

Chapter 9: [Radiological Safety](#)

Radiological Work and Area Entry Requirements

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URL: <https://www-group.slac.stanford.edu/esh/eshmanual/references/radReqWorkEntry.pdf>

1 Purpose

The purpose of these requirements is to maintain personnel radiation doses below regulatory limits and as low as reasonably achievable (ALARA) and to prevent unplanned or accidental exposure to ionizing radiation. They cover authorizing radiological work and posting of and access to areas. They apply to workers, supervisors, points of contact, and project managers, Radiation Protection and any other group involved in these activities.

2 Requirements

2.1 Radiological Work

Radiological work is any work involving the use of tools on beam lines, beam line components, beam line safety items, radiation hot spots; or *radioactive low conductivity water (LCW)* systems. All radiological work at SLAC must be authorized by line management and approved by cognizant Radiation Protection (RP) Department personnel. Radiological work must be conducted by trained personnel who are following written procedures and/or a radiological work permit (RWP). (See the [Radiological Work Permits Procedure](#) and the [Radiological Work Permit](#) site for further information.)

2.2 Area Entry

2.2.1 Area and Worker Classification

Workers at SLAC are classified according to the level of their training, which determines the areas they can enter without an escort (see [Chapter 55, "Site Access Control"](#)).

- General Employee Radiological Training (GERT)-qualified personnel can enter controlled areas (no dosimeter is required) and RCAs (a dosimeter is required). (See [Controlled Areas and Radiologically Controlled Areas \(RCAs\)](#) for a map of these areas.) The dose for GERT-qualified personnel is limited to 100 mrem total effective dose (TED) in a year. If a worker is likely to receive a dose higher than 100 mrem TED in a year, he or she must first complete RWT I training or higher.
- Radiological Worker Training (RWT) I or higher training and a dosimeter are required to enter any radiological area or a radiological buffer area.

2.2.2 Posting

All areas containing radiation hazards or having the potential to contain radiation hazards will be posted with the appropriate signs. [10 CFR 835](#) defines the radiological posting requirements. Any posting must

- Be clear, legible, conspicuously posted, and may include radiological protection instructions
- Contain the standard radiation symbol colored magenta or black on a yellow background, with black or magenta lettering
- Be used to alert personnel to the presence of radiation and radioactive materials, and to aid them in minimizing exposures and preventing the spread of contamination
- Be kept up to date by RP

Postings and signs inform personnel of potential or actual radiation hazards and to indicate requirements to enter, such as level of training, dosimeter types, and controls such as a radiological work permit (RWP) or specialized equipment.

Note Postings and signs indicate radiological area types, which are associated with particular occupational radiation dose limits, expressed in units of mrem. The indicated level of training is required so that visitors and workers are prepared to recognize hazards, use specialized equipment, and abide by specified controls.

The postings and signs are organized by the required level of training that a person (or qualified escort) must complete before entering. Every radiological area type and the associated signage, dosimetry, training, and controls are listed below.

Note Certain types of areas are included for completeness but may not be encountered at SLAC.

Table 1 Training Courses

Minimum Required Training	Abbreviation	Notes
General Employee Radiological Training (ESH Course 115)	GERT	A GERT-qualified worker or escort must be present, and special permission may be required.
Radiological Worker I Training (ESH Course 116)	RWT I	
Radiological Worker II Training (ESH Course 250)	RWT II	

2.3 Areas Requiring GERT Training

The training listed below is the minimum required for unescorted access. If training is not complete, the person seeking access must be accompanied by a GERT-qualified escort at all times.

GERT-qualified personnel are permitted to enter these areas only if it will not result in an annual radiation dose greater than 100 mrem.

2.3.1 Controlled Area

Representative
Signage



Description	Area where access is managed by or for the DOE to protect individuals from exposure to radiation and/or radioactive material. A controlled area at SLAC is one where an individual is not expected to receive more than 100 mrem per year.
Dosimetry	None
Minimum Training	GERT

2.3.2 Radiologically Controlled Area (RCA)

Representative
Signage



Description	A controlled area that requires dosimetry for entry due to the radiation levels in localized areas. The radiation level in certain localized areas within an RCA may vary, requiring limited occupancy. Individuals who enter only RCAs without entering radiological areas are not expected to receive a TED of more than 100 mrem in a year.
Dosimetry	Personnel dosimeter
Minimum Training	GERT

2.3.3 Controlled Area and Radioactive Material Area (Controlled Area + RMA)

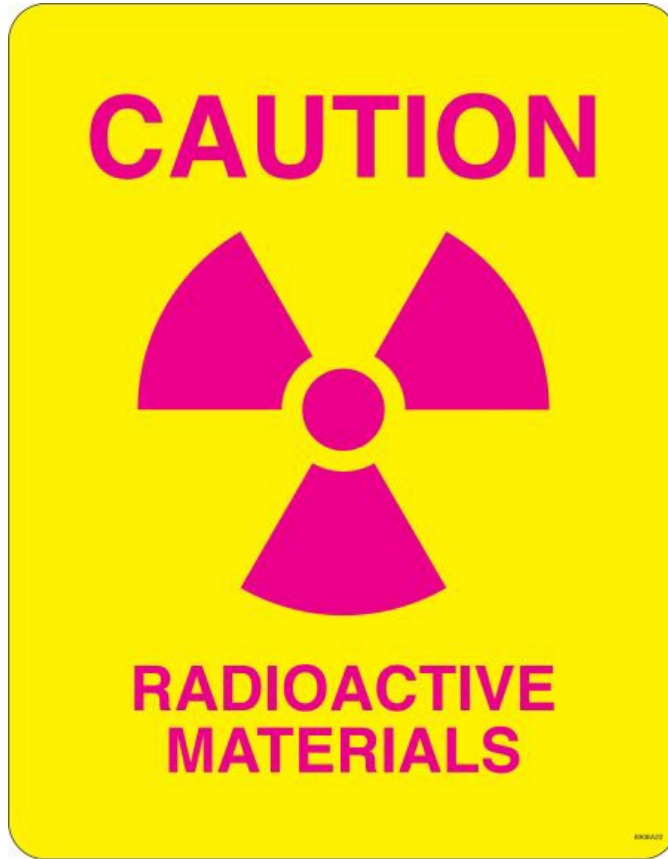
Representative
Signage



Description	A controlled area where items or containers of radioactive material exist and the total activity of radioactive material exceeds the applicable values provided in Appendix E of 10 CFR 835.
Dosimetry	None
Minimum Training	GERT

2.3.4 Radioactive Material Area (RMA)

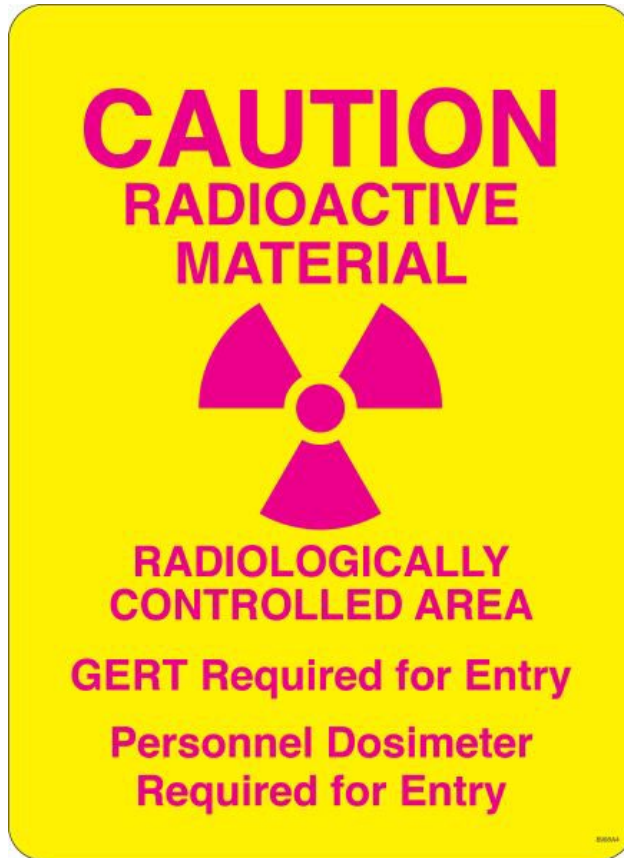
Representative
Signage



Description	Any area within a controlled area accessible to individuals in which items or containers of radioactive material exist and the total activity of radioactive material exceeds the applicable values provided in Appendix E of 10 CFR 835.
Dosimetry	Personnel dosimeter required if the area is also posted as an RCA
Minimum Training	GERT

2.3.5 Radiologically Controlled Area and Radioactive Material Area (RCA+RMA)

Representative
Signage

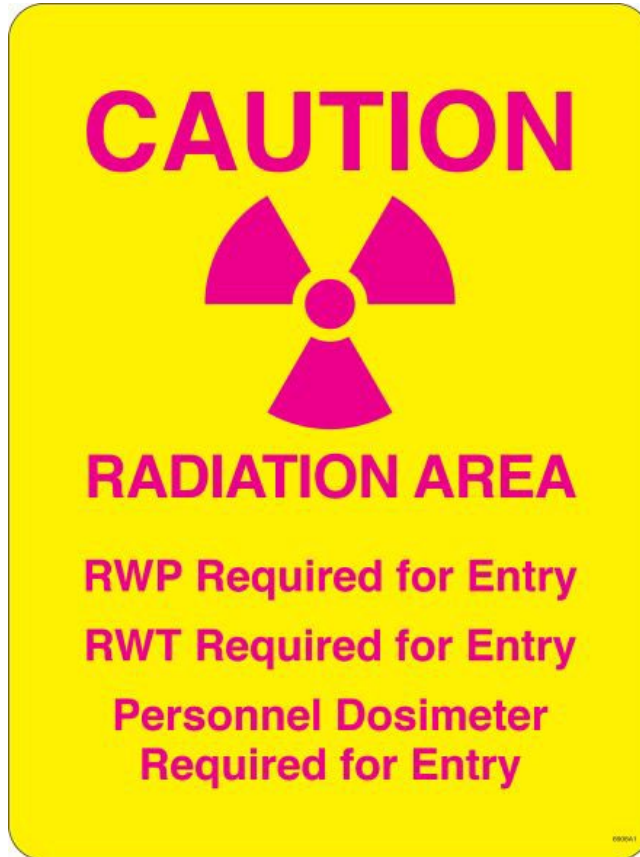


Description	A radiologically controlled area where items or containers of radioactive material exist and the total activity of radioactive material exceeds the applicable values provided in Appendix E of 10 CFR 835
Dosimetry	Personnel dosimeter
Minimum Training	GERT

2.4 Areas Requiring an RWT I Qualification (no untrained individuals allowed in these areas)

2.4.1 Radiation Area (RA)

Representative
Signage



Description	Area where radiation dose rates are greater than 5 mrem per hour @ 30 cm and less than or equal to 100 mrem per hour @ 30 cm
Dosimetry	Personnel dosimeter
Permit, Control, or Approval	Sign routine area radiological work permit (RWP) upon entry and exit Job type or routine task RWP for any radiological work to be performed
Minimum Training	RWT I

2.4.2 Radiation Area (RA) Intermittent Condition

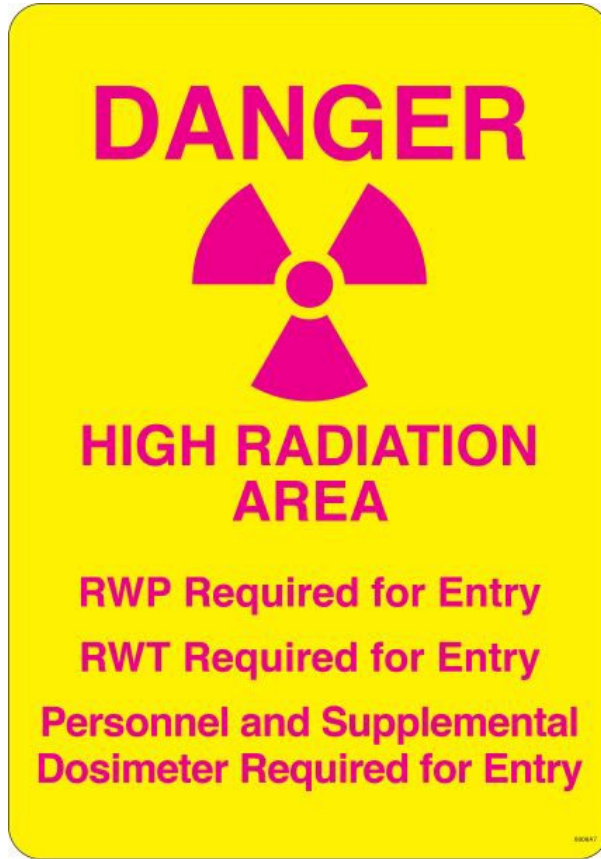
Representative
Signage



Description	A radiation area only when the klystron is energized (prompt radiation)
Dosimetry	Personnel dosimeter
Permit, Control, or Approval	Sign routine area radiological work permit (RWP) upon entry and exit Job type or routine task RWP for any radiological work to be performed
Minimum Training	RWT I

2.4.3 High Radiation Area (HRA)

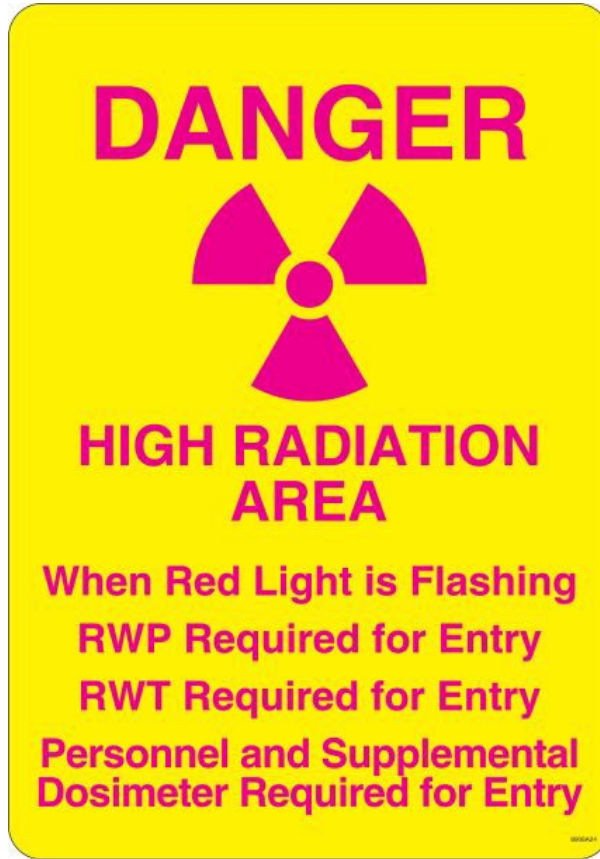
Representative
 Signage



Description	Area where radiation dose rates are greater than 100 mrem per hour at 30 cm and less than 500 rad/hr at 100 cm
Dosimetry	Personnel and supplemental dosimeter
Permit, Control, or Approval	Sign routine area radiological work permit (RWP) upon entry and exit. Job type RWP for any work to be performed
Minimum Training	RWT I

2.4.4 High Radiation Area (HRA) Intermittent Condition

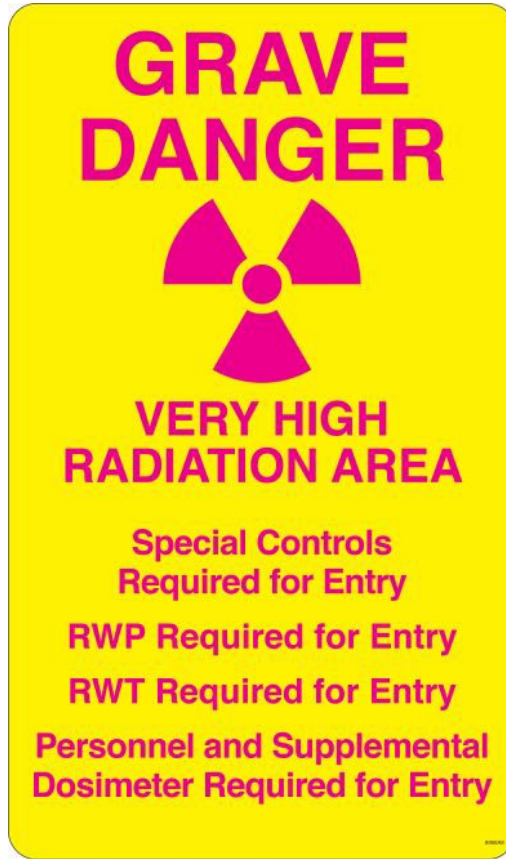
Representative
 Signage



Description	Area where radiation dose rates are greater than 100 mrem per hour at 30 cm and less than 500 rad/hr at 100 cm
Dosimetry	Personnel and supplemental dosimeter
Permit, Control, or Approval	Sign routine area radiological work permit (RWP) upon entry and exit. Job type RWP for any work to be performed
Minimum Training	RWT I

2.4.5 Very High Radiation Area

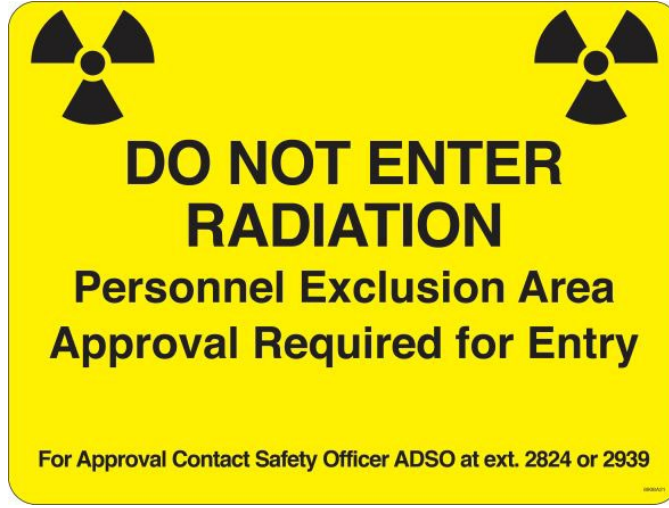
Representative
 Signage



Description	Area where radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads in one hour at 100 cm from a radiation source
Dosimetry	Personnel and supplemental dosimeter
Permit, Control, or Approval	Sign routine area radiological work permit (RWP) upon entry and exit. Job type RWP for any work to be performed Special controls
Minimum Training	RWT I

2.4.6 Personnel Exclusion Area

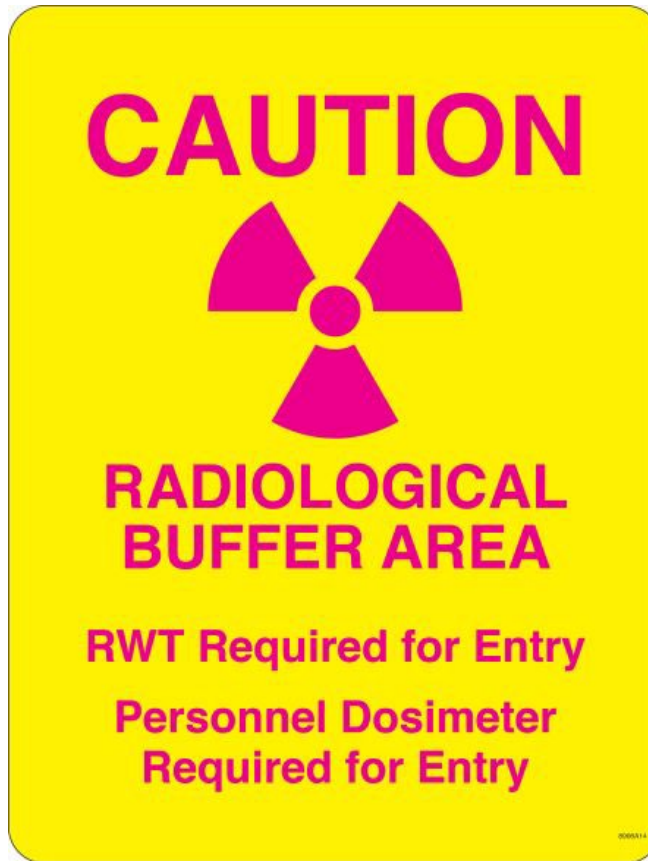
Representative
Signage



Description	Area secured during beam operations due to the potential for abnormal ionizing radiation dose rates, that are not controlled by engineered personnel protection systems (PPS)
Dosimetry	Personnel and supplemental dosimeter as directed by RP
Permit, Control, or Approval	For approval contact Accelerator Directorate Safety Officer (ADSO)
Minimum Training	RWT I

2.4.7 Radiological Buffer Area

Representative
Signage

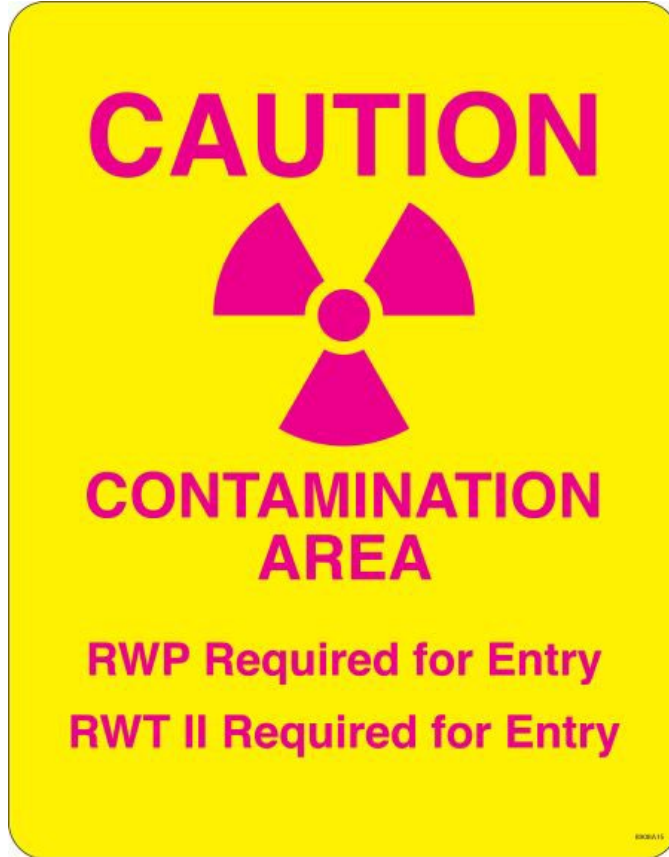


Description	Intermediate area established outside a contamination area to prevent the spread of radioactive contamination
Dosimetry	Personnel dosimeter
Permit, Control, or Approval	None
Minimum Training	RWT I

2.5 Areas Requiring an RWT II Qualification (no untrained individuals allowed in these areas)

2.5.1 Contamination Area

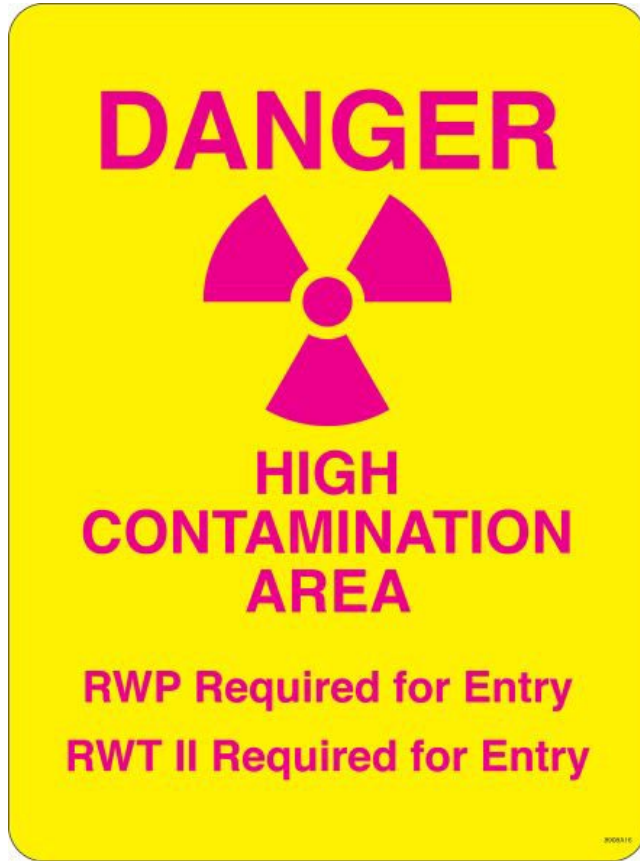
Representative
 Signage



Description	Area accessible to individuals where the removable contamination levels exceed or are likely to exceed the removable surface contamination values specified in Appendix D of 10 CFR 835, but do not exceed 100 times those values
Dosimetry	Personnel dosimeter
Permit, Control, or Approval	RWP upon entry and exit and to conduct work
Minimum Training	RWT II

2.5.2 High Contamination Area

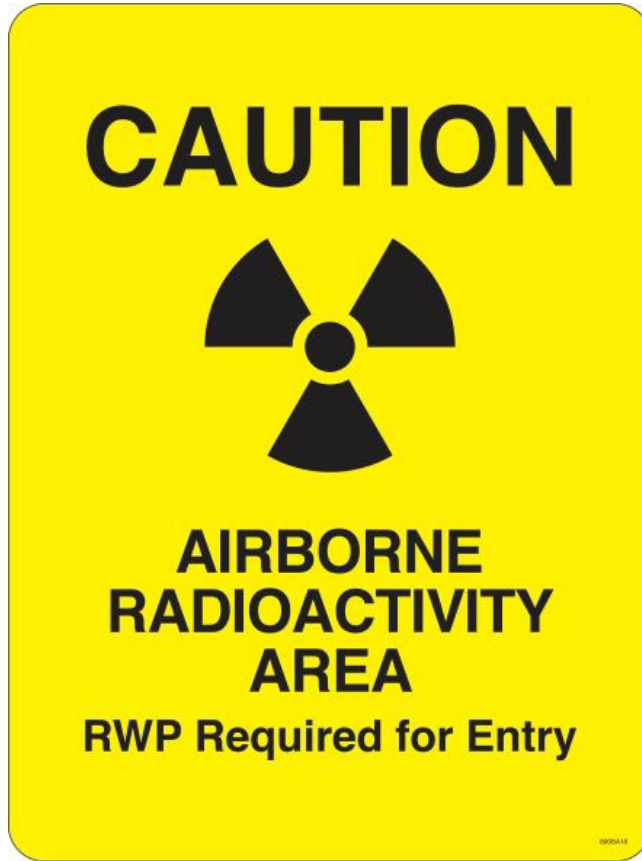
Representative
Signage



Description	Area accessible to individuals where the removable surface contamination levels exceed or are likely to exceed 100 times the removable surface contamination values specified in Appendix D of 10 CFR 835
Dosimetry	Personnel dosimeter
Permit, Control, or Approval	RWP upon entry and exit and to conduct work
Minimum Training	RWT II

2.5.3 Airborne Radioactivity Area

Representative
 Signage



Description	Any area accessible to individuals where 1) the concentration of airborne radioactivity above natural background, exceeds or is likely to exceed the DAC values listed in Appendix A or C of 10 CFR 835; or 2) an individual present in the area without respiratory protection could receive an intake exceeding 12 DAC-hrs in a week
Dosimetry	Personnel dosimeter
Permit, Control, or Approval	RWP upon entry and exit and to conduct work
Minimum Training	RWT II

2.5.4 Potential Internal Contamination

Representative
Signage

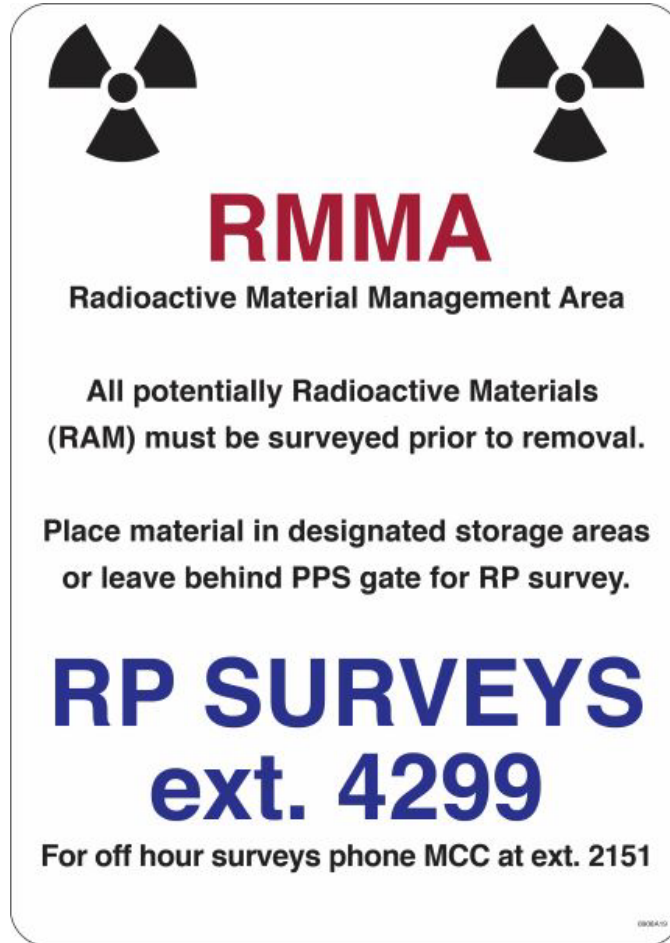


Description	An LCW system where the low conductivity water or the resin bottle may be radioactive
Dosimetry	None
Permit, Control, or Approval	Contact RP prior to opening the system. Depending on the activity/concentration additional radiological controls may be needed.
Minimum Training	RWT II

2.6 Additional Signage (signs that may be encountered in any type of area)

2.6.1 Radioactive Material Management Area (RMMA)

Representative Signage



Description	Placed at the exits of accelerator housings. Indicates that materials that were in the RMMA while the beam was on could be radioactive. All potentially radioactive items must be surveyed by RPF0 prior to removal.
Dosimetry	Personnel dosimeter
Permit, Control, or Approval	All potentially radioactive items must be surveyed by RPF0 prior to removal
Minimum Training	GERT

2.6.2 Hot Spot

Representative
 Signage



Description	A localized area where the dose rate is > 100 mrem per hour on contact
Dosimetry	Hot spots are posted within RCAs and radiological areas. Follow all dosimetry requirements during entry.
Permit, Control, or Approval	Hot spots are posted within RCAs and radiological areas. Follow all radiological controls during entry.
Minimum Training	GERT

3 Forms

The following forms and systems are required by these requirements:

- [Radiological Work Permit](#)

4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- The Radiation Protection Department maintains radiological work permits following the requirements of 10 CFR 835.

5 References

[SLAC Environment, Safety, and Health Manual](#) (SLAC-I-720-0A29Z-001)

- [Chapter 9, “Radiological Safety”](#)
 - [Radiological Safety: Personnel Dosimeter Requirements](#) (SLAC-I-760-0A05S-001)
 - [Radiological Safety: Safety Briefing](#) (SLAC-I-760-0A05S-004)
- [Chapter 55, “Site Access Control”](#)

Other SLAC Documents

- [Controlled Areas and Radiologically Controlled Areas \(RCAs\)](#)
- [Radiological Control Manual](#) (SLAC-I-720-0A05Z-001)
- [Radiological Work Permits Procedure](#) (SLAC-I-760-0A05B-002, FO 005)
- [Radiation Protection Department](#)
- [Radiation Protection \(SharePoint\)](#)
- ESH Course 115, General Employee Radiological Training ([ESH Course 115](#))
- ESH Course 116, Radiological Worker I Training ([ESH Course 116](#))
- ESH Course 250, Radiological Worker II Training ([ESH Course 250](#))

Other Documents

- Title 10, *Code of Federal Regulations*, “Energy”, Chapter 3, “Department of Energy”, Part 835, “Occupational Radiation Protection” ([10 CFR 835](#))