

**Section 2: ADDITIONAL REQUIREMENTS FOR LABORATORIES USING  
RADIOACTIVE MATERIALS, RADIATION PRODUCING MACHINES, OR LASERS****TABLE OF CONTENTS**

	<u>Page</u>
A. Regulations, Standards and References	2-2
B. Scope	2-2
C. Decommissioning of Existing Facilities Prior to Demolition or Renovation	2-2
D. Design Features for Radiological Labs	2-3
E. Laser Radiation Items	2-4
F. Ventilation Considerations	2-5
G. Laser Ventilation Considerations	2-5

**A. Regulations, Standards and References****Regulations:**

- California Radiation Control Regulations, Title 17 and Title 24
- California Radioactive Material License, 0676-43
- Code of Federal Regulation (CFR) 10, Parts 20 and 35
- Stanford University Radiation Safety Manual (STIPULATED IN LICENSE)

**University Policies:**

- Policies of the Administrative Panel on Radiological Safety

**Recommendations:**

- State of California, Department of Health Services, Radiologic Health Branch
- "Guide for the Preparation of Applications for Medical Programs" (RH 2010 4/90) (not formally adopted) (DOHS 2010)
- "Safe Handling of Radioactive Materials," National Council on Radiation Protection (NBS Handbook 92)
- "Safe Handling of Radionuclides," International Atomic Energy Agency (IAEA), Safety Series No. 1, (1973 ed. is still current as of 1999)
- "Structural Shielding and Evaluation for Medical Use of X-rays and Gamma Rays of Energies up to 10 Me", National Council on Radiation Protection, Report No. 49
- "Radiation Protection Design Guidelines for 0.1-100MeV Particle Accelerators," National Council on Radiation Protection, Report No. 51, (NCRP51)
- (Both NCRP49 and NCRP51 are referenced in California Regulations, Titles 17 and 22)
- Guide for the Preparation of Application for Medical Use Programs, (Proposed Revision 2 to Regulatory Guide 10.8, USNRC (NRC 10.8)
- Guide for the Preparation of Applications for Type A Licenses of Broad Scope, 2<sup>nd</sup> Proposed Revision 2 to Regulatory Guide 10.5, Revision 2, USNRC (NRC10.5)
- "CRC Handbook of Laboratory Safety, 4<sup>th</sup> Ed." CRC Press 1995, (CRCLAB)
- "Recommendations for the Safe Use Of LASERS," American National Standards Institute. (ANSI Z136.1)

**B. Scope**

All radioactive materials used at Stanford University are governed by the terms and conditions of the Stanford University Radioactive Materials License, issued by the Department of Health Services, Radiologic Health Branch. *All other radiation producing devices are regulated by the State of California, Department of Health Services.*

**C. Decommissioning of Existing Facilities Prior to Demolition or Renovation**

Decommissioning of existing facilities is an activity regulated by the State of California; contact Health Physics as early as possible (at least 120 days) before the planned initiation of construction. A plan for decommissioning must be drafted and submitted to the State, approved, and executed. A

report of findings with corrective actions stipulated must be submitted to the State and approved before demolition, renovation or construction can begin.

#### D. Design Features for Radiological Labs

##### ➤ *Approval Process*

1. **Proposals for new facilities must be submitted to the Radiation Safety Program for review. New facilities may require the approval of the Administrative Panel on Radiological Safety and/or by the California Department of Health Services prior to construction.**

California Radioactive Material License, 0676-43  
Stanford University Radiation Safety Manual

2. **Shared facilities for the use of radioactive materials should not be included in plans for new buildings. If such facilities are deemed absolutely necessary, the facility must be under the direction, control and authority of a single principal investigator, who shall be accountable for maintaining the facility in a safe and orderly manner.**

Policies of the Administrative Panel on Radiological Safety, June 18, 1985.

##### ➤ *Architectural Considerations*

3. **Benches in laboratories must be capable of supporting weight of necessary shielding for gamma rays.**

NBS Handbook 92  
IAEA, Safe Handling of Radionuclides

4. **When work involves gamma emitters (especially gamma irradiators) the floors and coatings must be able to support the gamma shielding.**

NBS Handbook 92  
IAEA, Safe Handling of Radionuclides

5. **When applicable, lead shielding must be incorporated in the structure. Based on the proposed type and quantities of radioactive materials, the Radiation Safety Program will determine the need for the shielding.**

*Note that for x-ray producing machines, shielding calculations will be performed by the Radiation Safety Program. Shielding design is to be in accordance with all applicable State Regulations and NCRP and ANSI standards. Designs must be submitted to the State through the Radiation Safety Program. During construction the shielding must be inspected by the Radiation Safety Program while walls are open. After completion, the effectiveness of the installed shielding and protective design features shall be evaluated by the Radiation Safety Program and required reports submitted to and accepted by the State prior to operation of the radiation producing machine.*

California Radiation Control Regulations, Title 17  
DOHS 2010

National Council on Radiation Protection, Report No. 49  
California Radioactive Material License, 0676-43

➤ **Security**

6. **Areas where radioactive materials or other radiation sources are used or stored shall be provided with adequate security (e.g., locks) to prevent removal or use by unauthorized personnel.**

California Radiation Control Regulations, Title 17  
Stanford University Radiation Safety Manual

7. **High radiation areas or very high radiation areas (as defined in 10 CFR 20.1602-2) shall be equipped with means to prevent inadvertent access and restrict access to only authorized personnel. Means to reduce exposure levels in the area may be required via an interlock device. In some applications, means to monitor the radiation levels in the areas shall be provided.**

California Radiation Control Regulations, Title 17  
10 CFR 20.1601-2

8. **High radiation areas or very high radiation areas (as defined in 10 CFR 20.1602-2) shall be equipped with a control device that energizes a conspicuous visible or audible signal so that an individual entering the area and the operator of the device are made aware of the entry.**

California Radiation Control Regulations, Title 17  
10 CFR 20.1601-2

➤ **Waste Storage**

9. **Adequate space must be available for radioactive wastes generated by projects within the lab. Most radioisotope projects will need about 10 sq. ft. of floor space for containers and shields within a lockable area. Radioactive wastes must be properly segregated by half-life categories.**

Stanford University Radiation Safety Manual

**E. Laser Radiation Items**

1. **Class IIIb and IV Laser facilities must be equipped with adequate shielding (e.g., thermal curtains using materials approved by the University's Fire Marshall, window glass that does not transmit direct laser radiation or the specular or diffuse reflections of the laser radiation (shutters or filters)). Portals and viewing windows must be designed to prevent any exposure above the permissible threshold limit value.**

ANSI Z136.1  
CRC Handbook of Laboratory Safety, 4<sup>th</sup> Ed.

2. **Class IIIb and Class IV laser facilities must in rooms secured by locks. Class IV laser**

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**installations must be provided with interlocked warnings that indicate the status of the laser prior to entering the facility.**

ANSI Z136.1

- 3. Electrical outlets need to be positioned in such a manner that leakage of water coolant will not lead to risks of electrocution.**

ANSI Z136.1

#### **F. Ventilation Considerations**

- 1. Ventilation requirements for the laboratories utilizing radioactive materials are dependent upon the types of materials used. Facilities that use radioactive gases shall be equipped with ventilation to adequately maintain concentrations to below allowable occupational exposure levels and to not permit escape of the gas to adjacent non-use areas such that concentrations exceed those allowed for uncontrolled areas. These range from no special requirements to those requiring separate exhaust systems equipped with "panic button" shut down switches. The Radiation Safety Program will review the proposed uses and make specific recommendations appropriate for each facility.**

DOHS2010  
10 CFR 20: Appendix B  
Stanford University Radiation Safety Manual

- 2. Depending on the type and quantities of radioactive materials or the location of the facility, fume hoods used with volatile radioactive materials have specific design requirements. These are detailed in the Fume Hoods Section of this Design Guide.**

#### **G. Laser Ventilation Considerations**

- 1. Appropriate ventilation to remove laser generated airborne contaminants must be provided for Class IIIb and IV lasers.**

ANSI Z136.1

- 2. Gas cabinets and adequate ventilation must be provided to mitigate the hazards associated with excimer laser gases or other lasers using toxic gases.**

ANSI Z136.1