

**APPENDIX 12**  
**EH&S DESIGN GUIDELINES FOR**  
**LABORATORY CONSTRUCTION AND RENOVATION PROJECTS**

The following items are often overlooked in project documents submitted to EH&S for review. It is critical that the project design team assures that these issues are properly addressed in plan submittals and field inspections. If deficiencies are discovered after projects are completed, the responsibility for correcting those problems will fall back on the design team, most likely at a higher cost for re-designing modifications.

Projects desiring variances from these guidelines will require advanced review and approval from EH&S.

If a project involves any laboratory or shop space, hazardous exhausts, fume hood ventilation, **biological safety cabinets, glove boxes** (or associated HVAC impacts on other areas), storm sewer drains, chemical storage issues or the presence of any hazardous materials, asbestos, lead paint, radioactive materials, **biological materials**, chemicals, gases, lasers, x-ray machines, petroleum tanks or generators, or other potential environmental or occupational hazards, the project design team or other parties responsible for the project must: a) ~~solicit from the client and submit to the EH&S Environmental Compliance group (303-492-6025), a comprehensive hazardous materials inventory, using the template provided by EH&S (see *General Issues* and *Chemical and Gas Inventories*, below), which will be used to determine special design requirements;~~ b) make sure the plan conforms with all applicable fire and building codes, and UCB Construction Standards and Appendices including, but not limited to the following:

**UCB Standards:**

- Make sure the following UCB Standard Sections and Appendices are incorporated into the Project Documents:
  - ✓ **Section 11610 – Laboratory Fume Hoods**
  - ✓ **Section 11611 - Laboratory Biological Safety Cabinets**
  - ✓ **Section 12345 – Metal Laboratory Casework**
  - ✓ **Section 12346 – Wood Laboratory Casework**
  - ✓ **Section 12348 – Laboratory Tops, Sinks, and Accessories**
  - ✓ **Section 12349 – Laboratory Service Fixtures**
  - ✓ **Section 15240 – Mechanical Sound and Vibration Control**
  - ✓ **Section 15440 – Plumbing Fixtures**
  - ✓ **Section 15852 – Special Exhaust Systems**
  - ✓ **Appendix #11 - EH&S Design Guidelines for Chemical Use Areas**
  - ✓ **Appendix#12 - EH&S Design Guidelines For Laboratory Construction and Renovation Projects**

**General Issues:**

1. Review Project Documents and Drawings to make sure that all of the applicable UCB Standards and items listed in this document are included.
2. Determine when “Special” Ventilation is needed, and if so, what type.
3. Occupied areas that have hazardous materials, chemicals and/or gases may require pre-project site preparation for safe storage. Hazardous materials/waste must be properly managed and/or

disposed before site work begins. Furthermore, any hazardous waste generated by the project must be safely managed and properly disposed by the contractors, with documentation, e.g., shipping manifests, provided to EH&S.

4. ~~Project "Clients" must provide complete chemical/gas inventories for EH&S review using EH&S template;~~ Project designs must incorporate hazardous material requirements - refer to Appendix 11 - *EH&S Guidelines for Chemical Use Areas*.

#### **Building/Room Ventilation –**

1. If a project's scope includes or will affect either supply or exhaust ventilation, the design team shall verify if there are fume hoods or other special exhaust systems that could be affected. Notify EH&S of any affected hoods, canopies, slot exhausts, etc. so that equipment can be re-certified for safe operation prior to being placed back into service.
2. Project documents shall include UCB Standard, Section 15240 – Mechanical Sound and Vibration Control to determine acoustical criteria for equipment and ductwork.

#### **Chemical, Biological, Radiological and Gas Inventories – UCB Standard, Appendix #11**

1. ~~Contact the EH&S Environmental Compliance Group at 303-492-6025 for information concerning Inventory submittals and evaluations.~~
2. All Inventories ~~require chemical and gas names, quantities, and locations of storage and use~~ **should be reviewed to determine appropriate engineer, safety, environmental, and storage controls specific to the use and storage within each project area.**

#### **Fume Hoods – UCB Standard, Sections 11610 and 15852**

1. Hoods should be visually inspected prior to mechanical, electrical, or plumbing work to make sure they meet UCB design standards.
2. Include UCB standard face velocity requirements in project documents and drawings.

#### **Existing Fume Hoods:**

##### **Relocation -**

- a. Hood owners/users shall complete a *Property Services, Facilities Management, Environmental Health & Safety Equipment Disposal/Resale Form*, return the original to EH&S with a copy to the party responsible for the project, and post a copy on the fume hood for the Contractor.
- b. **Hood shall not contain any chemical, biological, or radioactive materials or waste at time of relocation.**
- c. Hood shall meet current UCB Standards or be brought up to current UCB Standards prior to being placed back into service and certified for safe operation by EH&S.
- d. **Hoods shall be located in close proximity to where chemicals are stored, and should be located a minimum of 10 feet from any door or doorway or where interfering air currents and cross drafts from windows, high traffic areas, HVAC systems, or other apparatus, could adversely affect the proper function of the hood enclosure. Any source which decreases a hood's containment ability or capture efficiency shall be mitigated.**
- e. Project is responsible for ensuring that hoods meet UCB Standards for face velocity. Air supplies and exhausts for effected areas may require balancing **and shall be performed immediately following relocation of hood.**
- f. Balancing damper(s) at hood exhaust should be reviewed per Mechanical.

- g. Project is responsible for notifying EH&S, so that remaining and relocated devices/equipment/hoods can be certified for safe operation at completion of the Project.

**Disposal –**

- a. If a project's scope includes or will affect either supply or exhaust ventilation, the design team shall verify if there are fume hoods or other special exhaust systems that could be affected.
- b. Hood owners/users shall complete a *Property Services, Facilities Management, Environmental Health & Safety Equipment Disposal/Resale Form*, return the original to EH&S with a copy to the Party responsible for the project, and post a copy on the fume hood for the Contractor.
- c. Hood shall not contain any chemical, biological, or radioactive materials or waste at time of disposal.
- d. Interior room duct(s) that serviced disposed fume hood(s) should be removed and capped at the wall or ceiling so lab /room occupants cannot access the ducts for unauthorized use. All remaining hoods or special exhaust equipment must be balanced to conform to Section 15852 or Manufacturer's specifications immediately following the removal of hood from exhaust ventilation system.
- e. Project is responsible for notifying EH&S, so that remaining devices/equipment/hoods can be certified for safe operation at completion of the Project.

**New Fume Hoods:**

**Cup Sinks** - UCB Standard, Sections 11610, 12348 and 15852

- 1. If a User requests that a hood have a cup sink, the sink must have a minimum 3/8" raised edge around cup sink cut out, i.e., provide a 3/8" lip above work surface.

**Hood Alarms** - UCB Standard, Sections 11610 and 15852

- 1. Include Low Airflow Alarm and mount on front of hood.
- 2. One 2-gang duplex, 20A, 125V receptacle shall be located on top of fume hood to accommodate air flow alarm. A cover or strap should be secured over the receptacle so the alarm cannot be easily unplugged.

**Hood Base Cabinets** - UCB Standard, Sections 11610, 12345, 12346 and 15852

- 1. Include corrosive and/or flammable base cabinets below fume hoods based on submitted chemical/gas inventories. Additional chemical storage cabinets may be necessary to ensure proper chemical storage and segregation.
- 2. Vent base cabinets separately using hard duct connections. Flex connectors or flexible duct materials are NOT acceptable.
- 3. All materials used to vent flammable cabinets must have a flame spread rating of 25 or less.
- 4. Flammable and corrosive cabinet exhausts must have maximum separation before mixing.
- 5. Corrosive base cabinets should be vented through the hood work surface. Use manufacturer vent kits when available. If two corrosive base cabinets are used, vent both separately through hood work surface.
- 6. All flammable cabinets must have self-closing door(s) unless a variance is granted by the Campus Fire Marshall. Flammable storage cabinets must meet all applicable NFPA standards.

**Sash Stops** - UCB Standard, Sections 11610 and 15852

1. Include sash stop so that sash stops at approximately 18" above work surface. UCB Standard, Sections 11610 and 15852

**Open Bypass Hoods** - UCB Standard, Sections 11610 and 15852

1. Depending on Manufacturer (i.e. Kewaunee), fume hood bypass may not be closed when sash is open to 14" above work surface.

**Certification for Safe Operation** - UCB Standard, Sections 11610 and 15852

1. Projects are responsible for notifying EH&S, so that new devices/equipment/hoods can be certified for safe operation at completion of the Project.

**Biological Safety Cabinets** – UCB Standard, Section 11611

1. Biosafety cabinet installations and proposals for biological or biomedical research must be reviewed and approved by EH&S and the UCB Institutional biosafety Committee (IBC) to evaluate conformance with requirements of the Center for Disease Control (CDC) and the National Institute of Health (NIH). Such requirements can be found in CDC/NIH publication: "Biosafety in Microbiological and Biomedical Laboratories."
2. The CU-Boulder campus is not approved for biohazardous work above Biosafety Containment Level 2.
3. Biosafety cabinet selection and room designs must comply with National Science Foundation Publication 49: "International Standard for Class II (Laminar Flow) Biohazard Cabinetry" in addition to CDC and NIH requirements. If NIH funding is used to facilitate project, then the *NIH Building and Construction* requirements must be followed.
4. Cabinets shall be located in close proximity to where biological materials are stored, and should be a minimum of 10 feet from any door or doorway where interfering air currents and cross drafts from windows, high traffic areas, HVAC systems, or other apparatus, could adversely affect the proper function of the cabinet enclosure. Any source which disrupts the containment provided by the work access opening air barrier shall be mitigated.
5. Biosafety cabinets are equipped with integral filter components will require a special service contract for maintenance, calibration and filter replacement or disposal. Cabinet will require certification by a qualified Vendor to meet Manufacturer's operating specifications and/or NSF 49 Standard prior to being placed into service for BL-2 required containment.
6. A hand washing sink shall be located in the same room as the cabinet for immediate access and the path of travel shall be free of obstructions that may inhibit the immediate use of the equipment, including doors.
7. All Biosafety Level 2 rooms shall have an eye/face wash station provided in accordance with UCB Standard, Section 12349.
8. All Biosafety Level 2 rooms shall be maintained at an air pressure of at least 0.03" wg\* that is negative to the corridors or adjacent non-laboratory areas for all new construction and whenever feasible for renovated or existing spaces.
9. Vacuum lines should be protected with High Efficiency Particulate Air (HEPA) filters, or their equivalent. Filters must be replaced as needed. Liquid disinfectant traps may be required.

**Emergency Showers** - UCB Standard, Sections 12349 and 15440

1. Units are required to meet current ANSI Z358.1 Standards.
2. Water sources must be "potable". Verify sources using Cross Connection & Back Flow Prevention data.

3. Activation levers for showers require a wall clip to hold handle against wall.
4. Shower heads should be stainless or other material that will not break on impact.
5. Showers shall be in accessible locations that require no more than 10 seconds to reach.
6. Floor drains are required. Drain shall be plumbed to sanitary sewer drain.
7. Be sure to address ADA issues.

**Combination Emergency Shower & Eye/Face Wash - UCB Standard, Sections 12349 and 15440**

1. Units are required to meet current ANSI Z358.1 Standards.
2. Water sources must be “potable”. Verify source using Cross Connection & Back Flow Prevention data.
3. Activation levers for shower require a wall clip to hold handles against wall or stand pipe of unit.
4. Shower heads should be stainless or other material that will not break on impact.
5. Combination shower and eye/face wash unit shall be in accessible location that requires no more than 10 seconds to reach.
6. Eye/Face wash units must be plumbed to drains using “hard connections” to drain pipes.
7. Floor drains are required for showers. Drain shall be plumbed to sanitary sewer drain.
8. Be sure to address ADA issues.

**Emergency Eye/Face Wash - UCB Standard, Sections 12349 and 15440**

1. Units are required to meet current ANSI Z358.1 Standards.
2. Water sources must be “potable”. Verify sources using Cross Connection & Back Flow Prevention data.
3. Devices must be listed as an eye **and** face wash unit.
4. Hand held drench hoses or any unit that requires hand held operation to allow unit to continuously operate is **NOT permitted**.
5. Eye/Face wash units must be plumbed to drains using “hard connections” to drain pipes, unless they are faucet mount units.
6. Eye/Face wash units shall be located no more than 10 seconds to reach and must be in the same room where hazardous chemicals are used. For a strong acid or caustic, the eye/face wash unit shall be immediately adjacent or within 10 feet to the hazard.
7. Be sure to address ADA issues.

**New Laboratory Casework - UCB Standard, Section 12348**

1. Laboratory tops – provide a minimum of 3/8” raised edge around cup sink cut outs, i.e. provide a 3/8” lip above work surface.

**Hazardous Equipment –**

1. Lasers – contact EH&S Radiation Safety @ 303-492-2622
2. X-Ray Machines contact EH&S Radiation Safety @303-492-2622

**Storm Sewer Drains –**

1. There shall be no discharges to storm sewer drains without approval from EH&S.
2. Basement floor drains are assumed to be connected to storm sewers unless specifically verified to the contrary.
3. Projects may be responsible for correcting or plugging illicit connections associated with their scope of work.

4. Storm drains and inlets must be protected from work activities to prevent accidental releases to the environment.

**Food Service Issues -**

1. Food service establishments generally require design review and approval from Boulder County Health Department (BCHD) and/or State Health. Contact BCHD Food Service Inspections at 303-441-1438.
2. Operations where grease waste maybe generated or dish/pan washing occurs may require installation of an approved grease trap.

END OF SECTION APPENDIX 12