Chapter 16.5
HAZARDOUS AREA SAFETY INSPECTIONS

A. References

1. Safety Policies and Procedures Manual (SPPM) Chapter 4, Laboratory Safety
2. Environmental Health and Safety Laboratory Safety Manual
3. Laboratory Safety Inspection Checklist
4. Washington Administrative Code (WAC) 296-155-020 Housekeeping
5. Resource Conservation and Recovery Act (RCRA)
6. Chapter 16.5 Appendix A: Explanation of Conditions for Tier-1 Extra Hazard Classification
7. Chapter 16.5 Appendix B: Determining if a Chemical is a Particularly Hazardous Substance Using Its Safety Data Sheet (SDS)

B. Scope

Hazardous area safety inspections identify and control workplace hazards and ensure compliance with University policies and regulatory requirements. This chapter applies to all hazardous areas in the College of Arts and Sciences (CAS).

A **hazardous area** is any space within the College of Arts and Sciences where activities, materials, or equipment present potential physical, chemical, biological, human health, or environmental risks that require specialized safety protocols, protective equipment, or training beyond standard office or classroom settings.

Spaces that do not meet the hazardous area criteria are not considered to be tiered spaces and may use the General Safety Inspection Checklist for annual safety inspections. See CAS APP Chapter 16, General Safety Inspections, for more information.

C. Classification – Tier 1 (Extra Hazard) vs. Tier 2 (Ordinary Hazard)

Hazardous areas are classified as Tier 1 (Extra Hazard) or Tier 2 (Ordinary Hazard) based on the hazard criteria listed in this chapter. Employees with direct responsibility or authority over a hazardous area are responsible for reviewing the classification whenever hazards change. They are also responsible for notifying the unit safety committee of any change that would move the space from Tier 2 to Tier 1. The unit safety committee (or unit director/chair) makes the final classification determination.

A hazardous area is classified as Tier 1 if a credible accident involving the materials, equipment, or processes present in the spaces being considered could reasonably result in serious injury or illness, significant property damage, or major environmental release.

Examples of conditions that typically place a space in Tier 1 (one is sufficient):
See Appendix A for more information on conditions for Tier-1 classification.

- Use or storage of particularly hazardous substances (acutely toxic, carcinogenic, reproductive toxins, select agent toxins, P-listed wastes, etc.)
    - See Appendix B for more information

- Pyrophoric, water-reactive, explosive, or large quantities of un-stabilized peroxide-forming chemicals
- Heating or intentional ignition of flammable liquids (flashpoint below 100°F (38°C)) or flammable gases
- Storage of large quantities of flammable liquids
- Radioactive materials or radiation-producing machines (e.g., X-ray diffractometers)
- Class 3B or Class 4 lasers
- High-powered magnets (>0.5 T accessible static field)
- High-voltage systems or pulsed-power systems capable of serious injury
- Non-standard vacuum or pressure systems whose failure could cause serious injury (beyond routine lab glassware or autoclaves)
- Nanoparticle synthesis or heavy use of engineered nanomaterials with poorly characterized inhalation risk
- Operation at Biosafety Level 2 (BSL-2) or higher
- Use, storage, or dispensing of DEA Schedule I or Schedule II controlled substances
- History of serious incidents or repeated significant findings in the past five years

All other hazardous areas are classified as Tier 2 (Ordinary Hazard).

D. Safety Inspection Types

Self-Inspection

- An internal safety review conducted by the Principal Investigator (PI), lab manager, or trained designee (or manager for hazardous material storage areas) using the current EH&S Laboratory Safety Inspection Checklist or an approved version adapted for non-laboratory hazardous areas. The checklist must be fully documented, signed, dated, and submitted/retained as required in Section G.

Formal Inspection

- A comprehensive safety inspection coordinated, scheduled, and led by the unit safety committee or, when the committee is unable to perform this role, by the unit director or chair. An EH&S representative participates to provide technical guidance and consistency. The inspection is conducted using the current EH&S Laboratory Safety Inspection Checklist in the presence of the PI (or manager for hazardous material storage areas). Formal inspections are required every other year for Tier 1 spaces only.

E. Safety Inspection Frequency

All Tier-1 and Tier-2 hazardous areas in CAS are inspected annually. Centralized Waste Accumulation Areas may require weekly inspections.

Tier-1 hazardous areas

- Annual inspection required. Formal inspection (unit-led with EH&S participation) every other year; documented self-inspection in intervening years. See Section C and Appendix A for examples.

Tier-2 hazardous areas

- Safety inspections occur every year. Tier 2 hazardous areas conduct documented self-inspections using the EH&S checklist annually. EH&S may perform spot-checks as needed.

Centralized Waste Accumulation Areas (CWAA)

- Weekly inspection when active, conducted by EH&S-trained CWAA operators using the online EH&S form.

F. Inspection Procedures

- All inspections of hazardous areas use the current EH&S Laboratory Safety Inspection Checklist or an approved version adapted for non-laboratory hazardous areas.
- Formal (Tier 1) inspections are scheduled by the unit safety committee or unit director/chair and conducted with EH&S participation and the PI or hazardous area manager present.
- Self-inspections are performed by the Principal Investigator, lab or space manager, or a trained designee—individuals with direct responsibility for and authority over the hazardous area.
- EH&S provides training and guidance on request.

G. Documentation, Review, and Corrective Action

- Completed reports (self or formal) must be submitted within 30 days to:
  - College safety committee chair
  - Unit safety committee chair
  - Faculty researcher/PI or hazardous area manager whose space was inspected
  - Unit chair or director
  - Unit administrative office (for retention)
- Reports are retained according to University records-retention policy.
- The unit safety committee reviews all reports at its next meeting scheduled.
- Serious or egregious deficiencies trigger an immediate safety committee meeting.

H. Follow-up and Closure of Findings

- All deficiencies identified during self-inspections or formal inspections must be corrected as soon as practicable and no later than 30 calendar days after the inspection report is issued, unless a written extension is granted by the unit safety committee and approved by the unit chair/director for items requiring procurement, construction, or other justified delays.
- The Principal Investigator, area manager, or designee with direct responsibility and authority for the hazardous area must document corrective actions taken (e.g.,

photographs, receipts, updated SOPs, training records, maintenance logs) and submit evidence of abatement to both the unit safety committee chair and the unit chair/director.

- The unit safety committee reviews abatement documentation at its next meeting. Items remaining open beyond the deadline (or approved extension) will be escalated by the unit safety committee chair to the unit chair/director and the college safety committee chair. The unit chair/director, in consultation with EH&S and the college safety committee chair as needed, may restrict access to the hazardous area, prohibit purchasing or receipt of hazardous materials, or suspend related activities until deficiencies are resolved.

I. Workplace Hazard Assessment

Supervisors must maintain a current Standard Workplace Hazard Assessment Certification Form (Chapter 24, Personal Protective Equipment) and review it whenever tasks or hazards change.

Employees observing safety concerns should contact their supervisor or use the CAS Report a Concern tool.

Appendix A
Explanation of Conditions for Tier-1 Extra Hazard Classification

- Meeting one condition is enough to classify a space as Tier-1 Extra Hazard.
- This list is not exhaustive.

Use or storage of particularly hazardous substances (acutely toxic, carcinogenic, reproductive toxins, select agent toxins, P-listed wastes, etc.)

- A properly prepared, Globally Harmonized System (GHS)-compliant Safety Data Sheet (SDS) will explicitly tell you if a chemical falls into "particularly hazardous substance" (PHS) categories or P-listed wastes. It does this in three places:
    - Section 2 – Hazard(s) identification
    - Section 11 – Toxicological information
    - Section 15 (Regulatory information) will typically state: "RCRA P-listed hazardous waste" or list the exact P-code (e.g., P042 epinephrine, P001 warfarin, etc.).
- See Appendix B for more information on this section

Pyrophoric, water-reactive, explosive, or large quantities of un-stabilized peroxide-forming chemicals

- Substances that can spontaneously ignite in air or with water, detonate, or form shock-sensitive peroxides over time.
- SDS Section 2 or 10 will say:
    - Pyrophoric liquid/solid, water-reactive, explosive, or organic peroxide.
    - Examples: tert-butyllithium, silane, picric acid (dry), un-stabilized THF or diethyl ether stored past expiration.

Heating or intentional ignition of flammable liquids or flammable gases

- Deliberate heating of a flammable liquid (flash point < 100 °F / 38 °C) in an open or semi-open system where vapors can escape and encounter an ignition source (hot plate, heating mantle, oil bath, steam bath, reflux setup, rotary evaporator without explosion-proof design, open-beaker evaporation, etc.).
- Use of an open flame, torch, burner, kiln, furnace, or other ignition source that is directly fueled by a flammable gas (acetylene, propane, butane, hydrogen, natural gas, etc.).
- Any process in which flammable vapors or flammable gases are intentionally generated or released in the presence of an ignition source capable of causing rapid fire or flashback.
- Common examples that automatically push a hazardous area into Tier-1 status:
    - Rotary evaporation, reflux, or distillation of diethyl ether, pentane, acetone, hexane, THF, dichloromethane, or similar low-flash-point solvents
    - Heating flammable solvents on a hot plate, in an oil bath, or under open glassware
    - Running reactions in flammable solvents at temperatures above ~35°C
    - Bunsen burners, alcohol lamps, or spirit lamps in chemistry or biology labs
    - Oxy-acetylene, propane/oxygen, or MAPP-gas torches for welding, cutting, glassblowing, or brazing

- Gas-fired kilns, forges, or crucible furnaces in ceramics, sculpture, or foundry areas
- Hydrogen or natural-gas flame sources in instrumentation (e.g., flame-ionization detectors, atomic-absorption spectrometers) when the flame is exposed rather than fully enclosed

Storage of large quantities of flammable liquids

- Total combined volume of liquids with a flash point < 100 °F (38 °C) that exceeds 10 gallons (~38 L) in the space, regardless of container type or storage method (amounts inside flammable-storage cabinets, safety cans, refrigerators, or original shipping containers all count toward the 10-gallon threshold).

Radioactive materials or radiation-producing machines (e.g., X-ray diffractometers)

- Any licensed radioactive material (C-14, H-3, P-32, I-125, etc.) or X-ray machines, diffractometers, electron microscopes that produce ionizing radiation.

Class 3B or Class 4 lasers

- Lasers that can cause instant eye damage or skin burns (most research lasers above ~5 mW).

High-powered magnets (>0.5 T accessible static field)

- Large NMRs, MRI magnets, or custom superconducting magnets where people can get close to the fringe field.
- Typically 300 MHz NMR and above.

High-voltage systems or pulsed-power systems capable of serious injury

- Typically >1000 V or stored energy >10 J (e.g., capacitor banks, Tesla coils, high-power laser power supplies, electrophoresis rigs >5 kV used outside standard gel boxes).
    - Anything that requires special lock-out procedures or arc-flash labeling.

Non-standard vacuum or pressure systems whose failure could cause serious injury (beyond routine lab glassware or autoclaves)

- Large custom vacuum chambers, high-pressure reactors (>15 psig not rated as commercial pressure vessels), glass Dewars under high vacuum with implosion risk, etc.
    - Beyond ordinary lab glassware, Schlenk lines, or autoclaves.

Nanoparticle synthesis or heavy use of engineered nanomaterials with poorly characterized inhalation risk

- Making or routinely handling dry powders of metal/metal-oxide nanoparticles, carbon nanotubes, quantum dots, etc.
    - Examples are opening vials of dry nanopowder or generating aerosols.

Operation at Biosafety Level 2 (BSL-2) or higher

- Working with most pathogenic bacteria and viruses requiring BSL-2 containment.
    - Requires ORA approval and training.

Use, storage, or dispensing of DEA Schedule I or Schedule II controlled substances

- Examples are LSD, MDMA, fentanyl, cocaine, methamphetamine, many strong opioids and stimulants used in research.
    - Requires DEA research registration and controlled-substance license.

History of serious incidents or repeated significant findings in the past five years

- Area or space-specific compliance history (fires, exposures, major spills, repeated serious inspection violations).
    - Hazardous areas can move in and out of Tier-1 based on safety record.

Appendix B
Determining if a Chemical is a Particularly Hazardous Substance Using Its Safety Data Sheet (SDS)

This appendix provides step-by-step guidance on reviewing a chemical's Safety Data Sheet (SDS) to determine if it qualifies as a particularly hazardous substance (PHS). PHS include acutely toxic substances, carcinogens, reproductive toxins, select agent toxins, and P-listed wastes under the Resource Conservation and Recovery Act (RCRA).

If a chemical meets any of these criteria, its use or storage in a space is sufficient to classify that space as Tier-1 Extra Hazard.

- SDS are standardized under the Globally Harmonized System (GHS) and must be provided by the manufacturer or supplier. Always use the most current SDS for the specific product in use.
- Focus on Sections 2 (Hazard(s) Identification), 11 (Toxicological Information), and 15 (Regulatory Information), as these explicitly indicate PHS classifications. If the SDS is unclear or incomplete, contact Environmental Health and Safety (EH&S) for assistance.
- Note: Not all hazardous chemicals are PHS. For example, corrosives or irritants alone do not qualify unless they also meet PHS criteria. Quantities matter for some hazards (e.g., large amounts of flammables), but for PHS, even small amounts trigger Tier-1 status.

Acutely Toxic Substances

- Definition: Chemicals that can cause serious injury, illness, or death from a single exposure (e.g., ingestion, skin contact, or inhalation) at low doses.
- How to Identify on the SDS:
    - Section 2 (Hazard(s) Identification): Look for "Acute toxicity" listed with Category 1, or 2. Key indicators include:
        - Signal word: "Danger" (for Categories 1 or 2)
        - Pictogram: Skull and crossbones
        - Hazard statements: H300/H310/H330 ("Fatal if swallowed/in contact with skin/inhaled"), H301/H311/H331 ("Toxic if swallowed/in contact with skin/inhaled")
    - Section 11 (Toxicological Information): Check for low LD50 (lethal dose for 50% of test population) or LC50 (lethal concentration) values, such as:
        - Oral or dermal LD50 ≤ 50 mg/kg (Category 1) or ≤ 300 mg/kg (Category 2).
        - Inhalation LC50 ≤ 100 ppm/4h for gases, ≤ 0.5 mg/L/4h for vapors/dusts (Category 1), or similarly low values for Categories 2-3.
        - Routes of exposure and symptoms like "may cause respiratory failure" or "rapid onset of symptoms leading to death."
    - Examples: Hydrogen cyanide (H300, LD50 ~6 mg/kg), sodium azide (H300, highly toxic by ingestion), phosgene gas (H330, LC50 ~5 ppm).
    - Tip: If the SDS mentions "high degree of acute toxicity" or requires special handling like glove boxes, it's likely a PHS.

Carcinogens

- Definition: Substances known or suspected of causing cancer in humans or animals.
- How to Identify on the SDS:
    - Section 2 (Hazard(s) Identification): Look for "Carcinogenicity" with Category 1A (known human carcinogen), 1B (presumed human carcinogen), or 2 (suspected). Key indicators:
        - Signal word: "Danger" (for Category 1) or "Warning" (for Category 2).
        - Hazard statements: H350 ("May cause cancer"), H351 ("Suspected of causing cancer").
        - May specify route, e.g., "May cause cancer by inhalation."
    - Section 11 (Toxicological Information): References to listings by authoritative bodies:
        - International Agency for Research on Cancer (IARC): Group 1 (carcinogenic to humans) or 2A (probably carcinogenic).
        - National Toxicology Program (NTP): "Known to be human carcinogen" or "Reasonably anticipated."
        - OSHA: Specifically regulated carcinogens (e.g., 29 CFR 1910.1003).
        - Evidence from animal studies or human epidemiology indicating tumor formation.
    - Examples: Benzene (H350, IARC Group 1), formaldehyde (H350, IARC Group 1), chromium(VI) compounds (H350, known lung carcinogen).
    - Tip: Even if not explicitly labeled, check for phrases like "contains a substance classified as carcinogenic" in mixtures.

Reproductive Toxins

- Definition: Chemicals that can adversely affect reproductive health, fertility, or fetal development, including mutagens that damage genetic material.
- How to Identify on the SDS:
    - Section 2 (Hazard(s) Identification): Look for "Reproductive toxicity" or "Germ cell mutagenicity" with Category 1A, 1B, or 2. Key indicators:
        - Signal word: "Danger" (for Category 1) or "Warning" (for Category 2).
        - Hazard statements: H340 ("May cause genetic defects"), H341 ("Suspected of causing genetic defects"), H360 ("May damage fertility or the unborn child"), H361 ("Suspected of damaging fertility or the unborn child"), H362 ("May cause harm to breast-fed children").
        - May specify effects like "developmental toxicity" or "effects on fertility."
    - Section 11 (Toxicological Information): Details on reproductive/developmental studies, such as:
        - Animal data showing birth defects, reduced fertility, or heritable genetic mutations.
        - Human evidence of miscarriages, birth defects, or sterility.
        - Listings by agencies like California Prop 65 for reproductive toxicity.
    - Examples: Lead compounds (H360, developmental toxin), thalidomide (H360, known teratogen), ethylene oxide (H340/H360, mutagen and reproductive toxin).
    • Tip: These often overlap with carcinogens; check both categories.

Select Agent Toxins

- Definition: Highly toxic biological toxins regulated by the U.S. Department of Health and Human Services (HHS) or USDA due to potential for misuse (e.g., bioterrorism). These are specific substances, not general categories.
- How to Identify on the SDS:
    - Section 2 (Hazard(s) Identification): May mention "select agent" or extreme toxicity, but not always explicit.
    - Section 11 (Toxicological Information): Extremely low LD50 values (often <0.1 mg/kg) and descriptions like "potent neurotoxin" or "lethal in microgram quantities."
    - Section 15 (Regulatory Information): Look for references to "CDC Select Agents and Toxins" list, 42 CFR Part 73, or requirements for special permits/registration.
    - Always cross-reference with the official HHS/CDC Select Agents list if the chemical is a toxin like botulinum neurotoxin or ricin.
    - Examples: Botulinum neurotoxin (LD50 ~1 ng/kg, select agent), tetrodotoxin (LD50 ~8 µg/kg, select agent), abrin (select agent toxin from plants). • Tip: These are rare in most labs; if suspected, contact EH&S immediately for regulatory guidance, as possession requires federal registration.

P-Listed Wastes

- Definition: Acute hazardous wastes under the Resource Conservation and Recovery Act (RCRA), specifically P-coded wastes that are highly toxic even in small quantities (e.g., discarded unused chemicals).
- How to Identify on the SDS:
    - Section 15 (Regulatory Information): Explicitly states "RCRA hazardous waste" with a P-code (e.g., P001, P042). Look for phrases like "This chemical is listed as an acute hazardous waste under 40 CFR 261.33" or "P-listed waste when discarded."
    - No specific GHS hazard statement, but often overlaps with acute toxicity (e.g., H300).
    - Check the EPA's full P-list if not mentioned.
    - Examples: Warfarin (P001, rodenticide), epinephrine (P042, adrenaline), nicotine (P075), cyanide salts (P030-P031). • Tip: P-listing applies to unused/discarded pure chemicals or containers; even empty containers may be regulated.

Additional Resources

- If the SDS indicates any PHS traits but you're unsure about Tier-1 classification, contact EH&S for a review.
- If you have questions about a particular chemical, provide the SDS to your unit safety committee or EH&S.