity exists on the metals to be recycled.

5. If metals are determined to be not contaminated, then prior to release to a recycling pathway, an independent verification (IV) process **shall** be used to confirm that survey and evaluation processes are in place and are being appropriately implemented.

These activities may include review of technical and administrative procedures, and radiological monitoring to verify the effectiveness of the screening and release process. The level and scope of the IV effort should be commensurate with the potential for contamination, as well as the complexity and hazard. Personnel independent from the organization that operates the site will conduct IVs. While the IV may be performed by a regulatory agency (e.g., CA DPH-RHB, DOE, EPA, etc.), a non-regulatory entity (e.g., ORISE, third-party vendor, etc.) may also perform the assessment.

6. All releases of metals for commercial recycling shall be documented. Documentation shall include:
 - A description of property (metal) and quantities of material;
 - A history of the metals being released from the radiological area;
 - A description of the basis for determining that the metal has not been radioactively contaminated by DOE activities or operations; and
 - A description of the radiological survey and results, survey date, identity of survey technician, and the types and serial identification numbers of the instruments used.

⁵ For instruments with very low background rates (such as alpha survey meters), the "indistinguishable" criteria can be established by extrapolation from poisson distribution statistics or other suitable method.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

425 Guidance for Surveys of Soils and Grounds in Non-Radiological Locations of Area IV, SSFL

1. Soil cleanup standards in Area IV shall be determined based on the requirements of the "Administrative Order on Consent for Remedial Action" signed by the DTSC and DOE on December 10, 2010, which calls for "cleanup to background." Background levels will be specified by a "look-up table" using data from the US EPA "Radionuclide Background Study." Soil exceeding "look-up table" values will be excavated and managed and disposed of as LLRW.

426 Release of Radiological Facilities and/or Land for Unrestricted Use

1. Final surveys conducted following decontamination and decommissioning of radiological facilities and/or associated contaminated land shall be performed..
2. A facility-specific final survey procedure **shall** be written, using MARSSIM guidance. (NUREG-1575, EPA 402-R-97-016, Rev. 1).
3. DOE and DHS approved cleanup standards for building surface contamination and soil contamination shall be implemented based on N001SRR140131, "Approved Sitewide Release Criteria for Remediation of Radiological Facilities at SSFL."
4. An independent verification survey may be performed by an independent DOE contractor for DOE-owned radiological facilities. DPH (or other state approved third-party organization) may perform a second independent survey for DOE-owned radiological facilities.
5. DHS **shall** be invited to perform an independent verification survey for Boeing-owned radiological facilities.
6. DOE has the regulatory jurisdiction to release DOE-owned radiological facilities for unrestricted use.
7. DPH has the regulatory jurisdiction to release Boeing-owned radiological facilities for unrestricted use.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

PART 3 – Transportation of Radioactive Materials

431 Transportation and Transfer of Radioactive Material

1. Transportation of radioactive materials over public thoroughfares or by public conveyances shall be conducted in accordance with Department of Transportation (DOT), state, and local requirements. See SOP C-404, Shipping Radioactive Materials.

Note that the requirements of 10 CFR 835 do not apply to radioactive material transportation not performed by DOE or a DOE contractor (see § 835.1 (b) (7)).

2. [DELETED]
3. On-site transfers crossing or using public thoroughfares **shall** be performed in accordance with Department of Transportation, state and local shipping requirements and pre-approved agreements.

On-site transfers between facilities or locations on the same site that do not cross or utilize public thoroughfares are **not** considered transportation under Article 431.1. Such transfers **shall** be performed in a safe manner in accordance with SOP C-404, Shipping Radioactive Materials. The procedure includes requirements to ensure appropriate monitoring and control of the radioactive material.

- 4-9. [DELETED]

10. Radioactive materials *should not* be routinely transported in employee-owned vehicles. Notwithstanding this, an individual may transport radioactive sources, radiation measuring instrumentation, or radiological samples *if*:
 - A. The activity of the materials do not exceed exempt quantities as defined in 10 CFR 20,
 - B. The vehicle does not enter a public thoroughfare; and,
 - C. The individual is specifically authorized to do so on an applicable Use Authorization.

The use of personal vehicles for offsite transport of radioactive materials or devices that are packaged in compliance with DOT regulations is permitted only on a case-by-case basis. The permission of the RSO and shipping papers from the EHS DOT HazMat assignee must be obtained prior to the offsite movement of material.⁶

⁶ The intent of this waiver is to facilitate the transport of check sources, instruments, demonstration sources, samples, and other small quantities of radioactive materials by Radiation Safety personnel when needed in the performance of their duties.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

11. Access control, posting and labeling requirements for radioactive materials may be waived for transportation by DOE or a DOE Contractor if:
- The activities are conducted under the continuous observation and control of an individual who is knowledgeable of and implements required exposure control measures, or
 - Is conducted in accordance with Department of Transportation regulations or DOE orders that govern such movements of radioactive materials.

PART 4 - Radioactive Source Controls

441 Radioactive Source Controls

1. Sealed radioactive sources **shall** be used, handled, and stored in a manner commensurate with the hazards associated with operations involving the sources.
2. Each accountable sealed radioactive source **shall** be inventoried at an interval not to exceed six months. This inventory shall:
 - a. Establish the physical location of each accountable sealed radioactive source;
 - b. Verify the presence and adequacy of associated postings and labels; and
 - c. Establish the adequacy of storage locations, containers, and devices.
3. Except for sealed radioactive sources consisting solely of gaseous radioactive material or tritium, each accountable sealed radioactive source **shall** be subject to a source leak test:
 - a. upon receipt,
 - b. when damage is suspected, and
 - c. at an interval not to exceed six months.
4. Source leak tests **shall** be capable of detecting radioactive material leakage equal to or exceeding 0.005 microcurie (5 nCi; 11,000 dpm).
5. Notwithstanding the requirements of 431.3, an accountable sealed radioactive source is not subject to periodic source leak testing if that source has been removed from service. Such sources **shall** be:
 - a. stored in a controlled location,
 - b. subject to periodic inventory as required by Article 431.2, and
 - c. subject to source leak testing prior to being returned to service.
6. Notwithstanding the requirements of Articles 431.2 and 431.3, an accountable sealed radioactive source is not subject to periodic inventory and source leak testing if that source is located in an area that is unsafe for human entry or otherwise inaccessible.
7. An accountable sealed radioactive source found to be leaking radioactive material **shall** be controlled in a manner that minimizes the spread of radioactive contamination.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

PART 5 - Solid Radioactive Waste Management

451 Requirements

Radioactive Waste **shall** be collected and processed in accordance with Boeing -- SSFL Procedure SOP C-403, *Disposition of Radioactive Waste*. This procedure meets the requirements specified in DOE 5820.2A; 10 CFR 20.2001 - 2007, and CCR Title 17 (implementing 10 CFR 20 by citation).

452 Waste Minimization

To the extent practical, the generation of radioactive waste and spread of contamination from Contamination, High Contamination, or Airborne Radioactivity Areas **shall** be minimized. Minimization can be obtained by the appropriate use of the following practices on a routine basis:

1. Restrict material entering Radiological Buffer Areas and Contamination Areas to those needed for performance of work.
2. Restrict quantities of hazardous materials, such as paints, solvents, chemicals, cleaners and fuels, entering Controlled Areas and take measures to prevent inadvertent radioactive contamination of these materials.
3. Substitute recyclable or burnable items in place of disposable ones and reuse equipment when practical.
4. Select consumable materials such as protective coverings and clothing that are compatible with waste-processing systems, volume reduction and waste form acceptance criteria.
5. Reserve an assortment of tools primarily for use in Contamination, High Contamination, or Airborne Radioactivity Areas. Tools *should* be maintained in a designated storage or distribution area or a contaminated tool crib. Controls *should* be established for tool issuance and use such that contaminated tools are not inadvertently used in non-radiological areas.
6. Survey potentially contaminated material to separate uncontaminated from contaminated materials.
7. Segregate known uncontaminated from potentially contaminated waste.
8. Segregate reusable items, such as protective clothing, respirators and tools, at the step-off pad.
9. Minimize the number and size of Radioactive Material Areas.
10. Emphasize training in waste reduction philosophies, techniques and improved methods.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

453 - Mixed Waste

Radioactively contaminated hazardous materials may result in the creation of “mixed hazardous wastes” which are extremely expensive and difficult to dispose of.

Requirements specified in the Resource Conservation and Recovery Act and Toxic Substances Control Act apply to waste that contains both radioactive and hazardous materials.

Mixed Hazardous Waste control and minimization is described in PMP-0003 “Radioactive Waste Management Plan for LLW and MLLW.”

1. 53 FR 37045, "Clarification of Interim Status Qualification Requirements for the Hazardous Components of Radioactive Mixed Waste (23 September 1988)" discusses the Environmental Protection Agency's position regarding "Mixed" Hazardous Waste. DOE Order 435.1 "Radioactive Waste Management" describe controls for mixed waste generated in DOE facilities, describing how mixed waste generation *should* be minimized. The DOE guidance, being representative of EPA and NRC positions, is considered to be the basis for procedures described in this section. State of California regulations may also affect the classification of mixed hazardous wastes.
2. Technical and administrative controls *should* be established to minimize the volume of mixed waste generated and the amount of radioactivity in such waste. Volume reduction methods include process optimization, materials substitution and new technology development.
3. Materials suspected of being mixed waste **shall** be identified and segregated as soon as practical in the generating process to avoid combining mixed waste with other waste forms.
4. The appropriate regulatory requirements governing the waste types **shall** be applied. Where the “appropriateness” of such regulations cannot be established, then the most stringent regulatory requirements for the types of waste present **shall** be applied to waste classification and disposal.

PART 6 - Control of Radioactive Liquids and Airborne Radioactivity

461 Minimization and Control of Radioactive Liquid Wastes

1. DOE Order 435.1 “Radioactive Waste Management” provides criteria for minimizing the generation of radioactive liquid waste. Minimization *should* include evaluating operational requirements to reduce liquid usage and maximize recycling activities.
2. A water management program *should* be maintained to identify and eliminate unnecessary sources of radioactive liquid waste. This program *should* include aggressive measures to identify and repair leaks.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

3. Adequate storage capacity for liquid wastes **shall** be available to contain liquids generated during radiological operations. If adequate storage capacity is not available, then liquid-generating operations **shall** be conducted in such a manner to ensure that storage capacity is not exceeded by the generation of liquids (e.g., reduction of rate of generation, curtailment of operations, expansion of storage capacity, etc.).
4. Radioactive effluent release requirements are described in Article 422.
5. [MOVED]
6. [MOVED]
7. [MOVED]
8. Where a reasonable risk of contamination of an otherwise non-radioactive liquid effluent stream could reasonably occur, an appropriate monitoring program **shall** be implemented to provide assurance that no significant contamination of the effluent stream is occurring such that limits promulgated in the reference in Article 422.2 would be exceeded.⁷

462 Control of Radioactive Drains

There are no active radioactive drains at SSFL.

Radioactive drain systems are designed to transport radioactive liquids. Improper use may cause an environmental release.

1. In routine operations, radioactive drain systems **shall** not discharge to the environment nor be used for the disposal of non-radioactive liquids.
2. Radioactive drainage systems and procedures **shall** be provided such that the following criteria are satisfied:
 - A. Existing radioactive drain piping configuration **shall** be verified to ensure that no uncontrolled environmental releases will occur.
 - B. Flow indicating devices *should* be installed in leak-off lines with significant volumes of liquid waste.
 - C. Control devices or procedures (e.g., use of plugs to prevent nonradioactive input, notifications of prohibited substances, etc.) **shall** be utilized to restrict input to radioactive drain systems.

⁷ The SSFL sanitary sewage system is self-contained and is not connected to the city's sanitary sewage system. Sanitary sewage is collected weekly and transported to an offsite sewage treatment facility. Discharge to the environment occurs at the off-site sewage facility, and is conducted in accordance with that facility's permits and licenses.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

- D. Prior to removing drain systems from operation for maintenance or modifications, sufficient alternative waste handling procedures and equipment **shall** be provided.
 - E. A sufficient combination of engineering and administrative controls preventing unauthorized use of drains **shall** be provided.
3. Radioactive drains systems **shall** be designed to minimize the potential for environmental discharge or cross contamination of non-radiological drain systems. The following features of the radioactive drain systems provide such protection:
- A. Procedural and design controls that prevent nonradioactive drain connections into radioactive drains
 - B. Procedural and design controls that prevent cross-connections of radioactive drains with nonradioactive systems
 - C. Design reviews the design of radioactive drain systems or radioactive drain controls
 - D. Procedural and design controls that restrict the introduction of hazardous wastes into radioactive drain systems.

463 - Control of Airborne Radioactivity

- 1. Processes and activities with the potential for producing airborne radioactivity **shall** include engineering controls to limit releases.
- 2. Radiation Safety **shall** be notified when engineering controls that prevent worker exposure to airborne radioactivity, such as barriers, gloveboxes and glovebags, are compromised.

Prior to continuing operations with compromised engineering controls, an evaluation **shall** be performed, and necessary compensatory administrative or process control protective measures implemented.

The continuous or long-termed use of respiratory protection devices is discouraged. Implementation of short-term engineering modifications that provide a commensurate level of worker protection is the preferred alternative.

- 3. Preventive maintenance and surveillance procedures **shall** be established by the Principle User to ensure equipment controls are maintained in an operable condition for containment of airborne radioactivity.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

PART 7 - Support Activities

471 - Personal Protective Equipment and Clothing

1. Protective clothing designated for radiological control use **shall** be specifically identified by color, symbol, appropriate labeling, or other means of distinctive marking.
2. Protective clothing designated for radiological control use **shall** not be used for non-radiological work.
3. Personal protective equipment and clothing **shall** not be stored with personal street clothing.
4. Cleaned personal protective equipment that contacts the user's face (such as face shields and respirators), and protective clothing **shall** be surveyed before re-use. This survey **shall** be capable of detecting contamination levels equivalent to appropriate free-release or conditional use limits prior to reuse. The use of statistically representative sampling is acceptable.

472 – Laundry

Laundry is processed by an off-site commercial vendor. Boeing -- SSFL currently does not process laundry on-site.

1. Except as provided in Article 472.3, laundered protective clothing **shall** be surveyed using statistically representative sampling and *should* meet the following criteria prior to reuse⁸:
 - A. Beta-gamma radioactivity less than 1,000 dpm/100 cm²
 - B. Alpha radioactivity less than 100 dpm/100 cm².
2. Laundry vendors *should* be encouraged to:
 - A. Apply the latest techniques and instrumentation to detect contamination on personal protective equipment and clothing below SOP C-401, Table 2.2 total contamination values.
 - B. Segregate Boeing -- SSFL clothing and equipment from those of other customers of the vendor.

⁸ Protective clothing is utilized to prevent contamination of personnel who are working in contaminated areas. The proposed activity levels are guidelines. They may be adjusted higher or lower on an *ad hoc* basis. It is expected that guidelines would be adjusted downwards if the number of skin contaminations attributable to the use of protective clothing were to increase. Conversely, the guidelines could be increased if no contamination of personnel was occurring. The activities described have been found from experience to be an acceptable level of contamination.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

- C. Continue efforts to reduce contamination levels on reusable personal protective equipment and clothing.
 - D. Ensure that water-soluble dry cleaning residues are periodically removed from the clothing to prevent skin irritation and to prevent contamination of personnel from dissolvable contaminated residues.
3. Where automatic counting equipment is used by the vendor, Radiation Safety may contractually specify equipment settings to ensure that laundry is unlikely to cause cross-contamination of personnel. These limits may be determined in conjunction with the vendor, and are not required to meet the exact limits of Article 462.1, above. In the event that personnel contaminations trend upward as a result of protective clothing cross-contamination, these limits *should* be evaluated and respecified to prevent re-occurrences.

473 – Decontamination

1. Controlled Work Permits or technical work documents **shall** include provisions to control contamination at the source to minimize the amount of decontamination needed.
2. Work preplanning **shall** include consideration of the handling, temporary storage and decontamination of materials, tools and equipment.
3. Decontamination activities **shall** be controlled to prevent the spread of contamination.
4. Water and steam are the preferred decontamination agents. Other cleaning agents *should* be selected based upon their effectiveness, hazardous properties, amount of waste generated and ease of disposal.
5. Decontamination methods *should* be used to reduce the number of contaminated areas.
6. Efforts *should* be made to reduce the level of contamination and the number and size of contaminated areas that cannot be eliminated.
7. Radiation Safety *should* concur in the selection of decontamination techniques and methods. Facility line management *should* be responsible for directing decontamination efforts.

Boeing - SSFL EHS Manual

On-line procedure system contains the most current version of this document.

474 - Vacuum Cleaners and Portable Air-Handling Equipment

Improper use of vacuum cleaners and portable air-handling equipment may result in the generation of airborne radioactivity, loose surface contamination or high dose rates.

1. Vacuum cleaners and portable air-handling equipment used in Contamination, High Contamination, Radiological Buffer, Airborne Radioactivity, or Radioactive Material Areas **shall** be equipped with High-Efficiency Particulate Air (HEPA) filters.
2. ANSI/UL 586 provides HEPA filter integrity testing criteria. Vacuum cleaner and portable air-handling equipment HEPA filters **shall** be integrity tested prior to initial use, when units have been opened, and annually.
3. Vacuum cleaners used for radiological work **shall** be:
 - A. Uniquely marked and labeled
 - B. Authorized for use with a CWP or Use Authorization
 - C. Controlled to prevent unauthorized use
 - D. Designed to ensure HEPA filter integrity under conditions of use
 - E. Designed to prevent unauthorized or accidental access to the inner surfaces of the vacuum.
4. Radiation and contamination surveys **shall** be performed periodically on vacuum cleaners in use and labels on these units **shall** be updated. The frequency of radiation surveys *should* depend on the specific use of the vacuum cleaner.
5. Airborne radioactivity levels **shall** be monitored when a vacuum cleaner is used in a contaminated area.
6. A nuclear safety review **shall** be performed and documented prior to the use of a vacuum cleaner for fissile material.