

Chapter 9: [Radiological Safety](#)

# Radiological Work and Area Entry Requirements

Product ID: [237](#) | Revision ID: 2100 | Date published: 19 July 2019 | Date effective: 19 July 2019

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

## 1 Purpose

The purpose of these requirements is 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.*





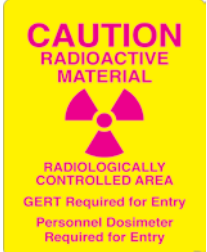
The postings and signs are organized by the required level of training that a person (or qualified escort) must complete before entering. The tables below list every radiological area type and the associated requirements in terms of signage, dosimetry, training, and controls.

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

**Table 1** Training Courses

Table	Minimum Required Training	Abbreviation	Notes
Table 2	General Employee Radiological Training ( <a href="#">ESH Course 115</a> )	GERT	A GERT-qualified worker or escort must be present, and special permission may be required as listed in Table 2.
Table 3	Radiological Worker I Training ( <a href="#">ESH Course 116</a> )	RWT I	
Table 4	Radiological Worker II Training ( <a href="#">ESH Course 250</a> )	RWT II	
Table 5	Varies		Signs that may be encountered in any type of area

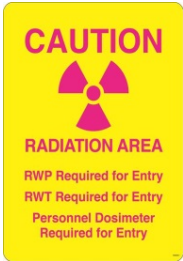
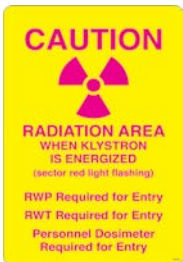
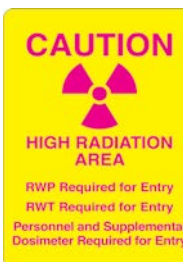
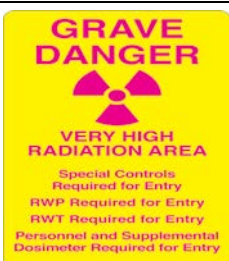

Table 2 Areas Requiring GERT Training


Representative Signage	Posted Area	Description	Dosimetry	Minimum Training <sup>a</sup>
	Controlled area	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.	None	GERT <sup>b</sup>
	Radiologically controlled area (RCA)	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.	Personnel dosimeter	GERT <sup>b</sup>
	Controlled Area and Radioactive material area (Controlled Area + RMA)	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.	None	GERT <sup>b</sup>
	Radioactive material area (RMA)	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.	Personnel dosimeter required if the area is also posted as an RCA	GERT <sup>b</sup>
	Radiologically Controlled Area and Radioactive Material Area (RCA+ RMA)	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	Personnel dosimeter	GERT <sup>b</sup>

<sup>a</sup> Indicates the minimum training required for unescorted access. If training is not complete, the person seeking access must be accompanied by a GERT-qualified escort at all times.

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

**Table 3** Areas Requiring an RWT I Qualification (no untrained individuals allowed in these areas)

Representative Signage	Posted Area	Description	Dosimetry	Permit, Control, or Approval	Minimum Training
	Radiation area (RA)	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	Personnel dosimeter	Sign routine area radiological work permit (RWP) upon entry and exit  Job type or routine task RWP for any radiological work to be performed	RWT I
	Radiation area (RA) intermittent condition	A radiation area only when the klystron is energized (prompt radiation)	Personnel dosimeter	Sign routine area radiological work permit (RWP) upon entry and exit  Job type or routine task RWP for any radiological work to be performed	RWT I
	High radiation area (HRA)	Area where radiation dose rates are greater than 100 mrem per hour at 30 cm and less than 500rad/hr at 100 cm	Personnel and supplemental dosimeter	Sign routine area radiological work permit (RWP) upon entry and exit.  Job type RWP for any work to be performed	RWT I
	Very high radiation area	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	Personnel and supplemental dosimeter	Sign routine area radiological work permit (RWP) upon entry and exit.  Job type RWP for any work to be performed  Special controls	RWT I
	Personnel exclusion area	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)	Personnel and supplemental dosimeter as directed by RP	For approval contact Accelerator Directorate Safety Officer (ADSO)	RWT I

Representative Signage	Posted Area	Description	Dosimetry	Permit, Control, or Approval	Minimum Training
	Radiological buffer area	Intermediate area established outside a contamination area to prevent the spread of radioactive contamination	Personnel dosimeter		RWT I

**Table 4** Areas Requiring an RWT II Qualification (no untrained individuals allowed in these areas)





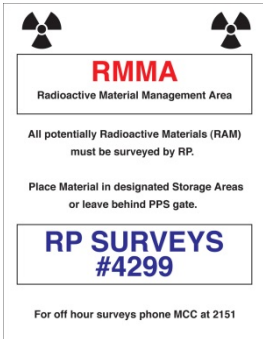

Representative Signage	Posted Area	Description	Dosimetry	Permit, Control, or Approval	Minimum Training
	Contamination area	Area accessible to individuals where the removable contamination levels exceed or are likely to exceed the removable surface contamination values specified in Appendix D of 10 CFR 835, but do not exceed 100 times those values	Personnel dosimeter	RWP upon entry, exit and to conduct work	RWT II
	High contamination area	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	Personnel dosimeter	RWP upon entry, exit and to conduct work	RWT II
	Airborne radioactivity area	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	Personnel dosimeter	RWP upon entry, exit and to conduct work	RWT II
	Potential internal contamination	An LCW system where the low conductivity water or the resin bottle may be radioactive		Contact RP prior to opening the system. Depending on the activity/concentration additional radiological controls may be needed.	RWT II

Table 5 Additional Signage

Representative Signage	Posted Area	Description	Dosimetry	Permit, Control, or Approval	Minimum Training
	Radioactive material management area (RMMA)	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 RPFO prior to removal.	Personnel dosimeter	All potentially radioactive items must be surveyed by RPFO prior to removal	GERT
	Hot spot	A localized area where the dose rate is > 100 mrem per hour on contact	Hot spots are posted within RCAs and radiological areas. Follow all dosimetry requirements during entry.	Hot spots are posted within RCAs and radiological areas. Follow all radiological controls during entry.	GERT

### 3 Forms

The following are forms required by these requirements:

- [Radiological Work Permit](#)

### 4 Recordkeeping

- 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](#))