

# **SAFETY INFORMATION**

Prepared by:

Staff of the Ferguson Structural Engineer Laboratory

**April 3, 2017**

**Revision 2**

**The University of Texas at Austin**  
**Ferguson Structural Engineering Laboratory**  
*Cockrell School of Engineering*

# Record of Revisions

Revision	Date	Affected Pages	Description
0	2016-06-13	All	Initial Issue
1	2016-07-15	18	Added section to discuss concealed carrying of firearms
2	2017-04-03	2, 4	Revised lab operating hours



Environmental Health & Safety

THE UNIVERSITY OF TEXAS AT AUSTIN

# Emergency Instructions For Laboratories

## Report All Lab Incidents to EHS

### 512-471-3511

Notify your Supervisor or Instructor



#### Chemical or Biological Spill

##### MAJOR SPILL/EXPOSURE

- If exposed, use emergency shower or eyewash, remove affected clothing immediately and rinse for 15 minutes
- Keep lab door closed
- Evacuate the area, if necessary
- Call UTPD, 911

##### MINOR SPILL

- Alert your co-workers
- Keep lab door closed
- Follow steps in your lab SOP or the Lab Safety Manual
- Contact EHS for assistance



#### Fire or Gas Leak

- Turn off gas if safe to do so
- Evacuate the area, if necessary
- Pull the nearest fire alarm and call UTPD, 911
- If appropriate, use fire extinguisher



#### Medical Emergency or Injury

##### LIFE THREATENING

- Call 911

##### NON-LIFE THREATENING

- Student-call UHS, 512-471-4955
- Employees-call OHP, 512-471-4647



#### Chemical or Natural Gas Odor

- Call EHS
- Be available to provide information to emergency personnel

### Complete the following information for your lab:

#### Location Information

Building: Ferguson Structural Engineering Lab Room Number: \_\_\_\_\_

Address: 10100 Burnet Road Building 24 or 9900 Neils Thompson Drive, Austin, TX 78758

Eric Williamson

PI: \_\_\_\_\_ Lab Phone: \_\_\_\_\_

#### Building Manager

Name: Mark Venti Office Location: PRC Bldg 24, Room 180A

Phone Number: 512-638-7193

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# CHAPTER 1

## Administrative

This safety information guide was developed for personnel involved in work associated with the Phil M. Ferguson Structural Engineering Laboratory (FSEL) at The University of Texas at Austin (UT).

### 1.1 MANAGEMENT STATEMENT OF SAFETY POLICY

The many challenging conditions and unique cases presented by research at FSEL must be managed in a safe and effective manner to fulfill research goals. Any incident involving equipment damage, property damage, personnel injury, or loss of life can prevent project completion; affect community goodwill; interfere with our ability to conduct research as an organization; and damage the image and reputations of the researchers, personnel, and institutions involved. The fundamental operating principle for an organization capable of fulfilling our difficult mission is an uncompromising commitment to safety.

The policies and procedures detailed in this document represent not only applicable federal and local legal requirements for workplace safety, but also the collective experience and understanding of our team of professionals as related to the maintenance of a safe and effective research environment. Personnel associated with FSEL operations are expected to maintain familiarity with this material, to abide by its specific policies, and to apply our central doctrine of safety to every work-related activity at all times.

### 1.2 TERMINOLOGY

**Administrative Staff:** Full-time staff employed at FSEL whose duties involve administration including appointments, purchasing, human resources, and management.

**Building 24:** The primary laboratory building at FSEL. A labelled floorplan of Building 24 is shown in Figure 1.

**Building 24b:** The storage building located West of Building 24 and North of Building 177.

**Building 46:** The storage building located South of Building 24.

**Building 177:** The administrative annex located West of Building 24.

**Faculty:** Faculty members that supervise research at FSEL.

**Elevated Work:** Any work that takes place on a ladder, scaffold, boom lift, or similar equipment that elevates workers more the 4 ft above the ground.

**FSEL:** Phil M. Ferguson Structural Engineering Laboratory.

**Heavy Lifting:** Lifting items in the lab using the overhead cranes or diesel powered forklifts.

**Immediate Hazard:** An immediate hazard exists if a reasonably careful person would realize that there is a danger of injury. Within FSEL, immediate hazard is interpreted as being in the same room as an activity that requires PPE. If any activity that would require PPE occurs within a room, all occupants of that room must also wear appropriate Tier II or Tier III PPE for the duration of the hazard, even if they are not directly involved in the activity.

**Lab Floor:** The main testing and fabrication area within FSEL Building 24.

**Lab Director:** Faculty member who oversees all aspects of the lab technical and administrative functions.

**Lab Manager:** Staff member who oversees lab operations.

**Lab User:** Any student, staff, or faculty member associated with FSEL.

**Light Duty:** Use of hand tools, rechargeable drills, and pneumatic grinders; strain gage installation; and electronics setup; a minimum of two students must be present on the lab floor if any elevated work is performed.

**PPE:** Personal Protection Equipment; typical FSEL PPE consists of hardhat, safety glasses, safety shoes, and long pants.

**PRC:** J.J. Pickle Research Campus of The University of Texas at Austin.

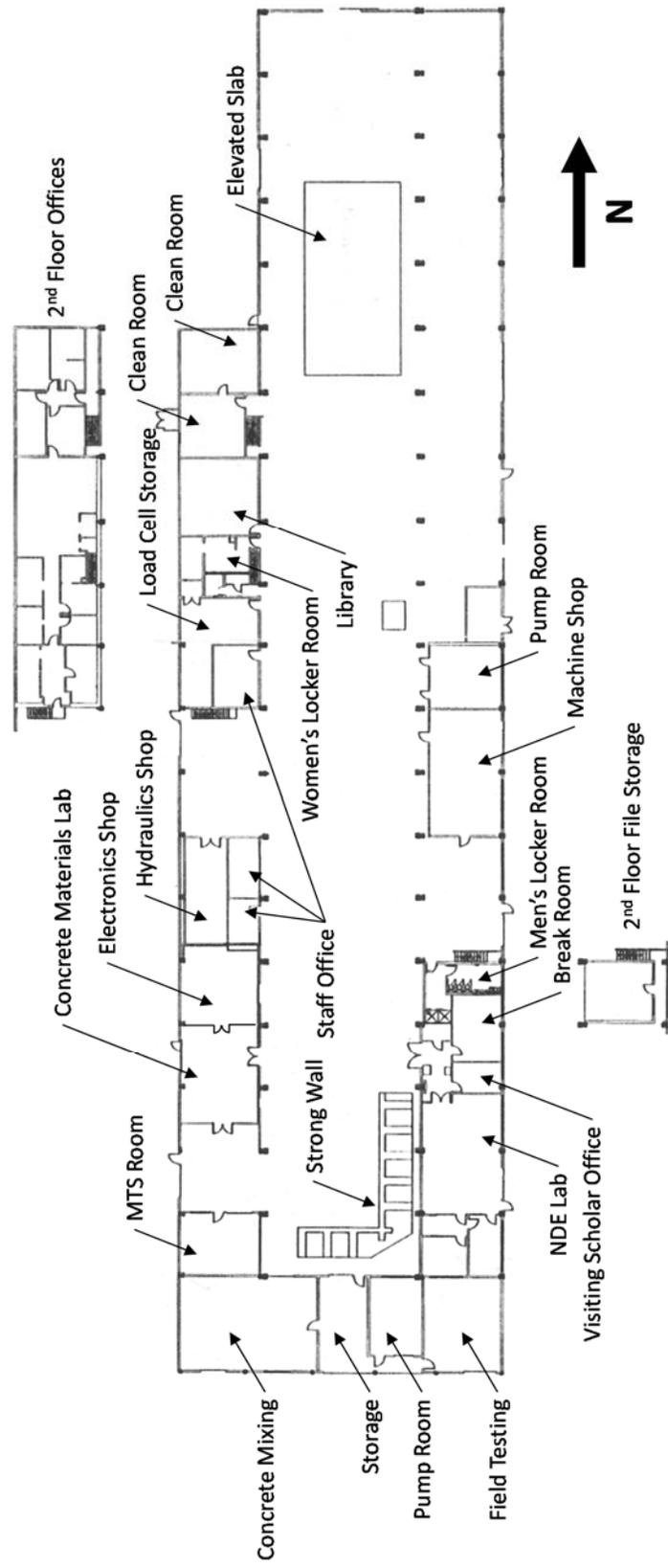
**Staff:** Full-time staff employed at FSEL.

**Students:** Graduate and undergraduate students working at FSEL.

**Technical Staff:** Full-time staff employed at FSEL whose duties involve laboratory operations including fabrication, testing, and disposal of test specimens; laboratory safety; heavy lifting; machining; welding; electronics; inventory; and management.

**UT:** The University of Texas at Austin.

**Visitor:** Someone visiting FSEL that is not a student, staff, or faculty member.



## **Figure 1: Floorplan of FSEL**

### **1.3 FSEL HOURS**

FSEL hours of operation are 7:30 am to 4:00 pm Monday through Friday, except official UT holidays or other occasions as specified by the laboratory director. Between 7:30 am to 4:00 pm, all activities are permitted within the laboratory including heavy lifting with staff assistance. Outside of these hours only light duty activities as defined in Section 1.2 or by the laboratory manager, are permitted within FSEL. During light duty hours, at least two people must be present on the lab floor. These people must remain in sight of one another and one person must always be capable of rendering or summoning aid if needed. Any user wishing to work outside the limits of light duty work after hours, on weekends, or holidays, must get all work pre-approved by the laboratory manager or laboratory director.

### **1.4 SAFETY STATEMENT**

This safety information guide was developed for FSEL students, faculty, staff, and visitors. Note that prior to engaging in any activities involving FSEL resources, users must complete safety requirements and training courses. In addition, users must sign the form provided in Appendix A to this document verifying that they have received the safety-training document and understood the material contained within.

### **1.5 STATEMENT OF RESPONSIBILITY**

Responsibilities of the various users of FSEL are outlined below.

#### **1.5.1 Safety Officer**

The safety officer has the primary authority and responsibility to develop and ensure implementation of a safety plan to ensure the health and safety of the faculty, staff, students, and visitors to FSEL. The FSEL laboratory manager serves as the safety office. This goal is accomplished by performing the following tasks:

- Analyze work procedures to identify potential hazards and then implement measures to eliminate or control those hazards,
- Communicate work place hazards and safety policies to employees and visitors,

- Establish and enforce safe operating procedures for job tasks,
- Provide proper safety equipment and personal protective equipment to employees,
- Report work-related fires, accidents, injuries, property damage, and unusual occurrences to EHS,
- Encourage prompt reporting of health and safety problems without fear of reprisal,
- Serve as a liaison with EHS and other campus safety resources on issues the department cannot resolve, and
- Ensure all training is completed before students begin work in FSEL.

### **1.5.2 All Staff, Students, Faculty**

Staff, students, and faculty have the responsibility to comply with FSEL policies, rules, and procedures. These responsibilities include:

- All safety, health, rules, policies, regulations, procedures, and directions will be followed,
- All hazardous conditions will be reported to FSEL technical staff,
- Protective equipment will be worn as required,
- No personnel will operate equipment or conduct any procedure without proper training and authorization, and
- All job related injuries or illnesses are to be promptly reported to facility staff. Prompt and appropriate medical treatment will be sought.

### **1.5.3 Visitors**

Visitors are present in Building 24 on a recurring basis. All visitor shall be escorted by an FSEL user and that FSEL users shall ensure visitors comply with safety requirements.

### **1.5.4 Rights of Laboratory Users**

If a safety concern is observed, laboratory users have the right to stop, alter, or refuse any task or operation of any piece of equipment that is being performed by any laboratory user.

## 1.6 TRAINING

Prior to commencing work within FSEL, a series of online training courses must be completed. Those courses are:

- OH 101: Hazard Communication,
- OH 201: Laboratory Safety,
- OH 202: Hazardous Waste Management,
- OH 500: Machine Shop Safety,
- OH 505: Lift Training, and
- OH 204: Compressed Gasses.

After completion of these courses, new personnel must email a screenshot of his or her training record to the laboratory manager and the administrative manager. The administrative manager can then provide instructions and a voucher for purchasing safety boots.

Within the first academic semester of beginning work on the lab floor, all personnel must complete FF 205: Portable Fire Extinguisher Training and FF 205 is offered regularly at various locations on the UT Main Campus or PRC. To find times and locations, and to register for the course, go to: <https://fireprevention.utexas.edu/extinguishers/training.html>.

OH 102: Site Specific Safety Training will be offered periodically at FSEL by the laboratory manager, laboratory director, or both. This course will demonstrate safety-related issues unique to FSEL. FSEL personnel should take this course at the first opportunity it is offered after they begin work at FSEL.

Additionally, OH 238: Laboratory Safety Refresher must be completed on a recurring 3-year interval. This course is to be taken online at: <https://ehs.utexas.edu/training/training-courses.php>.

No student, faculty, or staff is permitted to operate any piece of equipment without having received the appropriate training. FSEL technical staff will also provide training on an as-needed basis for the use of laboratory equipment and specific tasks.

Do not exceed your individual comfort level, if you are unsure of yourself or are not certain of the hazards and proper procedures associated with your tasks – get help from a member of the FSEL technical staff. Laboratory tools and equipment require careful attention.

## 1.7 ACCIDENT RECORDKEEPING

All accidents or injuries are to be reported to the laboratory manager for immediate response and treatment. The laboratory manager takes the following recordkeeping actions:

- Immediately informs the FSEL technical staff via any available means and
- Informs the administrative staff as soon as possible depending on the severity of the accident but no more than 24 hours after an accident.

The FSEL administrative staff will complete the necessary documentation and transmit it to the appropriate contacts within UT. Accident documentation should be kept on file to aid in site safety reviews and the identification of accident trends.

## 1.8 ACCIDENT INVESTIGATION AND ANALYSIS

In the event any incident occurs relating to FSEL operations involving significant property damage, significant equipment damage, injury, loss of life, or other medical emergency, the laboratory manager will conduct an immediate field review of operating conditions and safety procedures and will affect any necessary changes to prevent recurrence of the incident and limit secondary effects, in consultation with the laboratory director if possible.

The laboratory manager will then conduct a site-wide procedural review for updating operating practices and safety policy to reflect knowledge gained in the incident and to limit or eliminate future likelihood of occurrence. The laboratory director will immediately disseminate these updates to all FSEL personnel in the form of email bulletins and a revised safety manual.

## 1.9 EMERGENCY PLAN

The University of Texas Office of Campus Safety and Security has developed extensive emergency planning for a variety of scenarios, available at

<http://www.utexas.edu/safety/preparedness/plans/>. These plans address the following topics:

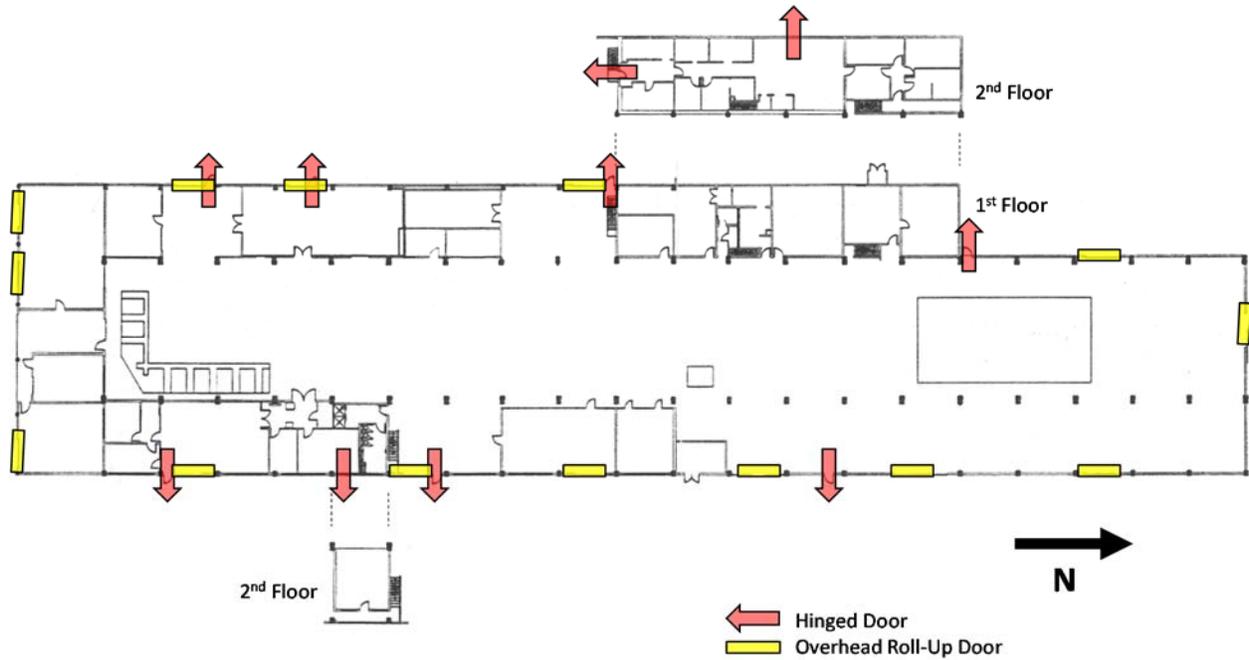
- **Emergency Management Plan:** a step-by-step guide explaining UT's official course of action in the event of fires, evacuation, terrorism, threats of violence, transportation accidents, and others. The plan contains information about the different levels of emergencies and outlines the corresponding roles of different university departments.

- **Infectious Disease Plan:** a step-by-step guide explaining UT's official course of action in the event of a pandemic outbreak. The plan contains information about the different levels of a pandemic and outlines the corresponding roles of different university departments.
- **Severe Weather and Hurricane Plan:** a step-by-step guide explaining UT's official course of action in the event of flash flooding, lightning, hail, tornadoes, high temperatures, strong winds, frozen precipitation, cyclones, and cold temperatures. The plan contains information about the different levels of severe weather and outlines the corresponding roles of different university departments.
- **Building Emergency Plan:** a customized emergency plan is available for each building on campus. The plan is important because certain emergency conditions may present the need to evacuate a building or to seek shelter in buildings. Pre-planning and rehearsal are effective ways to ensure that building occupants recognize the evacuation alarm, the outdoor warning system and other emergency communications, and know how to respond.

These plans represent official FSEL policy concerning disaster planning, emergency preparedness and response. All FSEL personnel are required to review and familiarize themselves with this material.

### **1.10 EVACUATION OF FSEL**

A building floorplan along with emergency exits is shown below.



**Figure 2: Floorplan of Building 24**

To evacuate FSEL and PRC by vehicle use one of the following Routes (Figure 3):

- Preferred Route
  - Proceed East on Read Granbury Trail
  - Turn Left (North) on Exploration Way
  - Exit PRC onto Braker Lane
- Alternate Route
  - Proceed East on Read Granbury Trail
  - Exit PRC onto Burnet Road
- Alternate Route
  - Proceed South on Niels Thompson Drive
  - Exit PRC via on Neil's Thompson Drive.



**Figure 3: PRC Evacuation Routes from FSEL**

### 1.11 PARTICIPATION

All FSEL students, faculty, and staff are required to read this safety manual. All personnel are involved in safety policy creation via regular employee meetings and the feedback process of

daily operations. Users must sign the form provided in Appendix A to this document verifying that they have received the safety-training document and understood the material contained within.

### 1.12 JOB HAZARD ANALYSIS

A hazard is the potential for harm. In practical terms, a hazard often is associated with a condition or activity that, if left uncontrolled, can result in damage, injury, or illness. Identifying hazards and eliminating or controlling them as early as possible will help prevent damage, injuries, and illnesses. Job hazard analysis is a technique that focuses on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment. Ideally, after you identify uncontrolled hazards, you will take steps to eliminate or reduce them to an acceptable risk level.

The Occupational Health & Safety Administration (OSHA) publication 3071 addresses job hazard analysis for employees, supervisors and management. A copy of this document can be found at <http://www.osha.gov/Publications/osha3071.pdf>.

FSEL technical staff has performed a Job Hazard Analysis identifying common field and shop tasks, attendant safety hazards, and appropriate action to mitigate such hazards. The results inform practices and procedures throughout this safety manual. A list of specific hazards is provided below for personnel familiarity. The hazards detailed must be communicated to all persons participating in the following tasks.

<b>Job Task</b>	<b>Task Hazards</b>	<b>Preventative Actions</b>
Crane operation, rigging, and/or moving load	<ul style="list-style-type: none"> <li>• Struck by moving or falling load</li> <li>• Crushing injuries</li> <li>• Damage to equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Never stand in a crush-point or under any suspended load</li> <li>• Use required PPE</li> <li>• Use teamwork for rigging</li> <li>• Verify rigging capacities and working loads</li> <li>• Prepare a rigging plan</li> </ul>
Specimen testing	<ul style="list-style-type: none"> <li>• Specimen failure (i.e., spalling concrete or bolt failure)</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Keep nonessential personnel at a safe distance from the test</li> <li>• Provide protective shielding to protect personnel and equipment</li> </ul>

<b>Job Task</b>	<b>Task Hazards</b>	<b>Preventative Actions</b>
Tensioning specimen to strong floor or strong walls	<ul style="list-style-type: none"> <li>• Smashing hand against surfaces while using a ratchet or wrench</li> <li>• Ergonomics (strain)</li> <li>• Equipment failure</li> <li>• Potential for heat stroke</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Be aware of your surroundings</li> <li>• Work slowly</li> <li>• Take breaks if physical activity is too high</li> </ul>
General working (walking and working throughout the lab area)	<ul style="list-style-type: none"> <li>• Tripping, slipping, or walking into objects</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Cover cords and cables</li> <li>• Immediately take care of any spills</li> <li>• Practice good housekeeping</li> </ul>
Working in an enclosed space	<ul style="list-style-type: none"> <li>• Heat exhaustion</li> <li>• Impact injuries</li> <li>• Cuts</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Take breaks</li> <li>• Drink plenty of fluids</li> </ul>
Working at elevated heights	<ul style="list-style-type: none"> <li>• Potential to fall</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Understand your limitations, be aware of your surroundings,</li> <li>• Use appropriate fall protection,</li> <li>• Notify staff if you are uncomfortable working at heights</li> </ul>
Operating and working from lifts, scaffolding, or ladders	<ul style="list-style-type: none"> <li>• Potential to fall</li> <li>• Impact injuries</li> <li>• Crush-points</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Never climb out of lift without using a fall arrest system</li> <li>• Do not stand on railings</li> <li>• Be aware of crush points between the lift's railing and other surfaces</li> <li>• Work slowly, know your limitations</li> </ul>

<b>Job Task</b>	<b>Task Hazards</b>	<b>Preventative Actions</b>
Lifting/moving materials	<ul style="list-style-type: none"> <li>• Strain to back</li> <li>• Dropping materials</li> <li>• Potential for cuts</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Know your limitations, do not lift over 100 pounds</li> <li>• Understand where your destination is and what your travel path will be</li> <li>• Use teamwork</li> <li>• Wear gloves when handling metal or sharp materials</li> <li>• Do not try to catch a falling object</li> </ul>
Specimen instrumentation	<ul style="list-style-type: none"> <li>• Skin and eye irritation</li> <li>• Falling objects</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Use latex gloves</li> <li>• Wash hands after using strain gauge glue.</li> </ul>
Forklift operation	<ul style="list-style-type: none"> <li>• Impact injury</li> <li>• Crushing</li> <li>• Falling objects</li> <li>• Rolling vehicle</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Only certified employees are allowed to operate the diesel forklifts</li> <li>• Only certified students are allowed to operate the electric forklifts</li> <li>• Be aware of surroundings while operating or working around an operational forklift</li> <li>• Do not stand in the operators blind spot</li> </ul>
Working with or around hydraulic equipment	<ul style="list-style-type: none"> <li>• Cutting or burns from high-pressure oil</li> <li>• Potential for slick spots on the floor</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Cautiously work around actuators and other hydraulic equipment</li> <li>• Never disconnect actuator hoses or components that may be under pressure</li> <li>• Use absorbent pads or oil dry to collect spilled oil</li> </ul>
Concrete/Grout handling (dry)	<ul style="list-style-type: none"> <li>• Skin, eye, respiratory hazards</li> <li>• Back strain</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Use latex gloves, dust masks</li> <li>• See manual lifting or lifting heavy materials</li> </ul>

<b>Job Task</b>	<b>Task Hazards</b>	<b>Preventative Actions</b>
Concrete/Grout handling/casting	<ul style="list-style-type: none"> <li>• Skin and eye hazards</li> <li>• Mechanical vibration</li> <li>• Hearing loss</li> <li>• Electric shock</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Minimize exposure to concrete vibrator</li> <li>• Use latex or rubber gloves due to burn potential from fresh concrete</li> <li>• Wash hands and exposed skin immediately following completion of work</li> <li>• Use gloves when using a vibrator to prevent skin burns</li> <li>• Use earplugs/ earmuffs</li> <li>• Keep extension cords and electrical connections dry</li> </ul>
Using FSEL tools	<ul style="list-style-type: none"> <li>• Mechanical injury</li> <li>• Mechanical vibration</li> <li>• Eye injury</li> <li>• Mechanical failure injury</li> <li>• Impact, cuts and hearing hazards</li> <li>• Electrical shock</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Take breaks to reduce exposure to vibrations</li> <li>• Know the limitations of power tool to avoid mechanical failure</li> <li>• Inspect and maintain the power tool</li> <li>• Do not wear loose clothing when operating rotating machinery</li> <li>• Tie back long hair when using power tools</li> <li>• Do not use power tools in wet or damp areas</li> </ul>
Welding or torching	<ul style="list-style-type: none"> <li>• Explosion</li> <li>• Burns</li> <li>• Electrical shock</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Keep area clear of any flammable materials or accelerants</li> <li>• Know where all fire extinguishers are located</li> <li>• Do not weld in wet or damp areas.</li> </ul>

<b>Job Task</b>	<b>Task Hazards</b>	<b>Preventative Actions</b>
Proper housekeeping and storage of materials	<ul style="list-style-type: none"> <li>• Creating airborne dust from sweeping</li> <li>• Impact injury from falling objects</li> <li>• Trip hazards</li> <li>• Forklift operation</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• Do not lean unstable objects against other objects or working surfaces</li> <li>• Do not leave tools and materials on elevated work platforms or specimens</li> <li>• Use a vacuum for general cleaning</li> </ul>
Working with pneumatic equipment (i.e. tools and hoses)	<ul style="list-style-type: none"> <li>• Impact injury</li> <li>• Eye injury</li> <li>• Hearing loss</li> </ul>	<ul style="list-style-type: none"> <li>• Wear required PPE</li> <li>• If hose becomes cut and begins to whip, do not try to catch or stop hose</li> <li>• Immediately locate and shut off valve</li> <li>• Use hearing protection</li> </ul>

### 1.13 REMEDIAL ACTION

When safety issues are raised, the laboratory manager or laboratory director perform an analysis of each issue addressing the following points:

- Consider potential severity of loss,
- Evaluate the probability of a loss occurrence,
- Weight various control alternatives and decide on the best one,
- Assess the likely degree of control to be achieved,
- Determine the cost of control, and
- Justify the recommended control if major expenditures are involved.

These points inform appropriate safety policy revisions that are immediately disseminated to all personnel via email or in-person tailgate meetings. Follow-up actions are then scheduled as follows:

- Issue work orders for immediate correction of the safety issue if this can be done without major expenditure,
- Monitor the budgeting of resources via purchasing and provisioning feedback,
- Ensure that remedial action is taken in a timely fashion by adjusting workload prioritization,

- Monitor activity progress via in-person, phone or email requests for feedback,
- Check the effectiveness of implemented controls, and
- Give ample credit where credit is due. Safety is a prime concern for all personnel; individual recognition promotes awareness of this principle.

Immediate feedback is expected from actions taken to effect the revised policy, and a follow-up review scheduled within the same work week to gauge policy effectiveness and to formulate and prioritize any further required corrective action.

#### **1.14 SAFETY RULES AND ENFORCEMENT**

All FSEL personnel monitor each other's actions as relevant to this document and professional standards of safe conduct. Unsafe conditions or behaviors are to be immediately reported to the laboratory manager or laboratory director. Disciplinary action shall be determined by appropriate FSEL staff and faculty on an as-needed basis. Typical steps for enforcement of safety rules is:

- First Infraction: Verbal instruction from FSEL staff,
- Second Infraction: Meeting with student, staff, and supervising faculty member to discuss the infraction, and
- Third Infraction: disciplinary action to be determined by the laboratory director.

Any willful violation of FSEL safety rules or refusal to follow the directions of FSEL technical staff will result in an immediate suspension of the right to work within the facility.

#### **1.15 SAFETY SELF-AUDITS**

FSEL is a small organization and operates on a lateral management structure keyed on collaborative work and peer review. The laboratory manager, laboratory director, and all other personnel are typically in contact on a daily basis. The topic of safety is explicitly maintained in daily operational discussion. Information relating to safety is quickly passed throughout the organization. Safety policy and management judgment decisions are quickly disseminated to all employees.

## **1.16 SAFETY SELF-INSPECTIONS**

Each employee is responsible for conducting a safety inspection of their associated facilities, work, and office areas on a frequent basis at appropriate intervals during project preparation, execution, and debriefing. Issues noted during these inspections are corrected with a briefing of the corrective action made to the laboratory manager for integration into global safety policy.

All new employees will be informed by the laboratory manager on proper safety practices. All personnel are responsible for the site safety. If you see something that does not look safe, inform the laboratory manager immediately. Never make assumptions regarding safety; other people may not be aware that something is wrong or that they are being unsafe. It is everyone's responsibility to make safety a priority and to ensure that all safety practices are implemented.

## **1.17 HANDGUNS**

UT operating policy states:

*The concealed carry of handguns is prohibited in areas where the discharge of a firearm might cause great harm, such as laboratories with extremely dangerous chemicals, biologic agents, or explosive agents, and areas with equipment that are incompatible with metallic objects, such as magnetic resonance imaging machines.*

Building 24 contains compressed flammable gas cylinders. These cylinders meet the standard outlined by UT. Therefore, the carrying of concealed firearms within Building 24 is not permitted. Additional information can be found through the UT Campus Carry website at:

<https://campuscarry.utexas.edu/>.

## **CHAPTER 2**

### **Safety Policies and Procedures**

#### **2.1 CLEANLINESS**

A safe working environment is a clean environment. All FSEL personnel will be responsible for maintaining their work areas in a clean and orderly state and cleaning shall be done on a regular basis. Any request from FSEL staff to clean an area shall be addressed in a timely manner.

Maintain good housekeeping in all areas in which you work. No work is complete until cleanup is done. Debris, coolants, and lubricants put workers at risk of cuts, slipping, or falling, and can be a skin irritant. Clean up the work area with a broom, brush, and dustpan, and clean up all spills with absorbents, degreasers, or both. Avoid using compressed air to blow chips off machinery. Not only is this a hazard to the eyes, it forces material into the precision inner workings of the machine and often distributes coolant, oil, and chips over a larger area. Clean up the machine and sweep the floor area of any remaining chips.

There are designated fire egress walkways within FSEL that are indicated by black and yellow striped tape adhered to the floor. These walkways should be kept clear. Electrical cords and air hoses in use are permitted to cross these walkways. When not in use, all cords and hoses should be cleared from the designated walkways. PPE is required for personnel within these walkways.

Pushcarts, dollies, and hand trucks are intended for transporting loads and should not be used to store material. If necessary, materials should be stored on pallets such that they can be moved with the forklifts when needed.

#### **2.2 PERSONAL PROTECTIVE EQUIPMENT (PPE) AND CLOTHING REQUIREMENTS**

Personal protective equipment, or PPE, is designed to protect people from serious workplace injuries or illnesses resulting from contact with workplace hazards. PPE includes a variety of devices and garments such as safety glasses, hardhats, safety shoes, face shields, goggles, coveralls, gloves, vests, earplugs, and respirators. PPE requirements at FSEL are divided into three tiers as shown in Table 1.

**Table 1: Tier I, II, and III Minimum PPE Requirements at FSEL**

<b>Tier</b>	<b>Minimum PPE Requirements</b>
I	PPE as necessary to protect from immediate hazards as defined in Section 1.2
II	Safety glasses, safety shoes, and long pants
III	All requirements of Tier II plus a hardhat

Areas where each tier of PPE is required within FSEL are shown in Figure 4. These requirements shall be met during hours of operation. The only exception to these requirements is: safety shoes and long pants need not be worn for personnel movement between the laboratory entrance near the receiving area (Door 3W) and women’s locker room or the upstairs student offices and the women’s locker room; however wearing these items is recommended. Such movement shall be 1) kept to a minimum, 2) avoided entirely in areas where lifting or other potentially hazardous activities are actively occurring, 3) performed without stopping, and 4) performed while wearing hardhat and glasses. Outside of hours of operations, all areas of Building 24 shall require Tier I PPE.

The requirements in Figure 4 and Table 1 represent minimum requirements. If laboratory personnel are near an area requiring a higher tier of PPE and if work requiring that higher tier of PPE is actively occurring nearby, PPE requirements for higher tier area shall be required in the lower tier area until the work is completed. For example, if a person is in a Tier I zone and nearby a person in a Tier III zone is performing potentially hazardous work, the person in the Tier I zone shall wear Tier III PPE or vacate the area. Hazards within the laboratory do not recognize the PPE tier boundaries so personnel must act accordingly.

There are walking lanes marked on the floor of FSEL. These lanes represent fire egress routes that must be kept clear. These lanes do not alter or reduce PPE requirements; PPE must be worn even when in the marked fire egress routes subject to the previous paragraphs of this section.

Each person will be responsible for checking his or her PPE and verifying that each piece is in safe working condition. Any PPE showing signs of wear, having tears, breaks, or cracks shall be disposed of immediately to prevent use by any other personnel. Personnel who are unsure of what PPE should be used during specific operations or are unsure if their PPE is in need of replacement, should consult with the FSEL technical staff.

Depending on activities being performed in the laboratory, additional PPE, such as hearing protection, gloves, dust masks, or other equipment, may be needed. Various types of PPE are described in the following sections of this document.

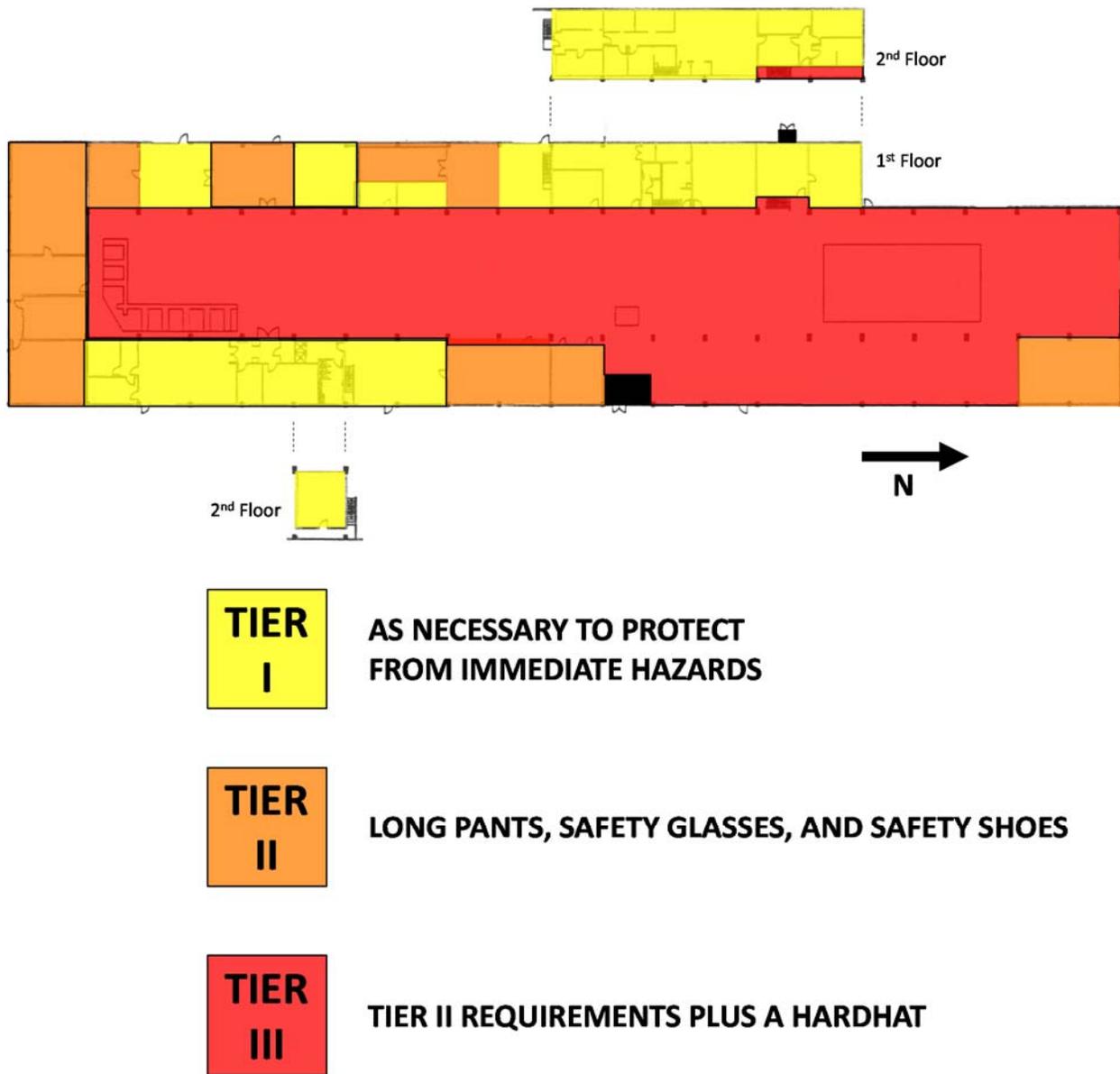


Figure 4: PPE Requirements with FSEL

### 2.2.1 Eye Protection

Students, faculty, and staff will be provided with safety glasses or goggles. Glasses or goggles shall be worn at all times when on the laboratory floor. For those that require prescription

glasses, safety glasses should be worn over the prescription glasses. FSEL users who wish to wear safety glasses over prescription glasses should contact FSEL technical staff for assistance. Some tasks, such as grinding or abrasion cutting, should be performed using a face-shield to protect the user's face as well as eyes.

Safety glasses used in FSEL shall comply with ANSI Z87.1. Safety glasses should be replaced after significant impact or damage.

### **2.2.2 Head Protection**

Hardhats can protect you from head impact, penetration injuries, and electrical injuries such as those caused by falling or flying objects, fixed objects, or contact with electrical conductors. In addition, OSHA regulations require employers to ensure that workers cover and protect long hair to prevent it from being caught in machine parts such as belts and chains.

Hardhat shall be worn during laboratory operating hours in areas designated in Figure 2. Outside of these hours, hardhats shall be worn as needed to protect from immediate dangers. Hardhats shall be worn correctly and baseball caps are not allowed under hardhats. A hardhat is provided to all FSEL students, faculty, and staff at the beginning of their work at FSEL. Hardhats that are damaged through use within the lab should be replaced. Contact the laboratory technical staff for a replacement hardhat.

Hardhats used in FSEL shall comply with ANSI Z87.1. Hardhats should be replaced every 5 years or after significant impact or damage.

### **2.2.3 Foot Protection**

Safety shoes can help prevent injuries by protecting you from hazards such as falling or rolling objects, sharp objects, wet and slippery surfaces, molten metals, hot surfaces, and electrical hazards. ANSI-rated safety toe footwear shall be worn during laboratory operating hours in areas designated in Figure 2. Outside of these hours, safety shoes shall be worn as needed to protect from immediate dangers.

UT Environmental Health and Safety (UT EHS) requires that closed-toe shoes be worn at all times in the laboratories. All shoes worn in the laboratory must have slip-resistant, non-absorbent soles. Sandals and perforated shoes are not allowed in the laboratory. Proper shoes reduce the potential for exposure to chemicals and injuries from broken glass and dropped items.

Safety shoes used in FSEL shall comply with ANSI Z41. Shoes should be replaced when they show significant signs of wear.

#### **2.2.4 Hearing Protection**

Exposure to high noise levels can cause irreversible hearing loss or impairment as well as physical and psychological stress. Wearing earplugs or earmuffs can help prevent damage to hearing. Earplugs made from foam, waxed cotton, or fiberglass wool are self-forming and usually fit well. Clean earplugs regularly, and replace those you cannot clean. Disposable earplugs are available in FSEL; contact the laboratory technical staff for additional information.

#### **2.2.5 Respiratory Protection**

When engineering controls are not feasible, workers must use appropriate respirators to protect against adverse health effects caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors. Respirators generally cover the nose and mouth or the entire face or head and help prevent illness and injury. A proper fit is essential, however, for respirators to be effective. In areas of dust, dust masks should be worn at all times; contact the laboratory technical staff for additional information.

#### **2.2.6 Skin Protection**

Workers exposed to harmful substances through skin absorption, severe cuts or lacerations, severe abrasions, chemical burns, thermal burns, and harmful temperature extremes will benefit from skin protection. In some cases workers must shield most or all of their bodies against hazards in the workplace, such as exposure to heat and radiation as well as hot metals, scalding liquids, body fluids, hazardous materials or waste, and other hazards. In addition to fire-retardant wool and fire-retardant cotton, materials used in whole-body PPE include rubber, leather, synthetics, and plastic. Contact the laboratory technical staff for additional information.

### **2.3 FIRE SAFETY**

The University of Texas at Austin Fire Prevention Services offers a variety of resources relating to fire safety and fire emergency management. Those resources can be found at <http://fireprevention.utexas.edu/safety/>. Personnel are directed to familiarize themselves with these resources; they represent official FSEL policy as regards to fire safety.

Within FSEL, there are lanes marked on the floor. These lanes represent fire egress routes that must be kept clear. These lanes do not alter or reduce PPE requirements. PPE must be worn even when in the marked fire egress routes.

Fire extinguishers are located in prominent marked locations throughout FSEL facilities and as shown in Figure 5.



**Figure 5: Fire Extinguisher Locations**

General building fire safety instructions are as follows:

- Rescue yourself first, and then assist others from the fire area if you are able to do so without placing yourself at risk,
- Announce the emergency to everyone in the fire area, and inform Fire Prevention Services or other relevant local fire prevention authority, and
- Contain the fire and resultant smoke by closing doors and windows leading to the fire area as you leave. This simple action can hold the fire back and keep smoke from entering adjoining areas, allowing time for everyone to escape.

## **2.4 MATERIAL SAFETY DATA SHEETS (MSDS)**

MSDS for most products are maintained in a visible, clearly marked receptacle in the center of the West wall of Building 24. The UT libraries maintain an extensive list of MSDSs that can be

accessed at <https://www.lib.utexas.edu/chem/info/safety.html>. Questions related to safe handling, storage, and disposal of materials should be directed to FSEL technical staff.

## **2.5 COMPRESSED GASSES**

Compressed gas storage in FSEL facilities includes flammable and non-flammable compressed gasses. Compressed gases are to be used only under the supervision of FSEL staff or by personnel trained and approved by the laboratory manager or director. Cylinders are to be refilled only by a commercial gas service provider. Cylinders must be inspected for leaks or damage upon each use and on a regular basis when in storage. Leaking or damaged cylinders must immediately be removed from service and returned to the provider. Gas cylinders must be strapped to an appropriate carrier or structure at all times. When the cylinders are not in use, they must be strapped to a stable, robust vertical support; any regulators, hoses or other apparatus external to the cylinders must be removed; and a manufacturer-approved protective cap must be installed over the valve or outlet of each cylinder. Compressed gas usage and storage must conform to OSHA 29 CFR 1910.101.

### **2.5.1 Combustible Materials Separation**

Cylinder storage and use locations must be kept clear of all weeds, grass, brush, and trash, as well as any other combustible materials, for a minimum distance of 5 m (15 ft) from all cylinders. Exception: an approved noncombustible barrier, cabinet, or hood may be used instead.

### **2.5.2 Cylinder Transportation**

Only standard DOT cylinders will be used for transporting compressed gas. Personnel who are trained to use compressed gases may use standard cylinder carts to transport cylinders within buildings and between adjoining buildings. Carts are preferred, but cylinders weighing 11 kg (25 lb) or less may be hand-carried. Valve-protection caps and plugs must be in place during movement of cylinders. Lecture bottles and other cylinders without protective caps must be transported in standard shipping crates, or an equivalent container. Gas cylinders must be transported between non-adjoining buildings by a person properly trained and equipped to transport gas cylinders.

### **2.5.3 Cylinder Position**

Gas cylinders must be stored in an upright (valve end up) position, which includes conditions where the cylinder is inclined as much as 45 degrees from the vertical. Exceptions include cylinders designed for use in a horizontal position, and cylinders with nonliquefied compressed gas that have a water volume less than 5 L (0.18 cf or 1.3 gal).

### **2.5.4 Cylinder Securing**

Gas cylinders must be secured to prevent falling due to accidental contact, vibration, or earthquakes. Cylinders must be secured in one of the following ways:

- By a noncombustible, two-point restraint system (e.g., chains) that secures the cylinder at the top and bottom one-third portions. Exception: cylinders less than 1 m (3 ft) tall require only one restraining point or
- By a noncombustible rack, framework, cabinet, approved strapping device, secured cylinder cart, or other assembly that prevents the cylinder from falling.

### **2.5.5 Cylinder Valves, Caps, and Plugs**

Gas cylinders designed to have valve-protection caps and valve-outlet caps and plugs must have these devices in place. Exception: when the cylinder is in use or being serviced. Gas cylinder valves must have a handwheel, spindle key, or other approved control handle on the valve stem while the cylinder is in use. Cylinder valves should be opened slowly. Cylinder valves seat in both the closed and open position and are likely to leak unless left in the fully open or fully closed position.

### **2.5.6 Unauthorized Cylinder Modification or Use**

All labels, markings, and tags provided on the gas cylinder by the manufacturer must be maintained in good condition. Gas cylinder parts must not be modified, tampered with, obstructed, removed, repaired, or painted by the gas user.

### **2.5.7 Empty Cylinders**

Gas cylinders should be left with residual pressure (i.e., typically 200 kPa or 30 psi) to prevent contamination of cylinder contents. Cylinders considered to be empty should be handled

with the same precautions as cylinders filled with gas because so-called “empty” cylinders still contain residual gas and pressure. Empty gas cylinders must be labeled “Empty” or “MT.”

### **2.5.8 Cylinder Changing**

Two people must be present during hazardous gas purge and cylinder change procedures. Reconnected gas fittings must be checked for leaks using a leak-detection fluid or other approved method.

### **2.5.9 Cylinder Temperature Control**

Gas cylinders should be stored in the shade and must not be exposed to temperatures exceeding 50°C (125°F).

## **2.6 FLAMMABLES**

Shop flammables are limited to cleaning solvents, aerosol paint, and other general-purpose chemicals. These are stored in clearly identified closed cabinets manufactured for that purpose, in accordance with OSHA 29 1910.106, and used according to manufacturer's instructions. Within FSEL, flammables are stored in two locations: 1) near the men’s locker room and 2) in the clean room. Both locations have clearly marked cabinets that should be kept closed when not in use.

## **2.7 CONFINED SPACES**

Work in confined spaces presents unusual and severe hazards to a sizable portion of the work force. Common tasks, such as welding, use of solvents and adhesives, live electrical work, or painting can quickly become lethal in a confined space. OSHA defines a confined space as a space that has the three following characteristics:

- Is large enough and configured such that an employee can enter and perform work;
- Has limited or restricted openings for entry and exit; and
- Is not designed for continuous employee occupancy.

A confined space is further defined as a space that meets both of the following conditions:

- Existing ventilation is insufficient to remove dangerous air contaminants, correct oxygen deficiency, or both; and
- Access to or exit from the space is difficult.

Laboratory personnel may be required to engage in projects where work is mandated and equipment installation in confined space is necessary. Consult with the laboratory manager or safety officer before performing any work in a confined space.

## **2.8 ELEVATED WORK**

In FSEL, there is often a need to work at elevations.

### **2.8.1 Fall Protection**

The personnel using the fall protection systems will be trained in the use, inspection, and limitations of the equipment before use. Details about fall protection are available through EHS at <https://ehs.utexas.edu/working-safely/safety-programs/fall-protection>

### **2.8.2 Ladders**

Safety hazards in the use of ladders can be substantially reduced by observing certain basic safety precautions as noted below:

- Painters' stepladders, or A-frame ladders, longer than 3.7 m (12 ft) should not be used.
- Wooden ladders are not permitted for use within FSEL.
- Ladders must be stored to prevent weathering, blistering, or cracking.
- All metal ladders must be legibly marked with signs reading "Caution - Do not use around electrical equipment."
- Portable straight and extension ladders must be used with slip-resistant shoes.
- Straight or extension ladders must be placed against a support at an angle such that the distance from the ladder base to the base of the support is one-fourth the distance from the base of the ladder to the height at which work will occur.
- Lash straight or extension ladders when used for access to high places.
- Face ladders when ascending or descending.
- Do not use a ladder as a scaffold.
- Do not place a ladder in front of a doorway, unless the door is blocked open, locked, or guarded.
- Do not place ladders on boxes or unstable bases to obtain additional height.
- Do not climb higher than the second step from the top of a ladder.
- Ladders with broken rungs or missing steps must not be used.

- Inspect all ladders before use.
- Report any defective ladders to the FSEL technical staff.
- FSEL technical staff must ensure that any ladder reported as defective or unsafe is removed from service.
- The use of a safety harness and lanyards is recommended when working higher than 8 ft. on a ladder or other high place.

Details about ladder safety can be found at:

<https://ehs.utexas.edu/working-safely/safety-programs/ladder-safety>

### **2.8.3 Scaffolding**

Scaffolds should be erected, moved, dismantled, or altered only under the supervision of the FSEL technical staff. Lab specific fall hazards vary as the laboratory is reconfigured on a frequent basis.

A scaffold-competent person shall supervise the erection, alteration, moving, or dismantling of scaffolding. Scaffolding shall be constructed in conformance with manufacturers' requirements. The installation should be on a solid surface, plumb and secured to a solid structure or otherwise adequately braced; the scaffold and, if needed, scaffold walk surface should be solid and constructed from materials specifically designed for that purpose. In all efforts to reduce accidents, personnel are required to use a safety harness while working at elevation.

### **2.8.4 Boom Lift**

Within FSEL only technical staff are allowed to move the boom lift. Once the lift is in the position where is needed, students, or others, will be instructed on how to raise, lower, and swing the lift as needed. In all efforts to reduce accidents, operators are required to use a safety harness while working at elevation. However, in the event of an equipment failure, cranes can be used in conjunction with a ladder to reach the stranded operator.

Before the boom lift is used, the laboratory safety officer or laboratory manager must review the circumstances to ensure proper use of equipment and approve its use. Proper use of equipment must be within the parameters of the vehicle's manufacturer manual.

#### ***2.8.4.1 Operating Conditions***

The extensible boom work platform must be operated under the following conditions:

- Two operators must be present at all times. One operator must be present on the work platform and the other must be on the ground and available to assist in the operation and perform any emergency duties.
- This unit must be inspected prior to each shift's use and must not be operated if found to be unsafe.
- All personnel occupying the work platform must wear an approved safety harness and lanyard properly attached to the equipment.
- Unless recommended for such use by the manufacturer, no extensible boom work platforms are to be used on an inclined surface. This equipment shall be used inside the FSEL on level ground.
- Unit must have control panels in the lift bucket and at its base.

#### ***2.8.4.2 Identification***

The following must be displayed on all work platforms in a permanent manner:

- Special warnings, cautions, or restrictions necessary for safe operation.
- Make, model, and manufacturer's name and address.
- Rated work load capacity.
- Maximum platform height.
- Instructions to study operating manual.

#### ***2.8.4.3 Inspections***

- Units must be inspected prior to each use. Inspections must include all items recommended by the manufacturer's manual.
- Preventive Maintenance: All maintenance on this piece of equipment is performed by a licensed mechanic at intervals no longer than recommended in the manufacturer's manual.

## **2.9 MANUAL LIFTING**

FSEL official policy prohibits manual lifting of objects weighing over 100 pounds. If a weight over 100 pounds must be moved or lifted, personnel must proceed according to one of the following courses of action:

- Disassemble or unpack the object into component pieces weighing less than 100 pounds.

- Enlist the aid of sufficient additional personnel to lift the weight such that no single person is lifting more than 100 pounds.
- Use provided hand trucks to move the weight under supervision of the FSEL staff and in accordance with manufacturer's directions. Do not to exceed the weight rating of the trucks as clearly marked.

## **2.10 MECHANICAL LIFTING**

Primary mechanical means to lift items at FSEL are forklifts and overhead cranes. Specific safety considerations for each of these are provided in the sections below.

### **2.10.1 Overhead Cranes**

Only trained FSEL technical staff are permitted to operate the overhead cranes.

Crane operators are responsible for:

- Knowing the hazards and precautionary procedures for their work area.
- Reporting any unsafe conditions or breach of procedural requirements to laboratory manager or laboratory director.
- Operating hoisting equipment safely.
- Conducting functional tests prior to using the equipment.
- Planning and conducting operations in accordance with established procedures and good safety practices.

The safety rules below apply to use of cranes at FSEL:

- The rated load of a crane must be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist must have its rated load marked on it or its load block and the marking must be clearly legible from the ground or floor. The large crane at FSEL has two hooks. The larger hook has a capacity of 25 tons and the smaller hook has a capacity of 5 tons. The smaller yellow crane has a single hook with a capacity of 10 tons.
- Both cranes are equipped with light that flashes yellow when the crane is in use.
- All hooks are equipped with a safety latch to prevent loads from bouncing off the hook.
- During hoisting, sudden acceleration or deceleration of the moving load is to be avoided.
- When hoisting, make sure the load does not come in contact with any obstructions.

- Cranes should not be used for side pulls except when specifically authorized by a responsible person who had determined that the stability of the crane is not thereby endangered and that various parts of the crane will not be overstressed.
- People in the vicinity of the crane should stop work and allow the crane to pass by unobstructed.
- The operator must avoid carrying loads over people.
- The load must not be lowered below the point where less than two full wraps of rope remain on the hoisting drum.
- When two or more cranes are used to lift a load, one qualified responsible person shall be in charge of the operation. That person must analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.
- Make sure the sling is well balanced. Avoid tip loading, and loading on hook latch.
- Never lift the load over the rated capacity.
- Do not operate with kinked, twisted or damaged chain.
- Never leave the suspended load unattended.
- Holding brakes on hoists shall be applied automatically when power is removed
- Replacement rope shall be the same size, grade, and construction as the original rope furnished by the crane manufacturer, unless otherwise recommended by a wire rope manufacturer due to actual working condition requirements.
- If a load is supported by more than one part of rope, the tension in the parts shall be equalized.
- Hooks shall meet the manufacturer's recommendations and shall not be overloaded.

### **2.10.2 Forklifts**

Operation of forklifts is restricted to trained personnel. Only FSEL technical staff who have completed the necessary training course may operate the diesel-powered forklifts. Only users who have been trained and certified by FSEL technical staff may use the electric forklifts. Training for the electric forklifts is typically offered once per semester. Anyone interested in receiving this training should contact the laboratory manager for more information. Training includes a combination of formal instruction, demonstrations, practical exercises performed by the trainee, and an evaluation of the operators' performance. Practical exercises must be performed under the direct supervision of trainers.

Each forklift is inspected before each use and is formally inspected by laboratory technical staff on a regular basis. Maintenance is performed by a certified forklift mechanic at intervals specific to each piece of equipment. Records of maintenance are available with the laboratory manager.

The following rules apply to use of forklifts at FSEL:

- Only authorized, trained personnel shall operate forklifts.
- Before use, a visual inspection must be made to ensure that horn, lights, brakes, tires, gas supply, hydraulic lines, etc. are in safe working condition. Employees shall not operate an unsafe forklift at any time.
- Fill fuel tanks out of doors while engine is off.
- Do not exceed the safe load capacity of a forklift at any time. Do not counterweight a forklift to increase lifting capacity.
- No person shall ride as a passenger on a forklift or on the load being carried.
- A forklift will not be used to elevate a platform or pallet with persons on it, except work platforms especially designed for this purpose. Work platforms must have standard guard rails, and must be securely fastened to the forks.
- No person shall stand or walk under elevated forks.
- Operators should avoid making jerky starts, quick turns, or sudden stops. The operator will not use reverse as a brake.
- Forklifts should be driven on the right side of the road or aisle way.
- Operators shall cross railroad tracks diagonally whenever possible.
- Forklifts shall be operated at a safe speed with due regard for traffic and conditions.
- Slow down on wet and slippery surfaces and at cross aisles or locations where vision is obstructed.
- Operators entering a building or nearing a blind corner shall make their approach at reduced speed. Sound horn and proceed carefully.
- Operators shall not drive toward any person who is in front of a fixed object or wall.
- Operators shall not overtake and pass another forklift traveling in the same direction, at intersections, blind spots, or hazardous locations.

- Operators should not put their fingers, arms, or legs between the uprights of the mast, or beyond the contour of the forklift.
- When the forklift is not carrying a load, the operator shall travel with the forks as low as possible. When carrying a load, it should be carried as low as possible (consistent with safe operation, 2 to 6 inches above the surface.)
- When lifting objects from below, forks should always be placed under the load as far as possible.
- No load should be moved unless it is absolutely safe and secure.
- The operator's view should not be obstructed by the load. In the event of a high load, the forklift will be driven backward.
- Operators shall look in the direction of travel.
- The forks should not be operated while the forklift is traveling.
- On a downgrade, the load shall be last, and the forks raised only enough to clear the surface.
- On an upgrade, the load shall be first, and the forks raised only enough to clear the surface.
- Use extra care when handling long lengths of bar stock, pipe, or other materials.
- Avoid sharp or fast end swing.
- Compressed gas cylinders shall be moved only in special pallets designed for this purpose.
- When unloading trucks or trailers, the brakes on the vehicle will be set (locked).
- Forklifts must be safely parked when not in use. The controls shall be neutralized, power shut off, brakes set, and the forks left in a down position flat on the surface, and not obstructing walkways or aisles.
- A forklift shall not be left on an incline unless it is safely parked and the wheels blocked.

## **2.11 USE OF TOOLS**

The use of power tools should be limited to personnel who have demonstrated a knowledge of the safe use of the equipment and who have been specifically authorized. The authority to operate any powered equipment at this facility shall be determined by the FSEL technical staff who will assess the operator's ability to handle the equipment efficiently and safely.

The following general rules apply to the use and maintenance of tools and machine equipment.

- Permit only qualified personnel who have necessary skills, through experience or training, to operate or maintain machine tools or machine equipment.
- All machine tools, power tools, and machine equipment must be fitted with all required guarding. Any questions about equipment guarding should be directed to FSEL technical staff.
- Operate and maintain machine tools, and machine equipment in accordance with the manufacturer's requirements, and the requirements of this section.
- Anchor and electrically wire all machinery and machine equipment designed by the manufacturer to be stationary. Only qualified electricians are permitted to install and remove wiring for hardwired shop machinery and machine equipment. Machine tools and machine equipment designed to be electrically connected by cord and plug are not subject to this requirement.
- Permit only qualified personnel or vendors to repair or otherwise service machine tools or equipment.
- Only operate machine tools when a second person is within sight or earshot of the tool user. This requirement is essential in case the operator gets caught in the machinery or suffers traumatic injuries. The second person need not be qualified to operate the equipment but does need to know how to turn off the equipment and how to call for emergency assistance. This second person must also agree ahead of time to perform such duties should the need arise.
- Ensure that all machine and tool guards are installed in place, are clean and in good working order, properly adjusted, and most importantly, used for their intended purpose. This requirement includes the use of chip shields for any drilling or cutting operations.
- Wear hearing protection, respiratory protection, or both as required by work authorization for operations that generate harmful noise, or airborne emissions. Contact the FSEL technical staff for assistance in determining which operations require such protection.
- Do not use audio equipment that obstructs the ear canal (e.g., earphones) or cell phone Bluetooth headsets while operating machine or power tools. Such devices distract the operator and can prevent him or her from hearing sounds that could provide warning of an unusual operating condition or someone calling out for assistance.

- Tie back or otherwise secure long hair; cuff or roll up long sleeves or other loose clothing, and remove or tape down loose jewelry when working with rotating machinery.
- Do not prepare or consume food or beverages in areas where hazardous materials (including oils, solvents, chemicals, cuttings, filings, and sawdust) are handled or generated.
- Where applicable, secure and clamp down work pieces in work-holding devices and machines, preventing the work from being lifted or dislodged.
- Use appropriate push sticks or other approved methods as indicated in the work authorization to keep hands and fingers well away from moving or rotating cutters, blades, and other points of operation.
- Turn off the machine before using a brush or wooden dowel to remove chips from the machining area. Chips are not only very sharp but can be hot and can snag. Do not remove chips with bare hands.

### **2.11.1 Fixed Power Tools**

Fixed power tools are power tools that are fixed to particular workbenches or work areas within FSEL. These include, but are not limited to, chop saws, table saws, panel saws, bench grinders, drill presses, milling machines, and lathes. Fixed power tools are used only by FSEL technical staff and personnel trained and approved by the FSEL technical staff.

Prior to operation, any fixed power tool must be inspected for safe and functional operation. Tools found deficient must be withdrawn from service via power removal or other warning notice, and the deficiency brought to the attention of the FSEL technical staff.

Appropriate clothing must be worn during use, including sturdy, closed-toed shoes; jeans or other sturdy long pants; and no loose-fitting clothing, jewelry or hair. Eye and ear protection is provided in accessible locations and must be worn while machines are in operation. Protective gloves are available if desired by tool operators.

All of the fixed power tools in FSEL are provided with guards to help prevent injury. Tools should not be operated with missing, deficient, or damaged guards. Any guards found in disrepair should be brought to the attention of the laboratory manager.

### **2.11.2 Portable Power Tools**

Portable power tools are to be used in accordance with manufacturer's directions and under the supervision of the FSEL technical staff. Prior to operation, the tool must be inspected for safe and functional operation and withdrawn from service if found deficient. Eye protection must be worn during operation and ear protection is recommended. Clothing must be maintained in an appropriate state for the hazards of the tool and the task at hand.

### **2.11.3 Hand Tools**

Hand tools are tools that are powered manually. Hand tools include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.

Some examples include the following:

- If a chisel and screwdrivers are used interchangeably, the tip of the tool may break and impact other employees.
- If a wooden handle on a tool, such as a hammer or an axe, is loose, splintered, or cracked, the head of the tool may fly off and strike the user or other employees.
- If the jaws of a wrench are sprung, the wrench might slip.
- If impact tools such as chisels, wedges, or drift pins have mushroomed heads, the heads might shatter on impact, sending sharp fragments flying toward the user or other employees.

All hand tools will be kept in a safe operating condition. Lab personnel shall not permit the use of unsafe hand tools. Students will be trained in the proper use and handling of hand tools. Staff and students, when using saw blades, knives, or other tools, should direct the tools away from aisle areas and away from other students working in close proximity. Knives and scissors must be sharp; dull tools can cause more hazards than sharp ones. Cracked saw blades must be removed from service. Wrenches must not be used when jaws are sprung to the point that slippage occurs. Impact tools such as drift pins, wedges, and chisels must be kept free of mushroomed heads. The wooden handles of tools must not be splintered. Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials should be used where flammable gases, highly volatile liquids, and other explosive substances are stored or used.

## **2.12 WELDING, GAS CUTTING, AND BRAZING**

Welding, gas cutting, or brazing operations are often performed in FSEL. FSEL maintains equipment for these purposes. These operations are performed by qualified FSEL technical staff or others specifically authorized by FSEL technical staff.

There are several hazards to consider when performing welding, brazing, or gas cutting operations. These hazards include fires, explosions, electrocution, burns, welder's flash, oxygen depletion, and toxic fumes. Do not look directly at welding arcs. Do not interrupt workers while they are welding, gas cutting, or brazing.

The laboratory manager or safety officer will be responsible to ensure their personnel are aware of these hazards and have taken adequate steps to prevent such an occurrence.

It is the responsibility of the person performing the welding, gas cutting, or brazing to ensure they use the appropriate equipment required to ensure safety during welding, gas cutting, or brazing operations. This includes personal protective equipment listed below:

- Respirators should be used when ventilation is less than adequate.
- Flame retardant clothing should be worn to prevent clothing from catching on fire.
- High top boots should be worn to prevent burns to the legs and feet.
- Gloves are recommended to prevent hand burns.
- All personnel are required to use an approved welder's shield or goggles. All shields must be ANSI (American National Standard Institute) approved and the proper shade for the type of operation being performed.

## **2.13 BLOODBORNE PATHOGENS**

FSEL research and other activities do not normally involve interaction with bloodborne pathogens. Unforeseeable personnel injury could potentially result in bloodborne pathogen exposure, and these cases should be managed in accordance with the guidelines below.

In the event human body fluids require clean up due to an injury, only trained personnel are allowed to clean up spills with approved clean up kits. If no trained personnel are present, secure the area and call the University Environmental Health and Safety department's 24-hour hotline at (512) 471-3511 for instructions.

All equipment and working surfaces must be cleaned and decontaminated using sanitizing cleanser after contact with blood or other potentially infectious material. If you get blood or other potentially infectious materials in your eyes, nose, mouth, or on broken skin:

- Immediately flood the exposed area with water, and clean any wound with soap and water or a skin disinfectant if available.
- Report this immediately to your employer.
- Seek immediate medical attention at UT Health Services or the nearest medical care facility.

More information regarding University of Texas at Austin policies for bloodborne pathogens can be found at the following link:

<https://ehs.utexas.edu/programs/biosafety/>.

## **2.14 HEAT STRESS**

When the body is unable to cool itself by sweating, several heat-induced illnesses such as heat stress or heat exhaustion and the more severe heat stroke can occur, and can result in death.

### Factors Leading to Heat Stress

- High temperature and humidity.
- Direct sun or heat.
- Limited air movement.
- Physical exertion.
- Poor physical condition.
- Some medicines.
- Inadequate tolerance for hot workplaces.

### Symptoms of Heat Exhaustion

- Headaches, dizziness, lightheadedness or fainting.
- Weakness and moist skin.
- Mood changes such as irritability or confusion.
- Upset stomach or vomiting.

### Symptoms of Heat Stroke

- Dry, hot skin with no sweating.
- Mental confusion or losing consciousness.

- Seizures or convulsions.

#### Preventing Heat Stress

- Know signs/symptoms of heat-related illnesses; monitor yourself and coworkers.
- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning; rest regularly.
- Drink lots of water; about 1 cup every 15 minutes.
- Wear lightweight, light colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, or heavy meals.

#### What to Do for Heat-Related Illness

- Call 911 at once.
- While waiting for help to arrive:
  - Move the worker to a cool, shaded area.
  - Loosen or remove heavy clothing.
  - Provide cool drinking water.
  - Fan and mist the person with water.

## **2.15 WILDLIFE**

FSEL personnel may encounter wildlife while working in the laboratory. The wildlife observed in the past includes but is not limited to raccoons, pigeons, hawks, mice, rats, possums, snakes, spiders, wasps, bees, and monkeys. Anyone who with questions about wildlife should contact the laboratory technical staff for assistance.

## **2.16 LANGUAGE**

All FSEL personnel should be fluent in English. Foreign-language workers must be able to acknowledge and demonstrate understanding of safety policies and training.

## APPENDIX A

### **Safety Training Certification**

This signature form is to certify that I have received a copy of, or electronic access to, the FSEL Safety Information. I have read it, understand it, and I hereby agree to abide by all of the instructions and advisories provided therein.

I understand that my unsafe acts can endanger my safety as well as the safety of others. I shall conduct myself in a safe manner at all times. I agree that any FSEL user is authorized to instruct me to perform safely whenever deemed necessary.

I shall immediately report any unsafe conditions that I encounter in the course of my work, to the FSEL technical staff, the FSEL laboratory director, my supervising faculty member, or some combination thereof.

I am aware that this certificate will be placed in my personnel file at FSEL, that it allows me to work in FSEL, and that I am obligated to abide by and support all of the safety rules and regulations of the laboratory.

Name:

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Faculty Supervisor:  
(if applicable)

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Signature:

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Date:

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