Washington University in St. Louis

Environmental Health and Safety

I. Pre-Construction EH&S Checklist

Planning (check if completed)	**Description – Comments** (Expand descriptions as needed to convey necessary information)
☐ **Type of Construction** - New Construction - Renovation (Partial or Gut Remodel) (circle) - Demolition	
☐ **Scope of Project** - Animal Facility - Auditorium or large assembly space - Office Space - Mixed Use - Laboratories: ☐ **<u>Submit</u> a complete inventory all chemicals, infectious agents, radioactive materials and research equipment of concern (research magnets, NMR, class 3 and 4 lasers, etc.) to EH&S for review** BSL3/BSL3+ | Darkroom Wet Lab | Clean Room Dry Lab | Microscopy Teaching Lab | Simulation Lab Other: | (circle or highlight) Specialized Research (circle or highlight and describe): - Nano Facility - Cryogenic Facility - Cyclotron - Research Magnet/NMR - High pressure/high temperature - Combustion facilities Clinics: - Patient Care Areas - Significant airborne infectious patient concerns (TB, Ebola, anthrax, SARS, MERS, etc.) - Art Studios, Woodworking Shops, Ceramic Shops, etc. - Pilot Plant Research (such as: Clean Coal Research, pilot scale combustion chambers, large scale pharmaceutical (>10 L), race car design labs, other.)	

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☐ **Property Environmental Site Assessment (ESA)** - Phase I and Phase II assessments need to be prepared which meet EPA's and Missouri Department of Natural Resources (MDNR) "All Appropriate Inquiry" Rules and the newly revised ASTM Phase I and Phase II ESA standards (Standards ASTM E1527, E2247, and E1903) - ESA's must be approved by and done in conjunction with the EH&S Environmental Compliance Officer, or her or his designee - ESA's must include remediation cost assessments for all hazardous materials, such as asbestos, USTs and environmental contamination, to meet Finance Office FIN 47 reporting requirements - Missouri One Call System – 1-800-DIG-RITE	

☐ **Hazardous Materials Review**
- Asbestos, lead, PCB's Surveys, plus estimated cost of abatement required needed for project
  - Use the University's Continuous Service Agreements (CSAs) for asbestos abatement and third party air monitoring
- Laboratory Decommissioning (chem., bio., and rad.) requirements
  - See Facilities / EH&S checklist	

☐ **Fire Marshal and Life Safety Requirements** - Anticipated hazardous material inventories and maximum quantities of each chemical (including their hazard class) - Total maximum quantities of flammable liquids (and other hazard classes) by control area per floor of building, and by room - Compare International Code Requirements vs. agreed variance with local jurisdiction - Wet labs on lower floors, below floor five - No material, equipment, combustible material, furniture in egress corridors; - Emergency signage and emergency egress requirements - Location of fire extinguishers - Responsibility for installing fire extinguishers - Fire Department Access	

- Siamese Connections - Fire lanes around building - Fire hose connections/Knox box - Fire (& CO) detection and suppression systems - Approvals by Building and Fire Code Officials	
☐ **Equipment** Potentially hazardous equipment to include but not limited to (circle or highlight): - UV lighting - Lasers (Class 3 or higher) - High temperature, high pressure equipment - Cell sorters - Autoclaves/Sterilizers - Chemical fume hoods - Biological safety cabinets (BSCs) - Down draft tables - Sterilizers - Research magnets - Infectious animal and non-human primate vivariums - Combustion facilities, such as coal gasification research - Toxic, pyrophoric, flammable or oxidizer compressed gas use - Cryogenic liquid, such as liquid nitrogen and helium, use	**Description - Comments**

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☐ **Biological Safety (requirements for)** - Biological Safety Level 3 or 3+ (BSL3/BSL3+) Laboratories - Animal ABSL3/ABSL+3 - Select Agents and Toxins - DEA Controlled substances - Ability to isolate HVAC systems to do CDC/UDSA required testing that demonstrates the laboratory space does not reverse airflow during supply and exhaust fan shutdown/power failure; also demonstrates redundant HVAC systems capability, if required.	
☐ **Radiation Safety:** - Specialized radioactive material production or use Machines: Cyclotrons, Linear Accelerators, View Ray, High Dose Brachytherapy, Gamma Knife, Proton Beam, e - Research and Clinical Magnets – Nuclear Magnetic Resonance (NMR), Magnetic Resonance Imaging (MRI) and other - Shielding calculations - Decommissioning of existing facilities - Lead shielding safety	
☐ **Smart design** - Easy maintenance access – e.g. of changing lights in atriums, cleaning glass/windows and ledges in tall atriums, access to shut-off valves and tempered water valves for safety eyewashes and showers, ease of cleaning in laboratories, clinics, shops and rest rooms, ease of repair of equipment or addressing water leaks, shut-off of high pressure steam and electricity for maintenance work, etc. - Strongly consider including interstitial mechanical spaces outside of BSL3, animal vivarium and airborne infectious disease spaces so mechanical and HVAC equipment can be repaired without the need to shut down research and doing costly room disinfections. - Design of laboratories and clinics to keep Food & Drink areas, including desks and offices, out of laboratory and clinic spaces - Where possible, follow NIH facility design criteria, as it tends to be industry standard for research settings	

☐ **General Design** - Floor and counter material – chemically resistant, easy to clean - Utility shutoff locations - Flooring and step slip coefficients, wet and dry - Maintain good indoor air quality (IAQ)	
☐ **American with Disabilities (ADA) requirements**	
☐ **Emergency Assembly Points**	
☐ **Clinical Safety** - Renovation – impact on immunosuppressed patient Infection Prevention requirements - Follow WUSM/BJH Infection Prevention requirements for construction, renovation and repair.	

II. Lab Design Checklist

Architectural/Layout Considerations

Research laboratories must be designed to support the equipment, materials and animals necessary for the proposed research and should be designed with flexibility for future projects as the type of research or occupants change. These laboratories must also be designed to promote safety and compliance.

- Eating/drinking/food storage areas, including desks and offices, must be separate from areas containing hazardous materials and access must be provided from a clean corridor (see http://ehs.wustl.edu/resources/EHS%20Documents/Eating%20Drinking%20and%20Related%20Activites%20in%20Laboratories.pdf)
- Secure storage locations must be provided in clean areas for storage of personal items (coats, bags, food, etc.)
- Room construction must meet the specifications outlined in Biosafety in Microbiological and Biomedical Laboratories and the NIH Guidelines For Research Involving Recombinant Or Synthetic Nucleic Acid Molecules for the biosafety level designated for the room.
- *Doors must be* lockable, yet allow emergency egress
- Secure, temperature-appropriate storage must be provided for work with DEA Controlled Substances or radioactive materials
- Meet recommendations of the National Research Council Committee on Laboratory Safety Culture and Prudent Practices in the Laboratory.

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☐ **Laboratory and Clinical Design** - Designed to keep food and drink out of labs/clinics; keep coats and personal items out, keep contaminated lab coats/gloves, etc. in - NIH design requirements (NIH funded laboratory and clinical projects are required to comply with NIH design standards) - No carpets, negative pressure relative to corridors, etc. - special use (Please describe) - Fume hood and biosafety cabinet (BSC) placement relative to traffic patterns and room air supply and exhaust - Eyewash / safety showers – tempered, easy access, inside labs, placement - Gas cabinet(s) for toxic gas use - Sensor and alarm system requirements for toxic gasses, cryogenic gasses - Adequate number of storage cabinets for segregation of hazard classes of chemicals and wastes - Security requirements for Drug Enforcement Agency (DEA) Controlled Substances, Nuclear Regulatory Commission (NRC) material, Department of Homeland Security (DHS) Chemicals of Interest (COI), Center for Disease Control and Prevention (CDC), US Department of Agriculture (USDA) and National Institutes of Health (NIH) Dual-Use Research of Concern, export controls, Select Agents and Toxins, research magnets, high power lasers (class 3 and 4), etc. - Design in flexibility to accommodate future use of lab and clinic space – increase or lower air changes, need for fume hoods, eyewash and showers, containment, blowout panels, intrinsically safe electrical systems, localized/specialized exhausts; formaldehyde use, etc. - Extremely toxic, poison by inhalation hazard (PIH), pyrophoric, reactive material use - Research requirements with regards to vibration, noise, dust, electrical fields - BSL3 requirements – pressure differentials; testing requirements (shut down of supply and exhaust, without reversal of airflow); kill tanks; pass-through autoclaves; hands-free operation of sinks and eyewash - Smart lab energy conservation flexibility	

- Adequate storage for biological/infectious/medical, chemical, and radioactive waste	
☐ **Emergency Equipment:** - Fire extinguisher type and placement - Fire detection and proper suppression systems - Smart detection – carbon monoxide, where needed - Voice annunciators over fire panel system – tie into emergency announcement system - Quenching monitoring system – displacement of O2 – alarms and increase air supply - Emergency lighting - Number of egress doors from labs and corridor length to exit stairwell - Safety and security controls – research magnets, ELF, UV, lasers, cyclotrons, cell sorters, etc. - Emergency power where needed - updating signage; seal wall penetrations with fire proofing material	
☐ Meet AAALAC, BNDD, Building Code, CAP, CDC, City/County/State Ordinance, DEA, EPA, Fire Code, Infection Prevention, MDNR, NIH, NRC OSHA, The Joint Commission, USDA and other regulatory and accreditation requirements	
☐ Other	