

## UCSF ADDENDUM to UC EH&S LABORATORY SAFETY DESIGN GUIDE

*NOTE: This addendum is prepared to insure all UCSF specific requirements are met.*

Appendix A. 1. **GENERAL REQUIREMENTS FOR LABORATORIES**

Appendix B. 2. **ELECTRICAL SAFETY**

Appendix C. 3. **LABORATORY VENTILATION AND FUME HOODS**

Appendix D. 4. **EMERGENCY EYEWASH AND SAFETY SHOWER EQUIPMENT**

Appendix E. 5. **PRESSURE VESSEL COMPONENTS AND SYSTEMS AND COMPRESSED GAS CYLINDERS**

Appendix F. 6. **HAZARDOUS MATERIALS STORAGE CABINETS**

Appendix F-1. **CHEMICAL LOAD L & B OCCUPANCY**

Appendix G. 7. **BIOSAFETY LABORATORIES**

Appendix H. 8. **ADDITIONAL REQUIREMENTS FOR RADIOACTIVE MATERIAL LABORATORIES**

Appendix I. 9. **ADDITIONAL REQUIREMENTS FOR LABORATORIES WITH IRRADIATORS AND/OR RADIATION PRODUCING MACHINES**

Appendix J. 10. **ADDITIONAL REQUIREMENTS FOR LABORATORIES USING NON-IONIZING RADIATION (NIR) SOURCES, INCLUDING LASERS**

Appendix K. 11. **ERGONOMICS DESIGN AND LABORATORY SPACES**

Appendix L. 12. **ADDITIONAL REQUIREMENTS FOR LABORATORIES WITH CONTROLLED SUBSTANCES (NEW)**

Appendix M. 13. **REFERENCES: (ADD)**

[Prudent Practices in the Laboratory](#)

## Appendix A. 1. GENERAL REQUIREMENTS FOR LABORATORIES

### B. Building Requirements:

3. Environmental Permits. Project managers shall consult with the campus Environment, Health & Safety to identify permitting and pollution abatement engineering requirements for the building. This should be done well before key resource allocation decisions are made. *(REVISED)*

*Good Practice*

### D. Laboratory Design Considerations

3. Laboratories should be designed with adequate workstation space, e.g., computers for instruments or data entry, where research is being conducted. Researches should be provided with personal workstations outside of the laboratory area away from hazardous materials and equipment. *(ADD to 3)*

*Good Practice*

21. Ports should be provided for obtaining samples of effluent from building laboratory drains.

*Clean Water Act (ADD)*  
*Regional Water Quality Control Board (ADD)*  
*Good Practice*

24. Laboratories should have designated areas for storing personal protective equipment; preferably at the entrance of the laboratory. This should include, but is not limited to: racks for lab coats; station for safety glasses, bonnets, shoe cover, etc. *(NEW)*

*Good Practice*

25. Entry doors into a laboratory shall be posted with the words "FIRE DOOR DO NOT BLOCK AND KEEP CLOSED". *(NEW)*

*CFC, Section 703.2.1*

26. There shall be an 18" clearance from ceiling for sprinkler areas and storage a maximum < 18" from ceiling and 24" for non-sprinkler areas. *(NEW)*

*California Fire Code (CFC) Title 19, Section 3.19 NFPA 72*

27. Stairways shall have handrails or stair railings on each side, and every stairway required to be more than 88 inches in width shall be provided with not less than one intermediate stair railing for each 88 inches of required width. (NEW)

*Title 8 section 3214*

28. Land line phone is required to be installed in all laboratories (NEW)

*Prudent Practice  
Good Practice*

29. Non-fabric chairs are required to be used in BSL 2 and 3. (NEW)

*BMBL – General Requirements for Laboratories 5<sup>th</sup> Edition  
Prudent Practice  
Good Practice*

30. Do not install magnetic fire door catches. Door to labs must be kept closed to maintain proper air balance and negative pressure. (NEW)

*ANSI Z9.5-2003*

*Good Practice*

31. Laboratories should be maintained under negative pressure versus non-lab areas. Laboratories should be designed so procedures occur in contiguous spaces and minimize propping fire open. The lab suites should not be divided between general lab areas and equipment rooms. (NEW)

*ANSI Z9.5-2003*

*Prudent Practices in the Laboratory*

## **E. Hazardous Materials Design Issues**

6. Sufficient space or facilities should be provided, so that materials with unique physical or hazardous properties (e.g., oxidizers, pyrophorics, reactivities, biological and radioactive) can be used and stored safely. Especially those materials that, in combination with other substances, may cause a fire or explosion, or may liberate a flammable or poisonous gas are kept separate. Separate space or facilities can include, but are not limited to: storage cabinets with partitions: e.g. acid, flammable, oxidizer and gas cabinets. (REVISED)

*24 CCR 9 (CFC) 8001.9.8  
NFPA 45, Chapter 9.2*

When designing the shelves and shelf spacing, it is important to include enough space (height and depth) for secondary containers.

## I. Non-Structural Seismic Hazard Abatement

1. All shelves (e.g., including those above benches and workstations and in cold rooms) shall have a passive restraining system such as seismic shelf lips (3/4 inch or greater). (*REVISED*)

*Prudent Practices in the Laboratory, Sections 4.E.1 and 4.E.2  
UCB Q-Brace Guidelines  
Good Practice*

3. Any equipment, including but not limited to, appliances and shelving to be installed by the contractor and has the potential for falling over during an earthquake, or moving and blocking corridors or doors, shall be permanently braced or anchored to the wall and/or floor. For more information refer to UCB Q- Brace Guidelines (*REVISED*)

*24 CCR 2 Table 16A-O  
UCB Q-Brace Guidelines  
Good Practice*

## Appendix B. 2. ELECTRICAL SAFETY

No Changes

## Appendix C. 3. Laboratory Ventilations and Fume Hoods

### B. General Laboratory Ventilation Design Issues

9. Flexible local exhaust devices (e.g., “snorkels” or “elephant trunks”) are not recommended by EH&S. If these devices are need, they shall be designed to adequately control exposures to hazardous chemicals and must be reviewed and approved by EH&S. *(ADD)*

*Prudent Practices in the Laboratory*  
*Good Practice*

12. HVAC system diversity must be discussed with EH&S Industrial Hygiene Specialist. *(NEW)*

*Prudent Practices in the Laboratory*  
*Good Practice*

13. Fume hood air flow monitor is required to ensure adequate flow. *(NEW)*

*CCR Title 8, Section 5154.1*

14. The HVAC commissioning report shall be submitted to EH&S - Industrial Hygiene Group for review and approval prior to occupancy. *(NEW)*

*ANSI Z9.5-2003*

15. Equipment such as chemical monitors, energy saving and emergency devices which will affect laboratory ventilation must be reviewed and approved by EH&S prior to installation. *(NEW)*

*Good Practice*

### G. Supply Air Arrangements

8. Supply system air should meet the technical requirements of the laboratory work, and the requirements of the latest version of ASHRAE, Standard 62, Ventilation for Acceptable Indoor Air Quality. Non-laboratory air or air from nonhazardous building areas adjacent to the laboratory may be used as part of the supply air to the laboratory if its quality is adequate. *Laboratory ventilation needs to be reviewed and approved by EH&S. (REVISED)*

*ANSI Z9.5 5.2.3 and 5.3.6*  
*Good Practice*

## **M. Hoods – Construction and Installation**

2. Sprinklers are required in fume hoods for H-6 and L rated laboratories. (NEW)

*NFPA 13 and 45*

*Mechanical Code*

*CFC, General Requirements Section 5101.11, Section 903.2.5.1.*

*General and 903.2.16 Group L Occupancies.*

*CBC 2010, Title 24, Chapters 2, 3,4,9.*

*CCR, Title 8 Section 3241. Sprinklers*

### **P-1. Hydrofluoric Acid Hoods.**

1. Contact EH&S for guidance and requirements. (NEW)

*CCR, Title 8 Section 5191. Occupational Exposure to Hazardous Chemicals in Laboratories*

*Good Practice*

## APPENDIX D. 4. EMERGENCY EYEWASH AND SAFETY SHOWER EQUIPMENT

### C. Equipment Requirements

1. Emergency eyewash, safety shower, and combination units shall comply with the requirements of ANSI Z358.1. Drench hoses even those ANSI approved are only supplemental equipment and shall not replace plumbed and self-contained emergency eyewash and shower equipment. Emergency eyewash and shower activation must be a one-step process. *(REVISED)*

*ANSI Z358.1*

*Good Practice*

6. Installation of floor drains for emergency eyewash and/or showers are not allowed. Laboratories in L occupancy building are required to have intact floors, therefore no floor drains. For additional guidance on floor drains for emergency equipment, refer to University of California [Risk Services Best Practices Bulletin #7: Capital Construction & Emergency Shower and Eyewash Drains. September 10, 2010.](#) *(REVISED)*

*City and County of San Francisco*

*CBC, Title 24*

*Cal/OSHA Standard, Title 8, Section 5162*

### D. General Location

6. Shower heads shall not be recessed into the ceiling. This prevents the ceiling from becoming wet or damaged when showers are tested. *(NEW)*

*Good Practice*

7. Identify eyewash and shower location with highly visible sign indicating to unit test “monthly.” Area around shower shall be well lighted. *(NEW)*

*ANSI Z358.1*

*Good Practice*

### F. Approved Equipment

The most versatile and complete emergency rinsing facility would include a combination unit with an emergency eye/face wash and a safety shower. An emergency eyewash/drench hose combination is not allowed. *(REVISED)*

*Title 8 Section 5162*



29 CFR 1910.151(c)  
OSHA interpretation letter dated 09/30/94  
ANSI Z358.1

## **APPENDIX E. 5. PRESSURE VESSEL COMPONENTS AND SYSTEMS AND COMPRESSED GAS CYLINDERS**

### **C. Compressed Gas Cylinders Restraint**

1. Approved storage racks (e.g., Unistrut, pipe racks) shall be provided to adequately secure gas cylinders using chains, metal straps, or other approved materials, to prevent cylinders from falling or being knocked over. Restraints must be noncombustible. *(REVISED)*

8 CCR 4650 (e)  
24 CCR 9, Section 7401.6.4  
NFPA 45, 8-1.5  
CFC, SECTION 3003.I  
NFPA Life safety Code 99 4-3.1.1.2(3)

## APPENDIX F. 6. HAZARDOUS MATERIALS STORAGE CABINETS

### C. Design

3. Flammable liquid storage cabinets shall be conspicuously labeled with the warning "FLAMMABLE — KEEP FIRE AWAY" in red letters on a contrasting background. Doors shall be well fitted, self-closing and equipped with a self-latching device. The bottom of the cabinet shall be liquid tight to a height of 2 inches. Cabinets shall be UL listed. *(REVISED)*

*8 CCR 5533*

*NFPA 30, Chapter 4-3.5*

*24 CCR 9 (CFC), 8001.10.6.2*

*CFC Article 79*

*California Fire Code (CFC) 2010 Sections 3404.3.2.1.1, 3404.3.2.1.2, 3404.3.2.1.3 and 3404.3.2.1.4*

7. Corrosive/toxic material storage cabinet shelving shall be constructed to prevent spillage of contents with tight-fitting joints, a welded or riveted liquid-tight bottom, a door sill of at least 2 inches, and lockable cabinet doors that are self-closing and self-latching. Corrosive materials should not be stored in metal cabinets unless the materials of construction are specifically treated to be corrosion-resistant. Cabinets shall be UL listed. *(REVISED)*

*Prudent Practices in the Laboratory, Section 3.C and 4.E*

*California Fire Code (CFC) 2010 - Sections 2703.8.7.1 and 2703.8.7.2*

### D. Venting Hazardous Material Storage Cabinets

1. The flammable cabinet is not required to be vented for fire protection purposes. If vented for whatever reasons, the cabinet shall be vented outdoors or to the fume hood exhaust duct in such a manner that will not compromise the specific performance of the cabinet. Refer to [Guidelines for Venting Flammable Storage Cabinets](#) *(ADD)*

*NFPA 30, 6.3.4*

## **APPENDIX F-1. TABLE CHEMICAL LOAD L & B OCCUPANCY (NEW)**

Building occupancy determines the allowable storage quantity of hazardous materials. A control area is defined as “spaces within a building where quantities of hazardous materials not exceeding the maximum allowable quantities per control area are stored, dispensed, used or handled”. Allowable volumes of hazardous materials decrease proportionally for each floor above the ground level. The maximum allowable quantity per control area shall be as specified in CFC Tables 2703.1.1(1) through 2703.1.1(4). For details on these requirements contact the Campus Fire Marshall.

*CFC, Title 9, Section 2701 & 2703*

## APPENDIX G. 7. BIOSAFETY LABORATORIES

### B. SCOPE

Reference: *NIH Guidelines for Research Involving Recombinant DNA Molecules and Biosafety in Microbiological and Biomedical Laboratories (BMBL), 5th Edition or current edition.* (ADD)

### C. Basic Laboratory Design for Biosafety Levels 1 and 2 Laboratories

2. Walls. Wall surfaces shall be free from cracks, unsealed penetrations, and imperfect junctions with ceiling and floors. Materials shall be capable of withstanding washing with strong detergents and disinfectants and be capable of withstanding the impact of normal traffic. (NEW)

*Prudent Practices in the Laboratory*  
*Good Practice*

3. Ceiling. In BSL 2 laboratories, drop ceilings must use smooth, cleanable tiles (Mylar face with a smooth surface, or the equivalent). Access panels shall be fitted with gaskets that seal the door when closed and also the flange around the panel lip where it meets the ceiling. (ADD)

*BMBL – General Requirements for Laboratories 5th Edition*  
*Prudent Practices in the Laboratory*  
*Good Practice*

6. Furniture and Casework

Only non-fabric chairs are allowed in BSL 2 and 3 rooms. (ADD)

*BMBL – General Requirements for Laboratories 5<sup>th</sup> Edition*  
*Prudent Practices in the Laboratory*  
*Good Practice*

8. BSL2 is required to have sink and eyewash inside the containment room. (ADD)

*BMBL Current Edition*  
*ANSI Z358.1-2009*

11. Commissioning:

All records should be submitted to the Biosafety Officer for review and approval. This must be on file and be accessible to laboratory personnel and third party inspectors. (ADD)

*BMBL Current Edition*

## APPENDIX H. 8. ADDITIONAL REQUIREMENTS FOR RADIOACTIVE MATERIAL LABORATORIES

### B. Basic Laboratory Design

1. A facility for handling radioactive material shall be located and designed so that the radiation doses to persons outside the facility can be maintained below applicable limits and are As Low As Reasonably Achievable (ALARA). It is recommended that whenever possible that a dedicated room be designed for the use and storage of radioactive materials and their waste. (*REVISED*)

*NCRP Report, No. 127, Section 4.1*  
*10 CFR 20*  
*40 CFR 191*

### E. Radiological Fume Hoods (NEW)

In buildings that have the "new" fume hood exhaust systems, single-ducting the radiological fume hood is not required. A fume hood may be "dedicated for radioactive use" (for radioactive contamination control purposes), nonetheless, it is permissible for the fume hood to be connected to the manifold-type exhaust system. Usage of volatile radioisotopes includes general-purpose radioiodination. Radioiodination by a laboratory must be authorized by the UCSF Radiation Use Authorization (RUA) issued to the laboratory. Higher level iodination requires additional radiation safety control.

The "new" fume hood ducting and exhaust system have the following features: manifold(s) with back-up fans (may be called blowers), back-up electrical power for utility company outages, remote monitoring to detect exhaust fan failures (i.e. Andover or similar system), and Phoenix-type control valves (to maintain the pre-set minimum exhaust flows.)

The dedicated radiological fume hood must be constructed of stainless steel to minimize decontamination issues. For non-stainless steel fume hoods, a portable special "iodination-box" may be used to control emissions. This must be approved by the Radiation Safety Officer (RSO).

Radiological fume hoods must have a face velocity of 125 lfm. If an iodination-box is used, the fume hood face velocity can be maintained at 100 lfm. This must be approved by the RSO.

The radioisotope hot-cell (a special fume hood for handling 1,000 or more millicuries of I-131 or other radioactive materials used to produce radioisotope products) will always require a dedicated single-ducted exhaust system. Any laboratory that believes a future radiological use would require a dedicated single-duct exhaust system must promptly

inform the UCSF RSO and Capital Programs of this possible future status. The information enables proper planning for the single-ducting requirement.

This addendum does not address filtration of radiological effluents for controlling radioactive emissions that may apply to some UCSF buildings. Consult the RSO.

**APPENDIX I. 9. ADDITIONAL REQUIREMENTS FOR LABORATORIES WITH IRRADIATORS AND/OR RADIATION-PRODUCING MACHINES**

*No Changes*

**APPENDIX J. 10. ADDITIONAL REQUIREMENTS FOR LABORATORIES USING NON-IONIZING RADIATION (NIR) SOURCES, INCLUDING LASERS**

*No Changes*

**APPENDIX K. 11. ERGONOMICS DESIGN AND LABORATORY SPACES**

*No Changes*



## APPENDIX L. 12. ADDITIONAL REQUIREMENTS FOR LABORATORIES WITH CONTROLLED SUBSTANCES (NEW)

### A. Basic Laboratory Design

1. A facility for handling controlled substances has be designed so that Federal Drug Enforcement Agency (DEA) regulated drugs, DEA List 1 and 2 chemicals and CA precursor chemicals including waste are secured from unauthorized removal. Physical security controls must be appropriate for the schedules and quantity of materials on hand and as follows:

Schedule I & II: In a drug safe, vault or steel cabinet under lock and key and in a room that has limited access during work hours and is locked during non-working hours.

Schedule III to V including List 1 and 2 chemicals: In a substantially constructed cabinet under lock and key (without wheels) and in a room that has limited access during work hours and is locked during non-working hours.

Others security conditions are subject to approval by Controlled Substance Officer.

*Federal Controlled Substances Act and the California Uniform Controlled Substances Act, including but not limited to those substances listed in 21 CFR §1308.11-1308.15 (controlled substances), 21 CFR §1310.02(a) (List 1 and 2 chemicals)*

*California Health and Safety Code §11100 (precursor chemicals)  
UCOP BUS 50*