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RCT: 2.05 CONTAMINATION CONTROL

RCT Module 2.05
Course # 8770

May 2016

Overview of Lesson

- The detection and control of radioactive contamination are an integral part of an aggressive ALARA program and provide an indication of the effectiveness of engineering controls and proper work practices in preventing the release of radioactive material. Radioactive contamination, if undetected or not properly controlled, can be spread and contaminate areas, equipment, personnel, and the environment.

TERMINAL OBJECTIVE

- Given the course material and/or after participating in a live classroom version of this course, RCTs must demonstrate a basic understanding of RCT: 2.05 CONTAMINATION CONTROL and its applications by completing the quiz at the end of the course.

Enabling Objectives

- 2.05.01 – Define the terms "removable" and "fixed" surface contamination, state the difference between them, and list common methods used to measure each.
- 2.05.02 – State the components of a radiological monitoring program for contamination control and common methods used to accomplish them.
- 2.05.03 – State the basic goal of a contamination control program, and list actions that contribute to its success.
- 2.05.04 – State the basic principles of contamination control, and list examples of implementation methods.

Enabling Objectives

- 2.05.05 – List and describe the possible engineering control methods used for contamination control.
- 2.05.06 – State the purpose of using protective clothing in contamination areas.
- 2.05.07 – List the basic factors that determine protective clothing requirements for personnel protection.
- 2.05.08 – Describe the methods for posting areas controlled for contamination.

2.05.01 – Radioactive Material Contamination

- Contamination is simply defined as radioactive material in an unwanted location.
- Two types of contamination
  - Removable
  - Fixed

2.05.01 – Removable Surface Contamination

- Removable surface contamination is contamination that is easily transferred to other personnel or equipment through normal contact.
- Removable contamination is measured by a transfer test using a suitable sampling material.
- Common materials used for the monitoring are the standard paper disk smear and cloth smear.

2.05.01 – Removable Surface Contamination

- The standard technique for measuring removable contamination involves wiping approximately 100 cm^2 of the surface of interest using moderate pressure.
- Qualitative, large-area wipe surveys may be taken using other materials to indicate the presence of removable contamination.

2.05.01 – Fixed Surface Contamination

- Fixed surface contamination is contamination that is ***not*** easily transferred to other personnel or equipment through normal contact.
- Fixed contamination is measured by the use of a direct survey technique.
- “Frisking" indicates the total contamination on a surface apparent to the detector from both fixed and removable.
- When non-removable levels are to be recorded, the removable level must be subtracted from the total.

2.05.02 – Components of a Radiological Monitoring Program

- Components of a radiological monitoring program are
  - Constant monitoring
  - Area and equipment surveys
  - External personnel surveys
  - Personnel internal monitoring and bioassay

2.05.02 – Constant Monitoring

- Various types of constant monitoring instruments can be used throughout facilities to warn personnel of radiation and contamination hazards or to provide retrospective data.
- Types of constant monitoring used at LANL include
  - Continuous air monitors (CAMs)
  - Fixed-head air samplers
  - Other types of process monitoring systems

2.05.02 – Constant Monitoring

- Continuous air monitor (CAM) – continuously samples the air for radioactive contamination in specific locations.
  - The air being sampled is drawn either through a moving particulate filter, which is then monitored by a detector system, or through an internal detector to directly identify radioactive material present.
  - A CAM can give both a visual and audible alarm to warn personnel of the presence of airborne contamination.

2.05.02 – Constant Monitoring

- Process monitoring systems – monitor certain operations in facilities to alert operators of abnormal conditions that might lead to the release of excessive amounts of radioactivity to the facility or environment.
- Types of process monitoring used at LANL include
  - Stack monitors
  - Ventilation operability monitoring
  - Radioactive liquid waste monitoring systems

2.05.02 – Area and Equipment Surveys

- Area and equipment surveys are conducted routinely throughout the facilities to locate sources of radiation and contamination and to detect potential changes in radiological conditions.
- Pre-job surveys are performed before work begins in radiological areas to evaluate the hazards and determine work limitations and physical safeguards.

2.05.02 – Area and Equipment Surveys
Direct Instrument Surveys

- Various types of portable survey instrumentation are used to measure the presence of radioactive contamination on a floor or surface.
- This is the only method available to detect fixed surface contamination.
- This method will detect removable, as well as fixed surface contamination activity.
- A direct survey must be combined with a "smear" survey to determine if the surface contamination present is removable or fixed.

2.05.02 – Area and Equipment Surveys
Smear Surveys

- A disk smear is wiped over an area of 100 cm^2 and counted with proper instrumentation to determine the activity of the nuclides present.
- Contamination levels are specified in units of dpm/100 cm^2 after applying applicable instrument correction factors.
- For objects with surface areas less than 100 cm^2, the units are reported as dpm/object area.

2.05.02 – Area and Equipment Surveys
Smear Surveys

- Disk smears are required if contamination levels are to be quantified.
- Disk smears are small, so they are usually used in an area of suspected contamination. Properly applied experience will dictate to the surveyor where contamination is most likely to occur and thus those areas that should be surveyed with disk smears.

2.05.02 – Area and Equipment Surveys
Large-Area Swipe (LAS) Surveys

- Routine contamination surveys taken in areas not suspected to be contaminated are performed with a chemically treated cloth called a Masslinn.
- The cloth is lightly pushed over an area and scanned directly with an appropriate detector to detect the presence of contamination.
- If contamination is detected, a more thorough disk smear survey should be performed.
- Large-area wipes are used only as an indication of removable surface contamination.

2.05.02 – External Personnel Surveys

- Personnel surveys are performed either by the individual (self-monitoring) using handheld or automated instruments or by an RCT.
- Self-monitoring is typically performed upon exiting an area controlled for contamination at established boundary points.
- Personnel monitoring by an RCT is usually conducted whenever contamination of the body or clothing is suspected or as required by exit monitoring when self-monitoring is not feasible or not allowed.

2.05.02 – External Personnel Surveys
Portable Instruments

- Portable instruments (friskers or handhelds) with sensitive handheld detectors are used by personnel to identify contamination on themselves whenever contamination is suspected.
- Friskers are used when exiting contaminated areas and, depending on the facility, can be used when exiting buffer areas and controlled areas.
- Geiger-Mueller (GM) detectors are most often used for beta-gamma monitoring and scintillation detectors for alpha monitoring (air proportional detectors used most often at LANL for alpha frisking).

2.05.02 – External Personnel Surveys
Personnel Contamination Monitors (PCMs)

- The PCM provides personnel with an external whole-body monitoring system.
- The contamination detectors within the monitors are capable of performing a survey of the whole body in a period of a few seconds, dependent on background radiation levels present in the area and the personnel contamination limit of concern.
- These automated systems typically provide a more reliable method of locating personnel contamination over handheld instruments.

2.05.02 – External Personnel Surveys
Portal Monitors

- The portal monitor is a "door-frame"-type device that provides a final monitoring point to ensure that contamination is not spread outside the facility to other facilities or the general public.
- These types of monitors are typically used only for beta-gamma monitoring.

2.05.02 – External Personnel Surveys
Hand and Foot Monitors (HFMs)

- Hand and foot monitors (HFMs) with detachable hand-held detectors provide another alternative to using handheld instruments (friskers).
- These devices can monitor the hands and feet during a period of a few seconds—again, dependent on background radiation levels present in the area and the personnel contamination limit of concern.
- After the hands and feet have been monitored, the detachable handheld detectors can be used to monitor the remainder of the body. At many LANL facilities, handheld instruments are used in addition to the HFM.

2.05.02 – External Personnel Surveys
Personnel Surveys

- Personnel surveys are performed whenever contamination of the body or clothing is suspected or as required for exit monitoring—e.g., when friskers or automated monitoring instruments are not available.
- The whole body should be surveyed, with special attention to areas that are more likely to become contaminated, including hands, feet, buttocks, knees, elbows, and head.

2.05.02 – Personnel Internal Monitoring and Bioassay

- In-Vivo Bioassay: The individual is placed inside an array of very sensitive detectors to measure the activity and energies of gamma-ray emissions from inside the body. This information can be used to determine the amount and type of nuclides present.
- In-Vitro Bioassay: Urine or feces samples are collected from an individual to determine the type and activity of the nuclides present in bodily waste. This information is used to approximate the amount of nuclides present in the body by their calculated rate of elimination. This method can be used to assess the presence of non-gamma-emitting nuclides.

2.05.03 – Basic Goal of a Contamination Control Program

- The basic goal underlying any effective contamination control program is to minimize contaminated areas and maintain contamination levels as low as reasonably achievable (ALARA).

2.05.03 – Basic Goal of a Contamination Control Program

- In some situations, this is not always possible because of
  - Economic conditions: Cost of time and labor to decontaminate a location(s) outweighs the hazards of the contamination present.
  - Radiological conditions: Radiation dose rates or other radiological conditions present hazards that far exceed the benefits of decontamination.
  - Operating conditions: Some areas, e.g., hot cells, will be contaminated because of normal operations.

2.05.03 – Basic Goal of a Contamination Control Program

- Other means of contamination control must be initiated when decontamination is not possible:
  - Engineering control (ventilation and containment)
  - Administrative procedures [radiological work permits (RWPs)]
  - Personnel protective equipment
- In fixed contamination areas, the contamination may be covered by paint, floor tiles, etc., when decontamination is not possible.

2.05.03 – Basic Goal of a Contamination Control Program

- "Good housekeeping" is a prime factor in an effective contamination control program. Every possible effort should be made by all individuals in all operations to confine the spread of radioactive material to the smallest possible area.
- A sound preventive and corrective maintenance program can prevent many radioactive material releases.

2.05.03 – Basic Goal of a Contamination Control Program

- All material taken into or out of contaminated areas must be controlled. RCTs should always be alert for potential violations to the basic principles of contamination control, including
  - The use of improper contamination control methods
  - Bad work practices
  - Basic rule or procedure violations
  - Radioactive material releases or liquid spills

2.05.04 – Principles of Contamination Control

- Basic principles of contamination control:
  - Administrative Controls
  - Decontamination
  - Preventive Methods
  - Engineering Controls
  - Personnel Protective Measures

2.05.04 – Administrative Controls
Access Control

- Once contamination has been located and radiological areas have been determined, access control to these areas must be adequately established.
- The primary access control point in a facility is the entry and exit portal between the clean area and the radiologically controlled area (RCA) or radiological buffer area (RBA).
- The success of a control program is based on controlling the movement of personnel and equipment between these areas to prevent a release of contamination to a clean location.

2.05.04 – Administrative Controls
Access Control

- Secondary access control points are set up within the RBAs to control access between surface-contaminated areas and noncontaminated areas.
- Yellow and magenta rope, chain, tape, or similar barriers are used to identify the boundaries and provide a recognizable visual barrier to personnel.
- During certain activities, the access control point may be continuously manned by an RCT.
- Step-off pads (SOPs) provide a line of distinction to identify the entry and exit points to contaminated areas and should be used when possible.

2.05.04 – Administrative Controls

- Other administrative controls include
  - Contamination Monitoring - routine workplace surveys that are performed to detect trends in the potential buildup of workplace contamination
  - Airborne Radioactivity Monitoring
  - Radiological Posting
  - Technical Work Documents
    - RWPs
    - Review of integrated work documents (IWDs) to ensure that radiological requirements are incorporated

2.05.04 – Decontamination

- Line management is responsible for ensuring prompt decontamination, where practical, of facilities, tools, material, and equipment so that contamination can be minimized in the workplace.
- Reasonable efforts should be directed toward the decontamination and unconditional release of these items rather than their disposal as radioactive waste.
- Items should be considered for disposal only when they are extremely contaminated and when the risks associated with the decontamination of those items outweigh the benefit to be gained from their reuse.

2.05.04 – Preventive Methods

- Identify and repair leaks before they become a serious problem.
- Establish adequate work controls before starting jobs.
- While conducting pre-job briefs, discuss measures that will help reduce or prevent contamination spread.
- Change out gloves or protective gear as necessary to prevent cross-contamination of equipment.
- Pre-stage areas to prevent contamination spread from work activities.

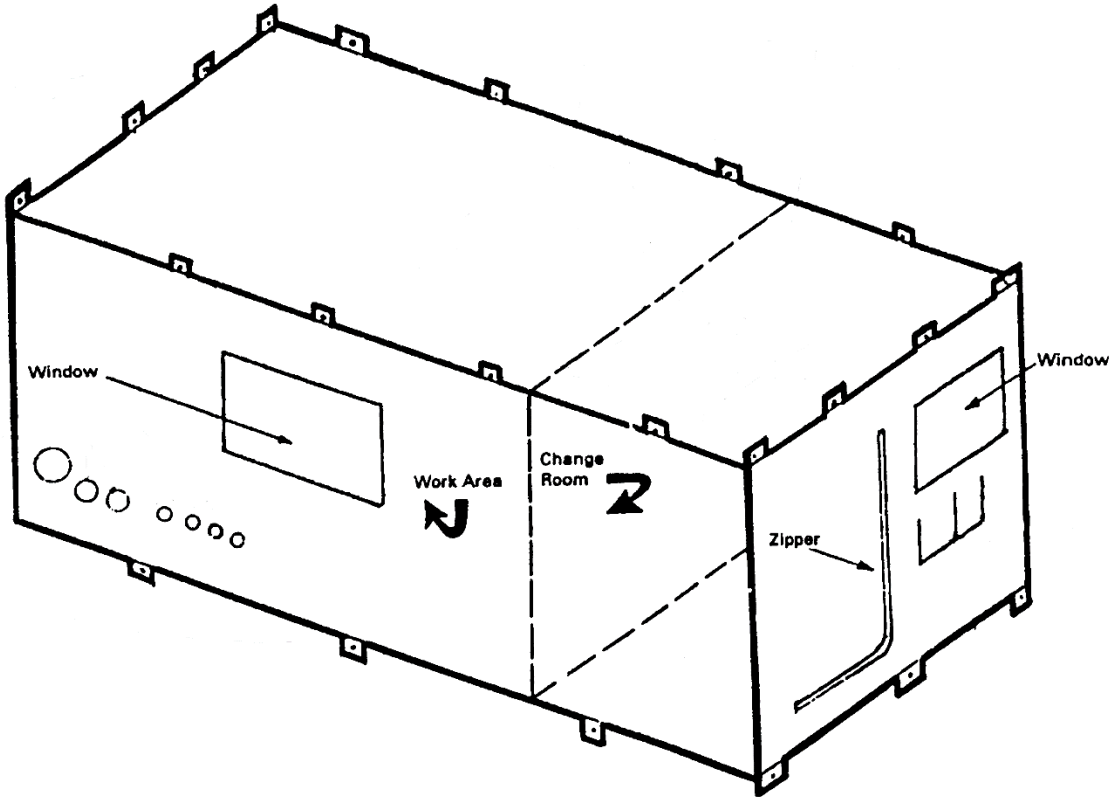
2.05.04 – Preventive Methods

- Cover piping/equipment below a work area to prevent contamination from dripping onto less-contaminated areas.
- Cover/tape tools or equipment used during the job to minimize decontamination after the job.
- Follow good work practices, such as good housekeeping and cleaning up after jobs.
- Confine the spread of radioactive material releases by using a sound preventive maintenance program.
- Control and minimize all material taken into or out of contaminated areas.

2.05.05 – Engineering Control Methods Used for Contamination Control

- Ventilation – air flow is from clean areas to RCAs, to areas of moderate contamination, to areas of high contamination, and finally to an exhaust system capable of removing any contamination from the air.
- Containment – A plastic tent (greenhouse or hut) built around the work area to confine all contamination to as small an area as possible. A HEPA system may be used to control air flow in the work area and remove airborne contamination.

2.05.05 Containment



2.05.05 – Engineering Control Methods Used for Contamination Control

- Bagging – The most widely used method of containment is bagging or wrapping. Contaminated tools or equipment are placed in plastic bags or are securely wrapped in plastic before being moved outside a contaminated area. When possible, wrapping tools or equipment before entering can help control contamination during use inside the contaminated area.

2.05.05 – Engineering Control Methods Used for Contamination Control

- Design and Control – The design of facilities should maximize the efficiency of maintenance, operations, and decontamination. Components should be selected that minimize the buildup of radioactivity. Support facilities are to be included that provide for the donning and doffing of protective clothing and for personnel monitoring. Personnel traffic should be routed away from contaminated areas.

2.05.06 – Purpose of Protective Clothing in Contamination Areas

- If engineering control methods are not adequate, then personnel protective measures, such as protective clothing and respiratory equipment, will be used.
- The purpose of protective clothing is to keep contamination off the skin and clothing of the workers.
- Protective clothing allows personnel to work inside an area with removable contamination and to exit the area without spreading the contamination.

2.05.06 – Purpose of Protective Clothing in Contamination Areas

- All personnel entering contaminated areas with removable contamination will be required to wear certain items of protective clothing.
- Some type of respiratory protective equipment will be required for work in areas where very high contamination levels exist or airborne contamination is present.

2.05.07 – Factors to Determine Personnel Protective Clothing Requirements

- Basic factors that determine the type and extent of protective clothing required are the
  - type and form of contamination
  - levels of contamination
  - type of work being performed
- Additional factors to consider include the potential for increased levels of contamination, the area of the body at risk, and competing hazards (i.e., heat stress, asbestos, etc.)

2.05.07 – Whole-Body Protection

- Lab Coats
- Coveralls
- Plastic Coveralls
- Disposable Coveralls

- At a minimum, outer personal clothing should not be worn under protective clothing for entry into high contamination areas (HCAs) or during work conditions requiring a double set of protective clothing.

2.05.07 – Hand Protection

- Surgical gloves – used only in light contamination areas.
- Rubber gloves – used in moderate to heavy contamination locations.
- Neoprene gloves – synthetic rubber gloves mounted to various containment devices to allow access by the wearer into the device.
- Cotton glove liners – may be worn inside standard gloves for comfort, but should not be worn alone or considered as a layer of protection.
- Leather or canvas work gloves – worn in lieu of or in addition to standard gloves for work activities requiring additional strength or abrasion resistance.

2.05.07 – Hand Protection

2.05.07 – Foot Protection

- Booties are used to protect the lower-leg area below the coveralls from contamination.
- Shoe covers are worn over booties to provide a second layer of protection and provide traction to wearer.
- Booties and shoe covers are normally constructed of plastic or rubber and may be taped to the pant legs of the coveralls or plastic suit, depending on the level of contamination and type of job.

2.05.07 – Respiratory Protection

- Full-face masks – used to filter particulate radionuclides.
- Supplied air systems – used to prevent inhalation of particulate and gaseous nuclides by the wearer in a non-life-threatening atmosphere.
- Self-Contained Breathing Apparatus (SCBA) – used to provide a portable source of breathing air to the user when entering an atmosphere that may be immediately dangerous to life and health.

2.05.08 Methods for Posting Areas Controlled for Contamination

- P121, *Radiation Protection*, Chapter 7, Area Designation and Posting
- Article 722, Posting Radiological Controlled Areas (RCAs)
  - RCAs are established and posted to warn individuals that they are entering areas managed to protect them from exposure to radiation and/or radioactive material.
  - Each access point to an RCA must be posted with the words NOTICE, CONTROLLED AREA, ACCESS CONTROLLED FOR RADIOLOGICAL PURPOSES.

2.05.08 – P121, *Radiation Protection*, Chapter 7, Area Designation and Posting

- RCA posting must not conflict with LANL security requirements.
- The criteria in Table 7-2 must be used for designating RCAs.

2.05.08 – P121, *Radiation Protection*, Chapter 7, Area Designation and Posting

Table 7-2. Criteria for Designating Radiological Controlled Areas (RCAs)	
Designation	**Criteria**
Radiological Controlled Area (RCA) for external radiation	Access to the area is managed to protect individuals from exposure to external radiation. ***Note:*** For areas where the potential exists for both removable contamination and external exposure, posting must include both designations.
RCA for contamination	Access to the area is managed to protect individuals from exposure to contamination, but removable contamination above values in Table 14-2 is unlikely. ***Note:*** The RCA for contamination designation suffices for volume contamination; volume contamination does not have to be designated additionally.
RCA for depleted uranium (DU) shrapnel	DU exists as a result of explosive and/or ammunition testing. Refer to Article 1432 for DU shrapnel control requirements.
RCA for volume contamination	Volume-contaminated materials that are not individually labeled may be present.
RCA for legacy contamination	No accessible contamination known to exist, but is known or suspected to exist within facility/programmatic systems or other inaccessible areas within the facility or area.
RCA for radioactive materials	Radioactive materials are present, but they do not present significant contamination or external radiation hazards.

2.05.08 – P121, *Radiation Protection*, Chapter 7, Area Designation and Posting

Table 14-2. Surface Contamination Values[1]		
Radionuclide	**Removable[2,4] (dpm/100 cm²)**	**Total (Fixed + Removable)[2,3] (dpm/100 cm²)**
U-natural, U-235, U-238, and associated decay products[9]	1,000[7]	5,000[7]
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	100[10]
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.[5,8]	1,000 beta-gamma	5,000 beta-gamma
Tritium and special tritium compounds (STCs)[6]	10,000	See Footnote 6

Table 14-2, Notes

[1] Except as noted in 6 below, the values in this table apply to radioactive contamination deposited on, but not incorporated into the interior or matrix of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides is present, the limits established for the alpha- and beta-gamma-emitting nuclides apply independently.

[2] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute (cpm) observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[3] The levels may be averaged over 1 square meter provided the maximum activity in any area of 100 cm^2 is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) from measurements of a representative number of sections it is determined that the average contamination level exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm^2 area exceeds three times the applicable value.

[4] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by swiping the area with dry filter or soft absorbent paper while applying moderate pressure and then assessing the amount of radioactive material on the swipe with an instrument of known efficiency.

Note: The use of dry material may not be appropriate for tritium.

For objects with a surface area of less than 100 cm^2, the entire surface must be swiped, and the activity per unit area must be based on the actual surface area. Using swiping techniques to measure removable contamination levels is not required if direct scan surveys indicate that the total residual contamination levels are below the values for removable contamination.

[5] This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 that has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

[6] Tritium contamination may diffuse into the volume or matrix of materials; thus, any evaluation of surface contamination must take into account the extent to which such contamination may migrate to the surface to ensure the surface radioactivity value provided in this table is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore, a "Total" value does not apply. In certain cases, a "Total" value of 10,000 dpm/100 cm^2 may be applicable either to metals of the types from which insoluble STCs are formed, that have been exposed to tritium, or to bulk materials to which insoluble STC particles are fixed to a surface.

[7] For strict compliance with 10 CFR 835, these limits apply only to the alpha emitters within the respective decay series; LANL applies these limits to associated beta emitters as well, based on good practices and ALARA considerations.

[8] The average and maximum dose rates associated with surface contamination resulting from beta/gamma emitters should not exceed 0.2 mrad/hr and 1.0 mrad/hr, respectively, at 1 cm, as applicable to specific hold and release points.

[9] Because of the physical properties of depleted uranium (DU) shrapnel, the contamination values of this table do not apply, and traditional methods/values for specifying levels of contamination are generally inappropriate to the situations in which such shrapnel is created. For DU shrapnel, area designations and contamination control described in Articles 722 and 1432.1, respectively, apply.

[10] Total transuranic contamination value of 100 is adopted from DOE O 5400.5, and subsequent direction from DOE; the 10 CFR 835 value of 500 may be used at the discretion of RP Division RP SMEs for applications of area designation, posting, and control of fixed contamination, including release of items from radiological areas.

2.05.08 – P121, *Radiation Protection*, Chapter 7, Area Designation and Posting

- Posting Radiological Buffer Areas (RBAs)
  - RBAs provide secondary boundaries within the RCA to minimize the spread of contamination and to limit doses to general employees who have not been trained as radiological workers. RBAs are considered part of the RCA. However, RBAs are considered to be an area of relatively higher radiological risk, where individuals are likely to receive greater than 0.1 rem external dose in a year and/or where a higher potential is present for contamination above Table 14-2 levels.

2.05.08 – P121, *Radiation Protection*, Chapter 7, Area Designation and Posting

- An RBA should be established for contamination control as a secondary boundary around CAs, HCAs, and ARAs. The size of the RBA should be commensurate with the potential for the spread of contamination.
- The posting of RBAs must contain the wording CAUTION, RADIOLOGICAL BUFFER AREA and any other information required for hazard communication.

2.05.08 – P121, *Radiation Protection*, Chapter 7, Area Designation and Posting

- Article 725, Posting Areas for Contamination
  - Areas must be posted to alert individuals to the presence (or likely presence) of surface contamination and airborne radioactivity in accordance with Table 7-4.
  - Derived air concentration (DAC) values found in 10 CFR 835, Appendices A and C, must be used in posting ARAs in accordance with Table 7-4.
  - An area must be considered a CA or HCA if at least 10% of the smears taken in the area exceed the applicable limit.

2.05.08 – P121, *Radiation Protection*, Chapter 7, Area Designation and Posting

Table 7-4. Criteria for Posting Contamination Hazards		
Area	**Criteria**	**Required Posting**
Contamination Area (CA)	Removable contamination levels (disintegrations per minute [dpm]/100 cm^2) that are greater than (or likely to exceed) Table 14-2 values but do not exceed 100x Table 14-2 values	CAUTION, CONTAMINATION AREA [see 835.603(e)]
High Contamination Area (HCA)	Removable contamination levels (dpm/100 cm^2) that are greater than (or likely to exceed) 100x Table 14-2 values	CAUTION or DANGER, HIGH CONTAMINATION AREA [see 835.603(f)]
Airborne Radioactivity Area (ARA)	Airborne concentrations (µCi/ml) above background that are greater than (or likely to exceed) the derived air concentration (DAC) values or that would result in an individual (without respirator) being exposed to greater than 12 DAC-hr in a week	CAUTION or DANGER, AIRBORNE RADIOACTIVITY AREA [see 835.603(d)]

2.05.08 Methods for Posting Areas Controlled for Contamination

- RP-1-DP-09, *Radiological Posting*
- Posting Process Diagram

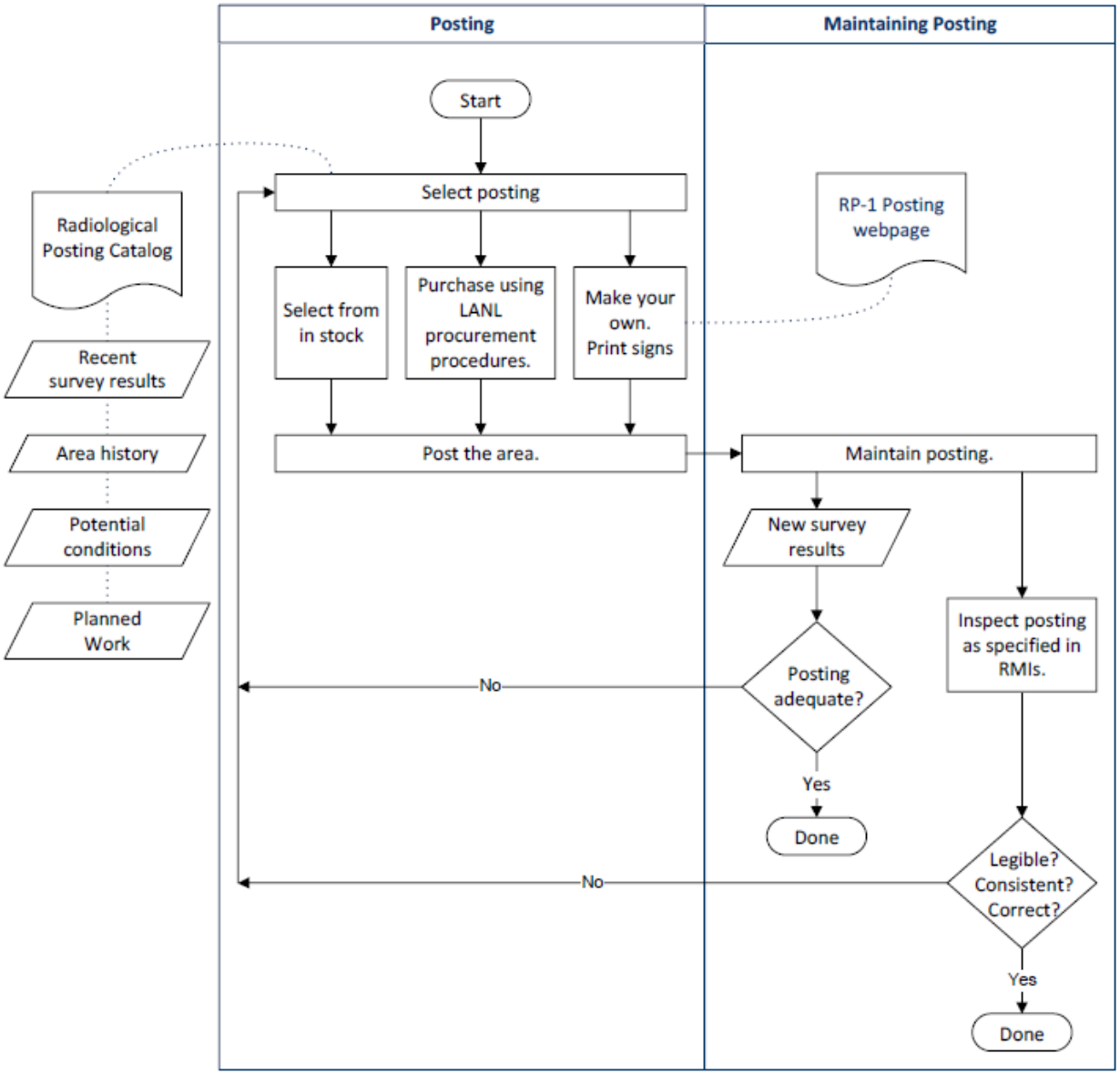


Figure 1 Radiological Posting Process

RP-1-DP-09, *Radiological Posting*

- When determining the need to post, or what the proper posting is for an area, review the:
  - most recent surveys,
  - area history,
  - potential conditions, and
  - planned work for the area to be posted.
- Post areas only to signify actual or potential radiological conditions. Areas should be posted if the potential for the situation to exist is high, even if it is not currently present.

RP-1-DP-09, *Radiological Posting*

- Use the RP-PROG Radiological Posting Catalog when selecting the posting for an area. Use the criteria in the “Posting Criteria” section of the posting catalog to determine the appropriate posting.
- Posting Contamination Areas:
- It is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination. The direct survey must be able to detect contamination below the levels specified in P121, Table 14-2.

RP-1-DP-09, *Radiological Posting*

- The total contamination levels determined by direct survey may be averaged over 1 m^2, provided the maximum activity in any area of 100 cm^2 is less than three times the values specified in P121, Table 14-2. For the purposes of averaging, any square meter of surface is considered to be above the surface contamination value if
  - from measurements of a representative number of sections, it is determined that the average contamination level exceeds the applicable value; or

RP-1-DP-09, *Radiological Posting*

- from measurements of a representative number of sections, it is determined that the average contamination level exceeds the applicable value; or
- it is determined that the sum of the activity of all isolated spots or particles in any 100-cm^2 area exceeds three times the applicable value.
- The exit requirements are worded “Remove outer layer of PPE and whole-body frisk.” Exiting an area requires both removal of the outer layer of PPE and a whole-body frisk.

An area is considered to be a CA or HCA if at least 10% of the smears taken in the area exceed the applicable limit.