

CONSTRUCTION REQUIREMENTS

Note: The buildings on the UCCS campus are divided into two categories: General Fund and Auxiliaries. General Fund Buildings include academic and administrative functions. Auxiliary buildings include residence halls, athletic, and dining facilities. In some cases, construction standards differ depending on the building category. Confirm building category with Facilities Services Project Manager.

Appendix 04 - Laboratories

- General Requirements
- Building/Room Ventilation
- Chemical and Gas Inventories
- Chemical and Gas Storage
- Acid Storage Cabinets
- Fume Hood General
- Existing Fume Hoods Relocation
- Disposal
- New Fume Hoods
- Biological Safety Cabinets
- Emergency Showers
- Emergency Eye/Face Wash
- Combination Emergency Shower & Eye/Face Wash
- New Laboratory Casework
- Hazardous Equipment
- Storm Sewer Drains
- Food Service General

APPENDIX 04 - LABORATORIES

A. General Requirements

- a. 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 redesigning modifications.
- b. Projects desiring variances from these guidelines will require advanced review and approval from EH&S.
- c. If a project involves any laboratory or shop space, hazardous exhausts or fume hood ventilation, biological safety cabinet, glove boxes, clean rooms (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, chemicals, gases, biological materials, 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
- d. Determine when "Special" Ventilation is needed, and if so, what type.
- e. Occupied areas that have hazardous materials, biological 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.

- f. Project designs must incorporate hazardous material requirements refer to UCCS Lab Safety Manual
- B. Building/Room Ventilation
- 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. 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.
 - b. Laboratories shall be ventilated per ASHRAE Standard 62, NFPA 45, NFPA 91, and ANSI/AIHA Z9.5
- C. Chemical and Gas Inventories
- a. All Inventories should be reviewed to determine appropriate engineer, safety, environmental and storage controls specific to the use and storage within each project area.
- D. Chemical and Gas Storage
- a. Solvent or flammable liquid storage cabinets
 - i. Provide units that are listed and labeled as complying with the requirements of NFPA 30 for design, construction, and capacity of storage cabinets and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.
 - ii. Fabricate the bottom, top, sides and doors of 18-gage steel with all double panel construction and a 1.5" air space between panels. Furnish with electrical grounding connection.
 - iii. Label cabinet "FLAMMABLE – KEEP FIRE AWAY" in bright red letters.
 - iv. Provide self-closing doors synchronized so that both doors will always fully close. Equip right hand door with three point latching system that automatically engages when doors close. Equip door latch system with lock. Equip each door with a fusible link hold open feature to ensure the door closes when the temperature outside of the cabinet exceeds 165° F.
 - v. Provide a 2" deep liquid tight pan covering on the entire bottom of the cabinet to provide containment for leaks and spills.
 - vi. Provide an adjustable shelf designed to allow circulation within the cabinet.
- E. Acid Storage Cabinets
- a. Cabinet is specifically designed for the storage of acids and bases.
 - b. Provide a removable shelf of the same material as cabinet and lined with a corrosion resistant liner.
 - c. Provide a polypropylene liquid tight pan covering on the entire bottom of the cabinet or similar devise, to provide containment for leaks and spills.
 - d. Acid storage cabinets shall be completely lined with a corrosion resistant liner.
 - e. Polypropylene construction is preferred.
- F. Fume Hood General
- a. Hoods should be visually inspected prior to mechanical, electrical, or plumbing work to make sure they meet UCCS design standards.
 - b. Hoods for a single project should all be from the same manufacturer
 - c. Hoods shall when connected to an exhaust system that provides proper exhaust volume under normal laboratory conditions, will operate in a safe, efficient manner, within acceptable tolerances for face velocities specified. Dead air pockets and reverse air currents will not be permitted along surface of hood interiors.

- d. Constant-volume or variable-air-volume fume hoods should be capable of maintaining 80-100 fpm at all sash heights below 13" measured from the top of the airfoil or 14" above work surface if airfoil is not present or if flush with work surface.
- e. Low flow, walk-in, combination vertical and horizontal sash fume hoods will need to consult with EHS for acceptable minimum face velocity.
- f. Include UCCS standard face velocity requirements in project documents and drawings.
- g. If per chloric acid must be used, a specialized, dedicated hood (stainless steel, porcelain coated or non-plasticized PVC lined) labeled for per chloric acid use only must be installed. A regular chemical fume hood may not be used for per chloric acid. The per chloric hood must have its own non-reactive duct and exhaust fan, built-in water wash-down system, and other features as described in the ACGIH Industrial Ventilation Manual.
- h. Radioisotope hood installations and the use of radioactive materials on campus require prior review, approval and licensing by EH&S. Conventional chemical fume hoods are suitable for many low level radioisotope applications, however, the use of some materials such as radioactive iodine requires a specialized radioisotope hood equipped with integral filter components. In these cases, service contracts must be set up for maintenance, calibration and filter replacement or disposal.
- i. Air exhausted from laboratory modules shall not pass unducted or be recirculated through other areas.
- j. If a hood is to be connected to an existing central or manifold exhaust system serving multiple fume hoods, then the air system will have to be evaluated to see if it has sufficient capacity for the addition of other exhausted equipment. Each individual exhaust drop on a central or manifold exhaust system shall be labeled for the specific room(s) it services.

G. Existing Fume Hoods Relocation

- a. Hoods shall not contain any chemicals, biological, or radioactive materials or waste during relocation.
- b. Hoods shall meet current UCCS Standards or be brought up to current UCCS Standards prior to being placed back into service and certified for safe operation by EH&S.
- c. 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 dorrway or where interfering air current and cross drafts from windows, high traffic area, 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.
- d. Projects are responsible for ensuring that hoods meet UCCS Standards for face velocity. Air supplies and exhausts for effected areas may require balancing and shall be performed immediately following relocation of the hood.
- e. Balancing dampers at hood exhausts should be reviewed per Mechanical.
- f. 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.

H. 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 sytem that could be affected.
- b. Hoods shall not contain any chemical, biological or radioactive materials or waste at time of disposal.
- c. 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 UCCS face velocity standards or manufacturer's specifications immediately following the removal of

- hood from exhaust ventilation system.
 - d. Projects are responsible for verifying if there are any other devices/equipment/hoods that are serviced by the same fan that serviced the disposed hood.
 - e. Projects are responsible for notifying EH&S, so that remaining devices/equipment/hoods can be certified for safe operation at completion of the Project.
- I. New Fume Hoods:
- a. Cup Sinks
 - i. 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.
 - b. Hood Alarms
 - i. Include Low Airflow Alarm and mount on front of hood.
 - ii. 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.
 - c. Hood Base Cabinets
 - i. 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.
 - ii. Vent base cabinets separately using hard duct connections. Flex connectors or flexible duct materials are NOT acceptable.
 - iii. All materials used to vent flammable cabinets must have a flame spread rating of 25 or less.
 - iv. Flammable and corrosive cabinet exhausts must have maximum separation before mixing.
 - v. 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.
 - vi. Plastic corrosive cabinets are preferred.
 - vii. 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.
 - d. Sash Stops
 - i. Include sash stop so that sash stops at approximately 18" above work surface.
 - e. Open Bypass Hoods
 - i. Depending on Manufacturer (i.e. Kewaunee), fume hood bypass may not be closed when sash is open to 14" above work surface.
- J. Biological Safety Cabinets
- a. Biosafety cabinet installations and proposals for biological or biomedical research must be reviewed and approved by EH&S and the UCCS 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 5th Edition."
 - b. The UCCS campus is not approved for bio hazardous work above Biosafety Containment Level 2.
 - c. 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.

- d. 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.
- e. 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.
- f. 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.
- g. All Biosafety Level 2 rooms shall have an eye/face wash station
- h. 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.
- i. 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.

K. Emergency Showers

- a. Units are required to meet current ANSI Z358.1 Standards, NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules, CDC-NIH Biosafety in Microbiological and Biomedical Laboratories 5th Edition, OSHA Blood borne Pathogen Standard 29 CFR 1910.1030,
- b. Water sources must be "potable". Verify sources using Cross Connection & Back Flow Prevention data.
- c. Activation levers for showers require a wall clip to hold handle against wall.
- d. Shower heads should be stainless or other material that will not break on impact.
- e. Showers shall be in accessible locations that require no more than 10 seconds to reach.
- f. Water flow should be activated by a push-pull or on-off mechanism so that the water remains on without requiring the use of the operator's hands. Automatic shut-off or water volume/timed units are not permitted. Whenever possible, shower units should have a visible, dedicated, labeled shut-off valve. If the valve is concealed, such as above the ceiling, a sign must indicate the location of the valve.
- g. Showers and eye/face wash units must be identified with highly visible signs per ANSI Z358.1
- h. Floor drains are required. Drain shall be plumbed to sanitary sewer drain.
- i. Be sure to address ADA issues.

L. Combination Emergency Shower & Eye/Face Wash

- a. Units are required to meet current ANSI Z358.1 Standards, NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules, CDC-NIH Biosafety in Microbiological and Biomedical Laboratories 5th Edition, OSHA Blood borne Pathogen Standard 29 CFR 1910.1030,

- b. Water sources must be “potable”. Verify source using Cross Connection & Back Flow Prevention data.
- c. Activation levers for shower require a wall clip to hold handles against wall or stand pipe of unit.
- d. Shower heads should be stainless or other material that will not break on impact.
- e. Combination shower and eye/face wash unit shall be in accessible location that requires no more than 10 seconds to reach.
- f. Eye/Face wash units must be plumbed to drains using “hard connections” to drain pipes.
- g. Water flow should be activated by a push-pull or on-off mechanism so that the water remains on without requiring the use of the operator’s hands. Automatic shut-off or water volume/timed units are not permitted. Whenever possible, shower units should have a visible, dedicated, labeled shut-off valve. If the valve is concealed, such as above the ceiling, a sign must indicate the location of the valve.
- h. Showers and eye/face wash units must be identified with highly visible signs per ANSI Z358.1
- i. Floor drains are required for showers. Drain shall be plumbed to sanitary sewer drain.
- j. Be sure to address ADA issues.

M. Emergency Eye/Face Wash

- a. Units are required to meet current ANSI Z358.1 Standards, NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules, CDC-NIH Biosafety in Microbiological and Biomedical Laboratories 5th Edition, OSHA Blood borne Pathogen Standard 29 CFR 1910.1030,
- b. Water sources must be “potable”. Verify sources using Cross Connection & Back Flow Prevention data.
- c. Devices must be listed as an eye and face wash unit.
- d. Hand held drench hoses or any unit that requires hand held operation to allow unit to continuously operate is NOT permitted.
- e. Eye/Face wash units must be plumbed to drains using “hard connections” to drain pipes, unless they are faucet mount units.
- f. 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.
- g. Water flow should be activated by a push-pull or on-off mechanism so that the water remains on without requiring the use of the operator’s hands. Automatic shut-off or water volume/timed units are not permitted. Whenever possible, shower units should have a visible, dedicated, labeled shut-off valve. If the valve is concealed, such as above the ceiling, a sign must indicate the location of the valve.
- h. Showers and eye/face wash units must be identified with highly visible signs per ANSI Z358.1
- i. Be sure to address ADA issues.

N. New Laboratory Casework

- a. 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.
- b. Provide an independent testing laboratory report certifying that the finish of laboratory tops, sinks, and accessories are capable of withstanding the specified chemical and physical resistance requirements.

O. Hazardous Equipment

- a. Lasers – contact EH&S @ 719-255-3212
- b. XRay Machines – contact EH&S @719-255-3212

P. Storm Sewer Drains

- a. There shall be no discharges to storm sewer drains without approval from EH&S. Basement floor drains are assumed to be connected to storm sewers unless specifically verified to the contrary.
- b. Projects may be responsible for correcting or plugging illicit connections associated with their scope of work.
- c. Storm drains and inlets must be protected from work activities to prevent accidental releases to the environment.

Q. Food Service General

- a. Food service establishments generally require design review and approval from El Paso County Health Department (EPCHD) and/or State Health. Contact EPCHD Food Service Inspections at 719-578-3199.
- b. Operations where grease waste maybe generated or dish/pan washing occurs may require installation of an approved grease trap.