



Laboratory Safety Manual

Boardman Hall Updated Fall 2024

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1 Introduction

The Civil and Environmental Engineering (CIE) Department & Lab Safety Manual sets forth procedures and work practices to provide the personnel, students, and visitors within the CIE department, including laboratories, a safe and efficient work environment. This Safety Manual is a collection of standard operating policies and procedures based on the U.S. Occupational Safety and Health Administration (OSHA), the University of Maine, and CIE rules and guidelines.

1.1 Manual Distribution/Location/Maintenance

This Safety Manual will be available to every new hire. Paper copies can be found in the Lab Manager's office (Room 112 Boardman Hall), in all laboratory spaces, or electronically from the CIE website.

This Safety Manual will be reviewed when significant changes are made, or at least once a year. Basic Department training will consist of providing a copy of this plan to all CIE employees, reviewing the plan with all CIE employees, and resolving any employee questions.

The CIE Laboratory Manager is responsible for updating this plan and its contents, including the Emergency Action Plan.

1.2 Glossary of Terms

CIE	Civil and Environmental Engineering
CHP	Chemical Hygiene Plan
CFR	Code of Federal Regulation
HazMat	Hazardous Material(s)
ISO	International Standards Organization
SDS	Safety Data Sheet, previously referred to as MSDS (Material Safety Data Sheet)
OSHA	Occupational Safety and Health Administration
PRF	Purchase/Reimbursement Request Form
LM	Lab Manager
PPE	Personal Protective Equipment
SAA	Satellite Accumulation Area
SEM	Safety and Environmental Management
UMaine	University of Maine

1.3 Responsibilities

Refer to Appendix A for key personnel in the CIE Department.

1.3.1 Direct Supervisors

Any faculty or staff with Graduate Students, Research Assistants, or other student workers under their supervision, whether they use the CIE Department Labs or not, becomes their Direct Supervisor. This includes clerical staff.

1.3.2 Laboratory Supervisors

The Laboratory (Lab) Supervisors are laid out in Section 2.1. They are responsible for maintaining respective laboratories in compliance with the following:

- University of Maine System Policies and Guides;
- OSHA Code of Federal Regulations;
- Maine Department of Labor rules and regulations; and
- CIE policies stated in this Manual

Lab Supervisors are responsible for identifying, obtaining, and implementing all training and PPE required for any work performed in respective laboratories.

1.3.3 Laboratory Manager

The Laboratory (Lab) Manager's office is Room 112 of Boardman Hall, phone # (207) 581-4406. The Lab Manager oversees all lab spaces and maintains a Chemical Inventory. The Lab Manager is also considered a Lab Supervisor.

1.4 Safety Training

All faculty, staff, post-docs, graduate students, and undergraduate workers must complete the following safety training. In addition, any group of students or association, such as the University of Maine student chapter of ASCE (i.e., Steel Bridge Students), must also complete the same safety training.

Documentation of all completed training must be filed with the Laboratory Manager.

1.4.1 University of Maine Basic Safety Training

The U.Maine Annual Basic Safety Training is a web-based course by SEM, accessed via UMS Academy (<https://umsacademy.maine.edu/d2l/home>), and includes a qualifying quiz. Each employee or any student, organization, or group is responsible for submitting proof of successful completion of this course to the Laboratory Manager.

1.4.2 CIE Department Safety Training

The CIE Department basic safety training consists of reading this Department & Lab Safety Manual, as described herein, and completing the checklist form in Appendix C (last page of this document) with their Direct Supervisor, Lab Supervisor, or Lab Manager in the absence of either. **The Lab Safety Plan of this Manual (Section 3) and the Chemical Hygiene Plan (Section 4) are not required as part of this training if the individual does not work in any of the Labs or handles chemicals.**

In addition, all Lab Supervisors are required to complete the following courses (web-based by SEM @ (<https://umsacademy.maine.edu/d2l/home>),

- Occupational Safety Responsibilities for Supervisors

The complete Lab Safety Training Series is also required for work in Rooms 15, 17, 20, 26, 28S, 29 & 40, as stated in their separate Chemical Hygiene Plans.

1.5 Tool Safety Training

Before use of any power tool, individuals must have specific training and show proficiency on a piece of equipment to the Lab Supervisor where the tool will be operated. The Ferland Engineering Education and Design Center will provide all tool safety training. Specific tools will require a "checkout procedure" to ensure they are correctly used. The "Tool Use Request" Forms are available from the Lab Manager.

2 Emergency Action Plan

2.1 Hazards

The significant hazards within the Boardman Hall are:

<u>Hazard</u>	<u>Location</u>
Fire	Entire Building
Chemical Spill	All Labs
Explosion	All Labs

2.2 General Emergency Procedures

In the event that:

- You discover a fire or chemical spill emergency;
- You smell smoke or the odor of burning/abnormally hot material;
- The alarm is sounded.

You shall:

- 1) Verbally warn others in the area.
- 2) Activate the Fire Alarm system (Pull stations near the exits).
- 3) If your workspace is not currently involved and you can do so safely: Shut windows and close the door tightly behind you as you leave.
- 4) Evacuate the building; do not use an elevator. Conduct a minimal sweep for visitors and students on the way out.
- 5) If you discover a fire or chemical spill emergency, call 911 (Cell phone call 581-4040) from a safe place and inform the dispatcher of what has happened.
- 6) Assemble at the rally point and account for all employees.
- 7) Brief the fire department of concerns upon their arrival.
- 8) Remain outside of the building until the authorities give the all-clear.

2.3 Exit Pathways

Use the closest exit in an emergency and go to the rally point (See attached building map, Appendix B). Each floor in the CIE department has a map with an evacuation route in the main hallway.

2.4 Rally Point

The rally point for Boardman Hall evacuation is the lawn in front of the Memorial Gym near the black bear statue; except in inclement weather, we can gather inside the Memorial Gym Lobby. At the rally point, the Evacuation Coordinator (Brenda Collamore; 207/581-2171; brendac@maine.edu), or the most senior staff person available, will take an accounting of employees. The Evacuation Coordinator will

inform the emergency responders if people cannot be accounted for. Evacuees should not go back into the building.

2.5 Use of Emergency Equipment

Although it is policy to evacuate in case of a fire, circumstances may dictate that a fire extinguisher is needed. **ONLY** use a fire extinguisher if:

- 1) You have been trained in the **hands-on** use of an extinguisher within the last three years.
- 2) You can put out the fire without endangering yourself or others.
- 3) You have an open path of escape at all times.

2.6 Personal Injury Emergency Procedures

In the event that:

- You are injured;
- You come upon an injured person in the building;
- If you encounter what you suspect to be blood or other bodily fluids, you shall:
 - a. Call 911 (from a cell phone, it is faster to call 581-4040) and inform the dispatcher of what has happened;
 - b. If the victim is someone other than you, administer first aid only if you are currently certified and using the proper personal protective equipment;
 - c. Inform the Laboratory Manager or Supervisor.

If the situation only involves blood or other bodily fluids and no victim, you must still call Public Safety at 911 (cell phone 581-4040) and inform the dispatcher. Keep people away from the suspected bodily fluid and inform the Laboratory Manager or Supervisor. Please **DO NOT** attempt to clean it up on your own.

The injured person should file an INCIDENT REPORT for Workers' Compensation: Employee Injuries & Illnesses (University of Maine System form). These can be found in the Lab Manager's office.

2.7 Prevention/Follow-up

SEM will conduct periodic safety audits to reduce the risks and hazards within the workspaces. Call the University of Maine Department of Safety & Environmental Management at 581-4055.

Once an emergency situation has been mitigated, an incident or near-miss report shall be completed. An investigation will be completed, and corrective measures will be implemented to prevent future recurrence of the problem.

3 Laboratory Safety Plan

3.1 Scope

This document is a general safety plan for CIE teaching and research laboratories within Boardman Hall. Laboratory locations, names, and faculty/staff supervisors are as follows:

Room	Laboratory Name	Lab Supervisor
4	Tool Room	Fisher
6/8a	Soil Behavior and Geotechnics Laboratory	Gallant / Zambrano Cruzatty
8	Higgins Materials Testing Laboratory*	Fisher
9	Gorrill-Palmer Soil Mechanics Laboratory*	Fisher
15/17	Woodard Environmental Teaching Laboratory*	Fisher
18	Stephen W. Cole Concrete Laboratory*	Fisher
20	Advanced Analytics Laboratory (under development)	Fisher
26	Microscope Laboratory	MacRae
29	Environmental Microbiology Laboratory	MacRae
30	Coastal Engineering Laboratory	Ross / Huguenard
32	Coastal Engineering Laboratory	Ross / Huguenard
40	Haley Ward Environmental Chemistry Laboratory	Apul
116	Kleinschmidt Hydraulics Laboratory*	Fisher
120	Micromechanics Laboratory	Landis

*Undergraduate teaching laboratory

All laboratories within the University of Maine System must have a specific laboratory safety plan. This section applies to all employees, students, visitors, and contractors that enter the CIE laboratories.

3.1.1 Student Design Laboratory (The Chez)

It is the responsibility of the officers of the University of Maine student chapter of ASCE to maintain the Student Design Laboratory in accordance with all safety regulations. The laboratory manager will oversee ASCE maintenance of the space and will have the final say on whether corrective action is required.

3.2 Personal Protective Equipment (PPE)

Appropriate PPE should be worn at all times when working in the CIE laboratories. Since no chemicals or equipment are allowed in the Student Design Laboratory, the Student Design Laboratory may be exempt from PPE requirements.

3.2.1 Hard Hats

Hard Hats that meet ANSI Z89-1997 Type I Class E will be worn in the Materials and Concrete laboratories when working with large, heavy equipment and materials, and anytime equipment or materials are being lowered into the building through the bay door in the Materials testing laboratory. Hard hats will also be required when directed by the Lab Manager or course instructor.

3.2.2 Protective Footwear

No sandals or open-toe shoes are allowed in any laboratory. Safety toe shoes or boots that comply with ANSI Z41-1991 are encouraged in the Concrete and Materials Labs.

3.2.3 Eye Protection

Safety glasses will be worn at all times when handling chemicals and using any loading frames in any of the labs. Safety glasses are also required when using water/air-pressurized systems in any of the lab spaces and when using power tools. Full-face shields will be worn when using grinders and are available for other operations.

3.2.4 Hearing Protection

Hearing protection is required when operating machinery and power tools. It is highly encouraged to use hearing protection whenever you will be exposed to noises exceeding 85 decibels, whether your exposure is lengthy or short-lived. An example of what something would sound like at 85-95 decibels is a circular saw, jig saw, belt sander, or nail gun.

3.2.5 Clothing and Attire

Appropriate clothing and attire must be worn in all laboratories. Proper clothing and attire include:

- Clothing worn in any laboratory should protect from the neck to below the knees; no shorts, short skirts, sleeveless garments, or bare midriffs.
- Remove any jewelry or articles of clothing that may be caught in a machine.
- Do not wear any excessively loose or restrictive clothing. This includes, but is not limited to, ties, scarves, fringe, and loose drawstrings.
- Long hair must be pulled back and secured/contained; long beards must also be contained.
- No open-toe shoes are allowed in any laboratory unless granted by the Supervisor.

3.2.6 Other

No food or drink is allowed in any laboratory. This includes candy, soda, coffee, tobacco products, etc. The only exception to the food and drink policy is the Student Design Laboratory. Cell phones, mp3 players, and other personal electronic devices must not be used when operating any machine.

Loud music that distracts or affects communication is prohibited. There is absolutely no horseplay allowed in the laboratories.

3.3 Tool Usage

Any tool that is used or stored in any CIE Lab becomes the property of the CIE department and, as such, must follow university policies and those outlined in this Manual.

Any new power tools purchased must be shown to the Lab Manager for proper identification and inventory.

Before use of any tool, individuals must have specific training and show proficiency on a piece of equipment to the Lab Supervisor where the tool will be operated. Specific tools will require a "checkout procedure" to ensure they are correctly used. "Tool Use Request" Forms are available from the Lab Manager.

Anyone using tools in any CIE Lab must:

- Not operate any machinery or equipment without proper training.
- Follow tool-specific rules for additional personal protective equipment/safety equipment or add additional safety equipment for your personal comfort.
- Stay alert, pay attention, and use common sense when operating a power tool. A moment of inattention while operating power tools may result in serious personal injury.
- Do not use tools while tired or under the influence of drugs, alcohol, or medication.

Always follow these procedures when working with and around the machines and power tools:

- Know how to turn off a machine before you turn it on.
- Do not disturb or talk to persons operating power machinery.
- Do not allow yourself to be distracted by others talking to you, or by your cell phone.
- All guards and shields must be secured and in place prior to operating equipment.
- Always stop the machine before making measurements or adjustments.
- Do not place any tools (especially hand tools) on machines. Keep them in their designated locations or on a nearby workbench.
- Use clamps or cinch straps to secure the material you are working with to a stable platform. Holding the material by hand or against your body is unstable and may lead to loss of control.
- Do not force one tool to do the job of another. Take the time to switch tools before getting one stuck or breaking one from using it improperly.
- Do not attempt to use a tool if the switch does not power it on or off. Any tool that cannot be powered with its switch is damaged and needs to be repaired.
- Before making any adjustments or changing attachments on a piece of machinery, disconnect the plug from the power source to reduce the risk of accidentally starting the tool.

- Maintain tools. If they are cutting tools, make sure they stay sharp. Make sure that tools are kept clean and free of debris. These steps will make the tool easier to control and prevent them from binding.
- Periodically check the tool for misalignment, breaking or moving parts, and any other condition that may affect the tool's performance.
- Do not overreach. Keep proper footing and balance at all times to maintain control.
- Report any damaged equipment or tools to the Laboratory Manager and take it out of service. Many accidents result from a broken or poorly maintained tool.

3.4 Electrical Safety

When working with electrically powered equipment, it is important to know the potential hazards associated with electricity. Special measures should be followed to prevent accidents from taking place, including:

- Grounded tools must be plugged into an outlet that has been properly installed and grounded in accordance with all National Electrical Code and NFPA 70E standards and ordinances. Do not remove the grounding prong or modify the plug in any way; if a tool electrically malfunctions or breaks down, grounding will provide a low resistance path to carry electricity away from the user.
- Double-insulated tools are equipped with a polarized plug (one pin is wider than the other). This plug will fit in a polarized outlet only one way. If the plug still does not fit, contact your Supervisor. Do not change the plug in any way. Double insulation eliminates the need for the three wire grounded power cords and a grounded power supply system.
- Do not expose power tools to rain or wet conditions. Water entering a power tool will increase the risk of electric shock.
- Do not abuse the cord. This includes not carrying the tool by its cord or pulling the plug from its outlet by the cord. Keep the cord away from heat sources, sharp edges, or moving parts. Replace damaged cords immediately, as they increase the risk of electric shock.
- When operating a power tool, use a 12/3 cord with SJTW rating for outside. Always plug into a GFCI (Ground Fault Circuit Interrupter) outlet or use a GFCI equipped extension cord. GFCI cords are rated for outdoor use and reduce the risk of electric shock.
- When there is electrical equipment failure, inform the Lab Manager at 581-4406, and a UMFEM Electrician will be contacted to conduct the work. No CIE employees may conduct electrical work on live circuits.

3.5 Housekeeping

Proper housekeeping helps to eliminate the risk of slips, trips, and falls. Keep your work area clean, clear of debris, and well-lit. Return all tools after use, and store project items adequately when you finish working.

3.5.1 Aisles, Exits, and Access to Emergency Equipment

Exits and access to emergency equipment must be kept clear at all times. Do not allow hoses or electrical cords to become a tripping hazard. If hoses or electrical cords must cut across a room, aisle or hallway, the hose or cord must be long enough to rest flat on the floor and must be covered with a floor cable cover to avoid tripping. Aisles must be of sufficient width (minimum of 28 inches) to permit the safe passing of personnel, carts, and/or other material.

Provide ample workspace around each machine. Work surfaces will be reasonably clear and should allow work to be conducted in an efficient and safe manner.

3.5.2 Compressed Air

Compressed air must not be used to clean skin, clothing, or general equipment. Do not clean chips or sawdust from machines with compressed air or with hands; a brush or hook should be used.

When cleaning of machines and equipment by compressed air is considered necessary, the outlet pressure should be no more than 10 psi and safety glasses must be worn at all times. If the compressed air line has no visible outlet regulator, that outlet shall not be used to clean anything.

3.6 Laboratory After Hours Work

After hours work in the CIE laboratories by Undergraduate students is strongly discouraged. No potentially hazardous work will take place in CIE laboratories outside of normal business hours (8 a.m. to 5 p.m., Monday through Friday) without the Lab Manager's prior approval. At least two people must be present at the worksite when potentially hazardous work is being performed outside of normal business hours.

3.7 Visitors General Safety Rules

The CIE employee accompanying clients/visitors is responsible for the safety of their visitor(s) and must ensure that they follow all safety requirements.

No matter what the visitor's purpose, the following minimum safety requirements will be observed:

- A. Visitors will be accompanied by a CIE employee or student designated by the CIE Department Chair.
- B. No food or drink is allowed in any laboratory. This includes candy, soda, coffee, tobacco, etc.
- C. Safety glasses will be worn at all times in all laboratories when any testing/research work is in progress.
- D. Hearing protection is required around loud operations.

The Lab Manager or the Lab Supervisor has the right to ask a client/visitor to leave the Lab if safety procedures are not followed.

3.8 Lockout/Tagout

When there is equipment malfunction the Lockout/Tagout program as implemented by SEM (<https://mycampus.maine.edu/group/mycampus/sm-training>) will be followed. The Laboratory Manager is in charge of enforcing the Lockout/Tagout program. Only CIE personnel who have successfully completed SEM's Lockout/Tagout training program are authorized to conduct Lockout/Tagout. Lockout/Tagout equipment must be obtained from SEM or the electrical shop and used exclusively for Lockout/Tagout purposes.

4 Chemical Hygiene Plan

This basic Chemical Hygiene Plan (CHP) is a written procedure for the safe handling of chemicals in the laboratories. Note that when there is a lab specific CHP, the information is in addition to and supersedes any potential conflict with this CHP. This basic plan includes all aspects of handling chemicals: Ordering, receiving, storage, use, disposal, and spill clean-up. It is the goal of the CIE Department to have the chemicals needed on hand without having an excess amount. CIE is committed to the safe use, storage, and disposal of chemicals.

4.1 Responsibility

All Department employees and students using the laboratories are responsible for reading and following this Chemical Hygiene Plan unless a Lab-specific plan is used in their laboratory, reading and following the Safety Data Sheet (SDS) for any chemical the employee or student use, and following project work instructions.

4.1.1 Lab Supervisor

The Lab Supervisor is responsible for all chemicals ordered, stored, used, and disposed of in their Lab. It is the responsibility of each Lab Supervisor to train employees and students with regard to the proper handling of chemicals within the laboratory. The responsibilities include:

- A. Ensuring chemicals and chemical wastes are handled properly.
- B. Providing training to their workers for specific chemicals used for the project and how to store them.
- C. Providing training to their workers for specific PPE necessitated by the use of chemicals.

4.1.2 Lab Manager

The Lab Manager will work under the guidance of the University of Maine Safety and Environment Management's Chemical Hygiene Officer and has the authority to:

- A. Implement and enforce all Chemical Hygiene Plans.
- B. Be the point of contact between Department employees, Safety and Environment Management's Chemical Hygiene Officer (Peter Snow, 581-4056).

The Lab supervisors will work together with the Lab Manager, who is responsible for the CIE chemical inventory for all laboratories, including both research and teaching laboratories.

4.2 Information and Training

4.2.1 Lab Supervisor Responsibility

The Lab Supervisors will provide training to all project personnel concerning the use and handling of specific chemicals and the project's chemical use. The Lab Supervisor will ensure all employees working on the project have received initial chemical training and specific training for the chemicals the project. It is the Lab Supervisors' responsibility to educate their personnel with any additional Lab-specific CHP, specifically, with regards to chemicals, of:

- Proper handling
- Storage
- Disposal
- Proper PPE
- Waste management plan
- SAA management plan

4.2.2 Safety Data Sheets (SDS)

SDS (previously known as Material Safety Data Sheets or MSDS's) are OSHA-mandated forms that contain information relevant to a hazardous chemical. This form must include both acute and chronic health hazard information, recommended personal protective equipment (PPE), and emergency response procedures. All chemicals must have an SDS.

All Boardman Hall laboratory rooms, including storage closet room 28S, each have an SDS binder(s) containing information on chemicals located and/or used in those specific labs. When a new chemical is ordered, print out the SDS and give a hard copy to the Lab Manager with a specific location so that it can be filed accordingly.

4.3 Personal Protective Equipment (PPE)

PPE, as required by the SDS, will be worn at all times when handling chemicals. If the SDS does not require PPE, (Health NFPA/HMIS of 0 or 1) at a minimum appropriate chemical gloves and safety glasses will be worn when handling chemicals.

4.4 Chemicals

All substances have a rating system governed by the National Fire Protection Association (NFPA) or the Hazardous Materials Identification System (HMIS). CIE will use these two systems of hazard identification for all chemicals used in the CIE laboratories. The NFPA/HMIS numbers vary from 0 (no

hazard) to 4 (extremely hazardous) in three categories: Health hazard, flammability, instability (reactivity). Chemicals in the CIE laboratories will be handled as follows:

- Non-hazardous chemicals - Any substance that has NFPA/HMIS ratings of less than 2 (0, 1), will be treated as a non-hazardous chemical for storage. This means the chemical does not require special storage; however, it may require special disposal.
- Hazardous chemicals - Any substance that has a NFPA/HMIS rating of 2 or more will be treated as a hazardous chemical.
- Handling, use, storage, and disposal will be in accordance with:
 - a. The SDS
 - b. CIE Chemical Hygiene Plans
 - c. The project's work instruction or standard operation procedure

4.4.1 Chemical Ordering Procedures

Chemicals shall be ordered within the following parameters:

- The Lab Supervisor will access the Chemical Inventory to see if there is any amount left in any other CIE Lab
- Quantity must be the minimum required for the project's completion
- The order form must have the Lab Supervisor's name, storage/usage room number, and date ordered.
- All chemical ordered must have an SDS provided with it. If the most recent SDS copy is unavailable in the laboratory, it is the requestor's responsibility to obtain an updated copy from the manufacturer. If the SDS indicates that it has a NFPA/HMIS hazard rating of two or above, the Lab Supervisor will consult SEM to determine if there are any special handling, storage, or disposal requirements.

4.4.2 Processing Chemicals

The Lab Manager will:

- a. Enter the chemical into the Chemical Inventory Database.
- b. Print CIE Chemical Control Labels for the chemical when needed
- c. Check the SDS to determine if it matches the chemical that was received. If the SDS is not on the premises or does not match the chemical received, the Chemical Hygiene Officer will not release the chemical for use.

The owner (responsible person) will:

- a. Remove the chemical from its shipping container only after communication to Lab Manager about chemical has been received.

4.5 Chemical Inventory

The Lab Manager will maintain the Chemical Inventory Database for all chemicals stored or used in the CIE laboratories. All chemicals and materials will be entered into the database. When a chemical has been consumed or disposed of, it will be marked inactive in the Chemical Inventory Database. A hard copy of the complete annual chemical inventory (organized per room) will be available in the lab manager's office.

Any chemical that is outdated or expired will be disposed of.

Chemicals that are no longer needed should also be reviewed and possibly disposed of. Chemicals over 20 years old will be disposed of regardless.

The Chemical Inventory Database will contain the following information:

- Product's chemical name
- Product's CAS number
- Storage location
- Chemical amount
- Expiration Date (if any)

4.6 Chemical Storage Procedures

4.6.1 General chemical storage requirements:

- Chemicals will be stored according to manufacturers' and SDS instructions.
- Storage must be away from exits, heat, and direct sunlight.
- Shelves must be substantial enough to support the weight of the chemical containers and be chemical resistant.
- Reactive chemicals will not be stored in a wooden cabinet.
- Sufficient area will be provided so that incompatible chemicals can be segregated.
- Proper ventilation of chemical storage cabinets will be supplied and special ventilation may be required (consult SDS).
- Secondary containment will be provided for liquids that are flammable, corrosive, highly toxic, or highly volatile. Plastic tubs are sufficient in many cases).
- Flammables will be stored in flammables cabinets at all times (Room 18 or Room 28S - preferred location).
- Drums will be grounded and stored upright on secondary containment pallets.
- Bench tops will not be used as storage areas.
- Chemicals requiring refrigerated/freezer storage must be stored only with compatible materials.
- Secured storage may be necessary for highly toxic or regulated chemicals; see the SDS and Laboratory Manager.

- With the exception of gas cylinders, chemicals cannot be stored on the floor. Gas cylinders must be stored away from heat sources, kept upright, and secured with a proper harness. They must have a cap installed when not being used.
- All containers must be constructed from a proper material that is compatible with the chemical that it will contain, must have tight-fitting lids that prevent a spill if the container is tipped, and must be labeled with contents and hazards.

4.6.2 Compatibility

Chemicals must be stored in such a manner as to avoid interaction between incompatible chemicals. Segregation of incompatible substances may be accomplished by adding labeled plastic tubs to the storage area, which provide both segregation and secondary containment in case of a leak. This will not work in the case of chemicals that attack the plastic tubs or give off fumes that interact with other chemicals in the same cabinet.

Anytime there is any question or an extremely hazardous chemical is to be stored, consult the SDS and get advice from the Laboratory Supervisor, Lab Manager and/or SEM.

4.6.3 Secondary Container Labelling

If a chemical is transferred to a secondary container, the container must be labeled with:

- A NFPA sticker with the appropriate numbers assigned to each color code.
- The date.
- The initials of the person using the chemical from the secondary container (working quantity).
- When the working quantity is no longer needed, the person using the chemical is responsible for contacting the Laboratory Manager to ensure proper disposal of the chemical.
- No secondary containers, including the ones filled with water, shall be left unlabelled.

4.7 Accumulation/Handling of Waste

Waste will be placed in the smallest container possible. The container will be compatible with the chemicals making up the waste. The container will be labeled as waste with a list of the chemicals making up the waste. The waste container will be stored in a compatible cabinet closest to its generation point. The storage cabinet will be compatible with the chemicals in the waste.

4.8 Satellite Accumulation Area (SAA)

A satellite accumulation area is any area that is used to store waste that will accumulate over time. When a project generates waste an SAA will be required and must meet the following guidelines:

- A. The SAA will be approved by Lab Supervisor.
- B. The SAA will be marked with appropriate signage to identify it as an SAA.
- C. The SAA will be inspected daily by the person creating the SAA. SEM form MF00032 Satellite Accumulation Area Inspection Log will be used and faxed to SEM (581-4085) on the first day of each month or when the SAA is no longer needed for disposal.

4.9 Chemical Disposal

Chemicals will be turned in to SEM for disposal when they:

- Have been consumed (empty containers).
- Have become waste.
- Are no longer needed by the project.
- Have been transferred to secondary containers, thereby producing an empty container.
- Have expired.
- Except for rinsing out residue in a laboratory sink, chemical waste will not be put into drains, including storm drains.

4.9.1 Disposal Through SEM

When turning chemicals/waste in to SEM:

- a. Send an email to the Lab Manager with the chemical name and CAS number
- b. The Laboratory Manager will mark the chemical as inactive in the Chemical Inventory Database.
- c. A Request for Chemical Pick-up and Disposal Form will be generated and faxed to SEM.
- d. Attach the Chemical Pick Up and Disposal Form to the chemical container.
- e. The Lab Supervisor/Lab Manager will indicate the SAA to place the container in for pick-up.

4.9.2 University of Maine Waste Minimization Goals

It is the goal of the University of Maine and the Department of Civil and Environmental Engineering to minimize the release of toxins into the environment. This may be accomplished through a variety of means: Waste minimization, recycling, toxics use reduction, and substitution with less toxic alternatives.

4.10 Spill Response, Evacuation, and Reporting

4.10.1 Chemical spill guidelines

Chemical spills are separated into two classes: emergency and non-emergency:

Emergency spills will be immediately reported to the University of Maine Public Safety, and no clean up should be attempted. They are spills that:

- Result in an injury.
- Impact more than just the room it occurred in.
- Are in a public area (hallway, stairwell, or common room).
- Do not have a proper spill kit available.
- Are larger than those on-site are trained to handle.
- Require PPE that is not available or is unknown.
- Are of an unknown chemical.

- Are too large for the spill kit.
- Maybe too large for clean-up.

Non-emergency spills result in none of the above-mentioned consequences and may be cleaned up by CIE laboratory workers provided they can do so safely and have been trained in chemical clean-up. Note that when in doubt, treat the chemical as an Emergency Spill.

The Lab Manager may be contacted at 581-4406 for the proper use of the Chemical Spill kit.

Appropriate spill kits are located in all laboratory spaces.

4.10.2 Emergency chemical spill procedures guide

- If the hazardous material has contaminated a person, take immediate first aid action. Most likely, this will be the use of the emergency shower and/or eyewash (rinse for a full fifteen minutes).
 - While taking first aid action, shout for help.
 - Let others know of the danger.
 - Seek medical attention.
- If you are on the scene, but not the victim, administer first aid only
 - If you have been trained.
 - If you are using the proper PPE.
 - If you have called 911 or arranged for someone else to call 911.
- If you have not been contaminated:
 - Leave the room.
 - Secure the door.
 - Warn others to stay away.
 - Report to the Lab Manager
- Activate the evacuation/fire alarm and call 911 from a safe place. The campus police at 581-4040 can also be contacted. Give the dispatcher the following information:
 - Location of the spill (building, room number and portion of room affected).
 - Identify the material spilled.
 - Your name and phone number where you can be reached.
 - Meet the emergency responders and identify yourself as the person who reported the spill.

4.10.3 Non-Emergency chemical spill guide

- Determine that you can safely handle the situation with your available resources.
- Alert others in the area to the problem.
- Prevent others from coming into contact with the hazardous material, by barricading, locking doors, establishing warning signs, or having someone stand at the entrance to direct traffic.
- Perform the clean-up in accordance with the SDS.
- Call Safety and Environmental Management (581-4055) to report the spill and report the following information:
 - Where and when the spill occurred

- Who was involved (both name and phone number)
- What chemical was spilled
- The quantity spilled
- How the clean-up was accomplished
- Safely dispose of the material resulting from the spill by placing it in a compatible, sealed container and label it as "Spill Clean-up Material". This label must also contain a list of the chemical contents of the spill including amounts and concentrations. Complete and send a request for a chemical pick-up form to SEM.

4.11 Laboratory Specific Chemical Hygiene Plans

The laboratory-specific CHPs contain more detailed instruction on safety, chemical management, standard operating procedures and guidelines for the types of work performed in each lab area. They exist for the Environmental Engineering laboratories (Boardman Hall rooms 15/17, 20, 26, 29, 40) and chemical storage area (room 28S). Paper copies are kept in the laboratories, and additional copies are available from the Laboratory Manager.

Appendix A – Key Personnel

Department Chair:

Shaleen Jain, Ph.D., P.E.
email: Shaleen.Jain@maine.edu
105A Boardman Hall
Work: 207-581-2170
Home: 207-992-3230

Lab Manager:

Neil Fisher, Ph.D.
email: neil.r.fisher@maine.edu
112 Boardman Hall
Work: 207-581-4406
Cell: 207-299-7033

Primary safety coordinator:

Jean MacRae, Ph.D.
email: Jean.MacRae@maine.edu
315A Boardman Hall
Work: 207-581-2137
Home: 207-866-4084

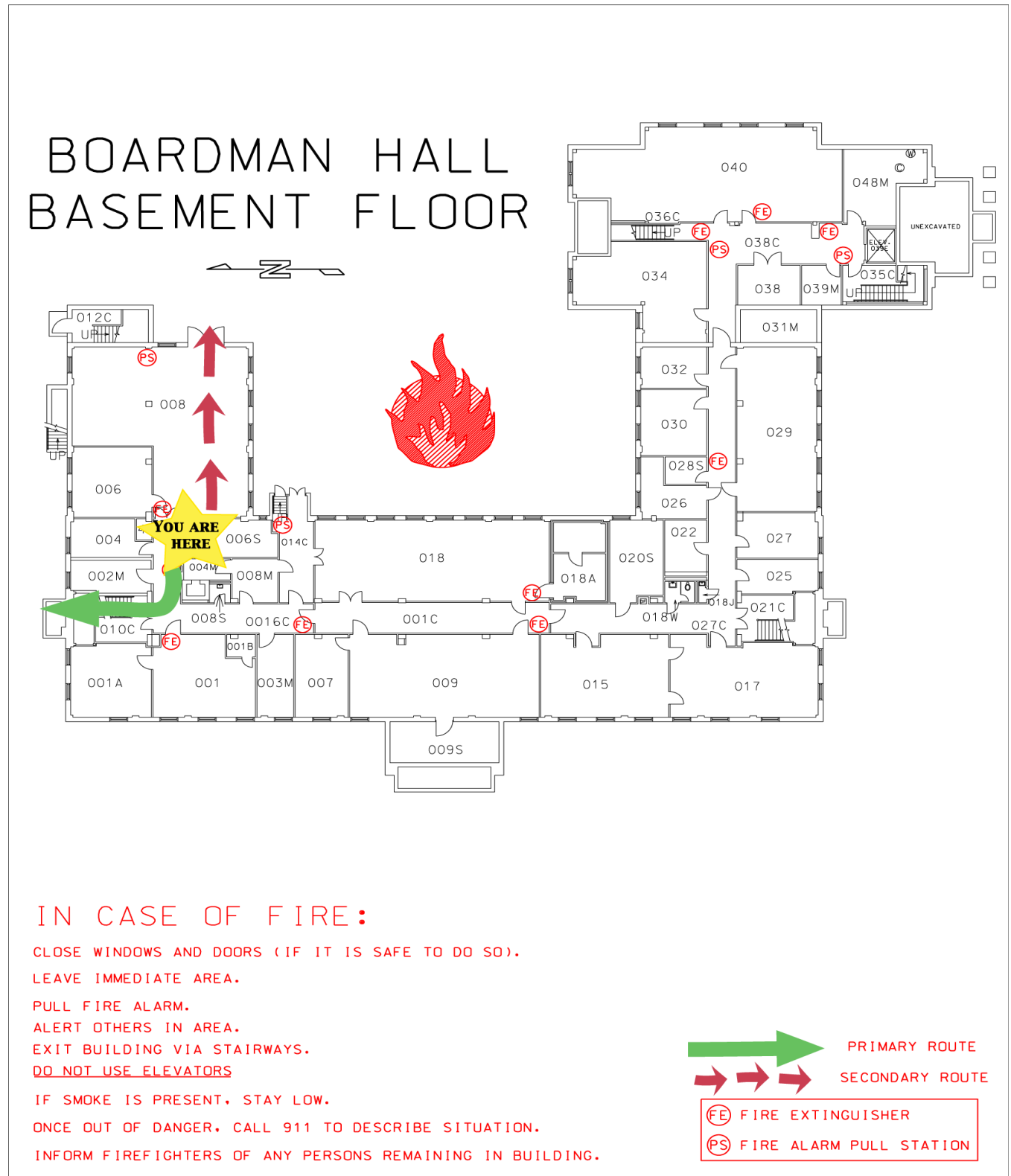
Secondary safety coordinator:

Onur Apul, Ph.D., P.E.
email: Onur.Apul@maine.edu
207 Boardman Hall
Work: 207-581-2981
Cell: xxx-xxx-xxx

Appendix B

Emergency Evacuation Routes

Map 1. Rooms 4, 6, 8, 8a (Tool Room, Materials Testing Lab, Soil Behavior and Geotech Labs)



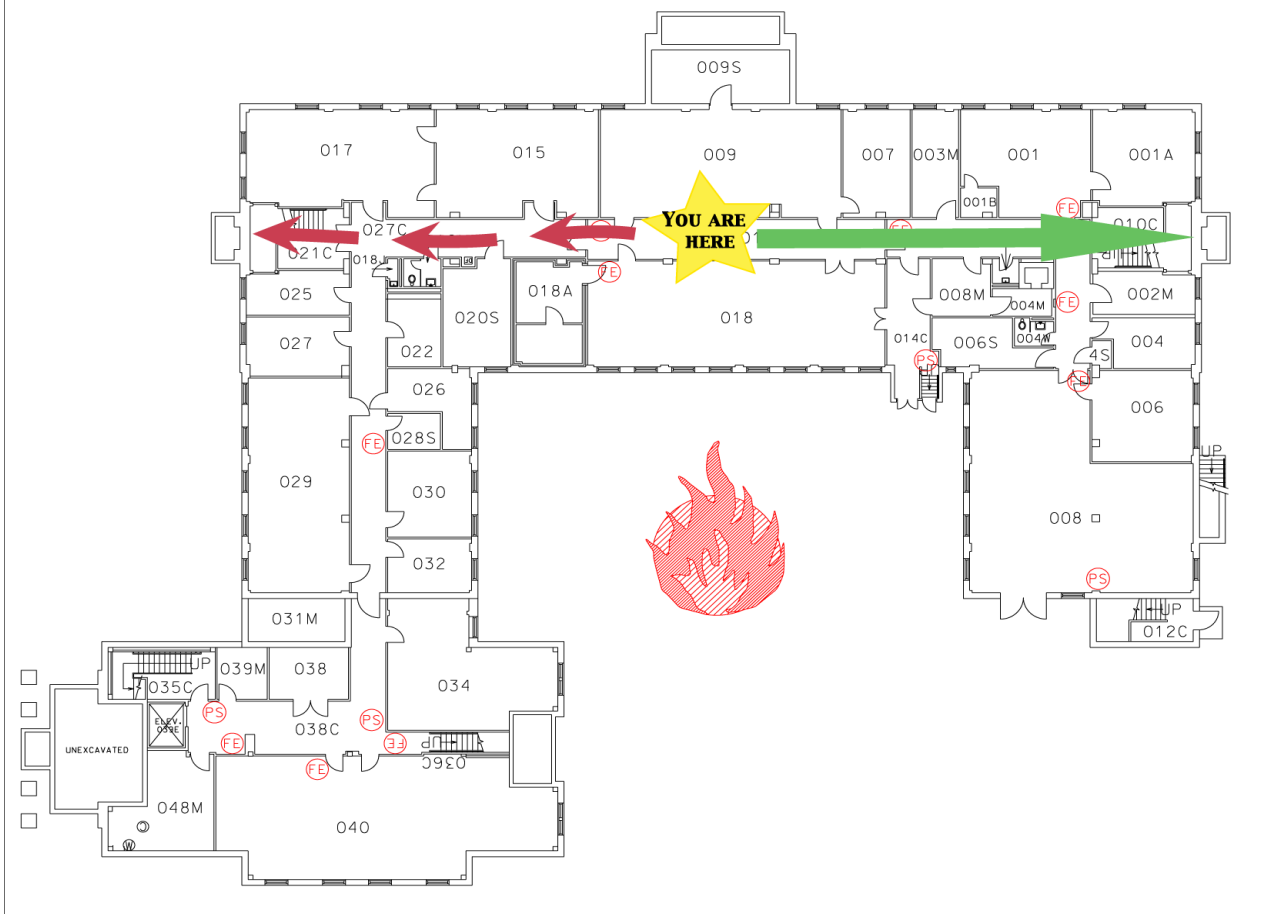
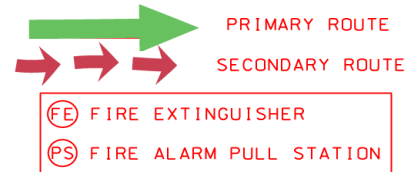
Map 2. Rooms 9, 18 (Soil Mechanics Lab and Concrete Lab)

BOARDMAN HALL BASEMENT FLOOR

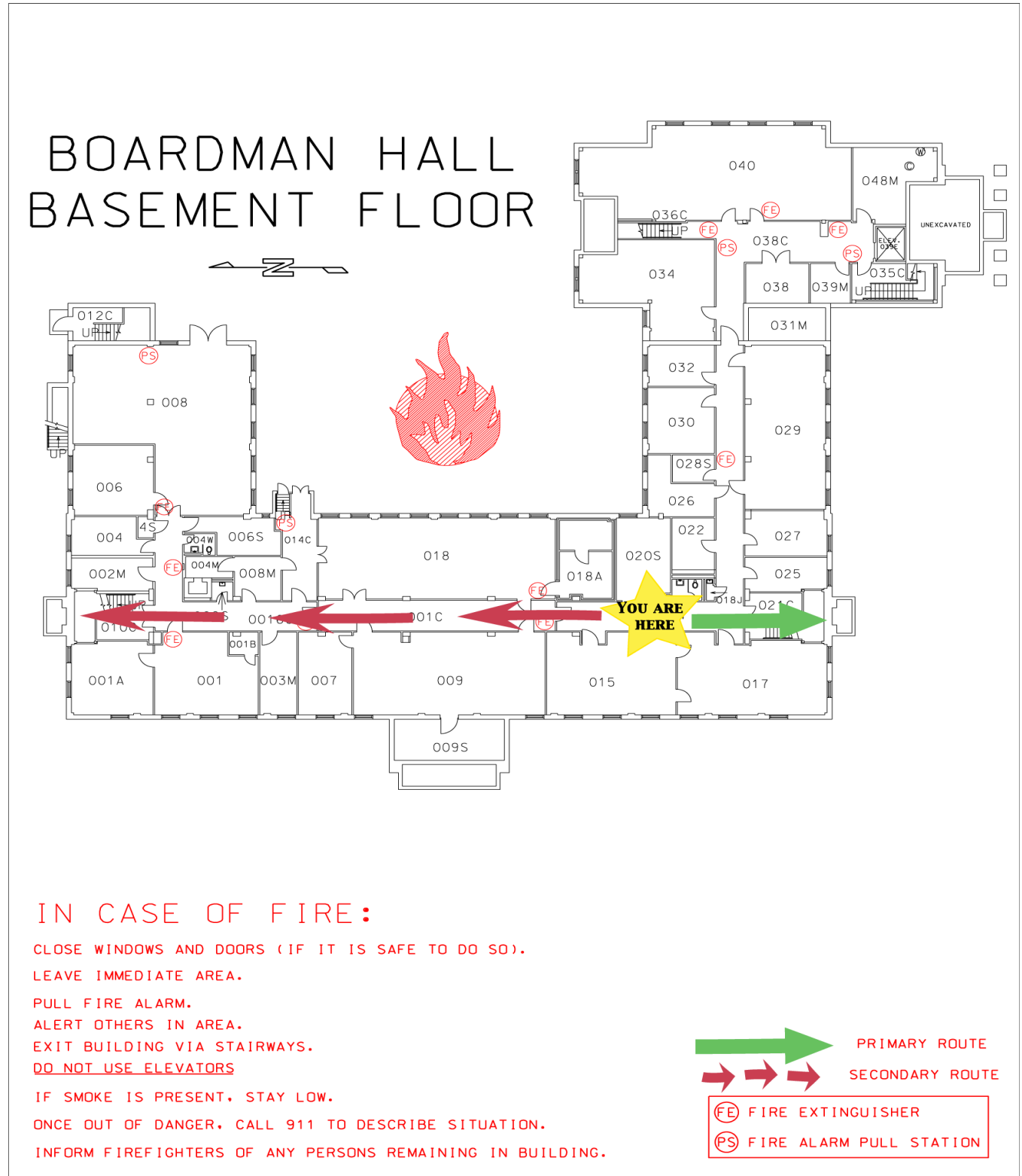


IN CASE OF FIRE:

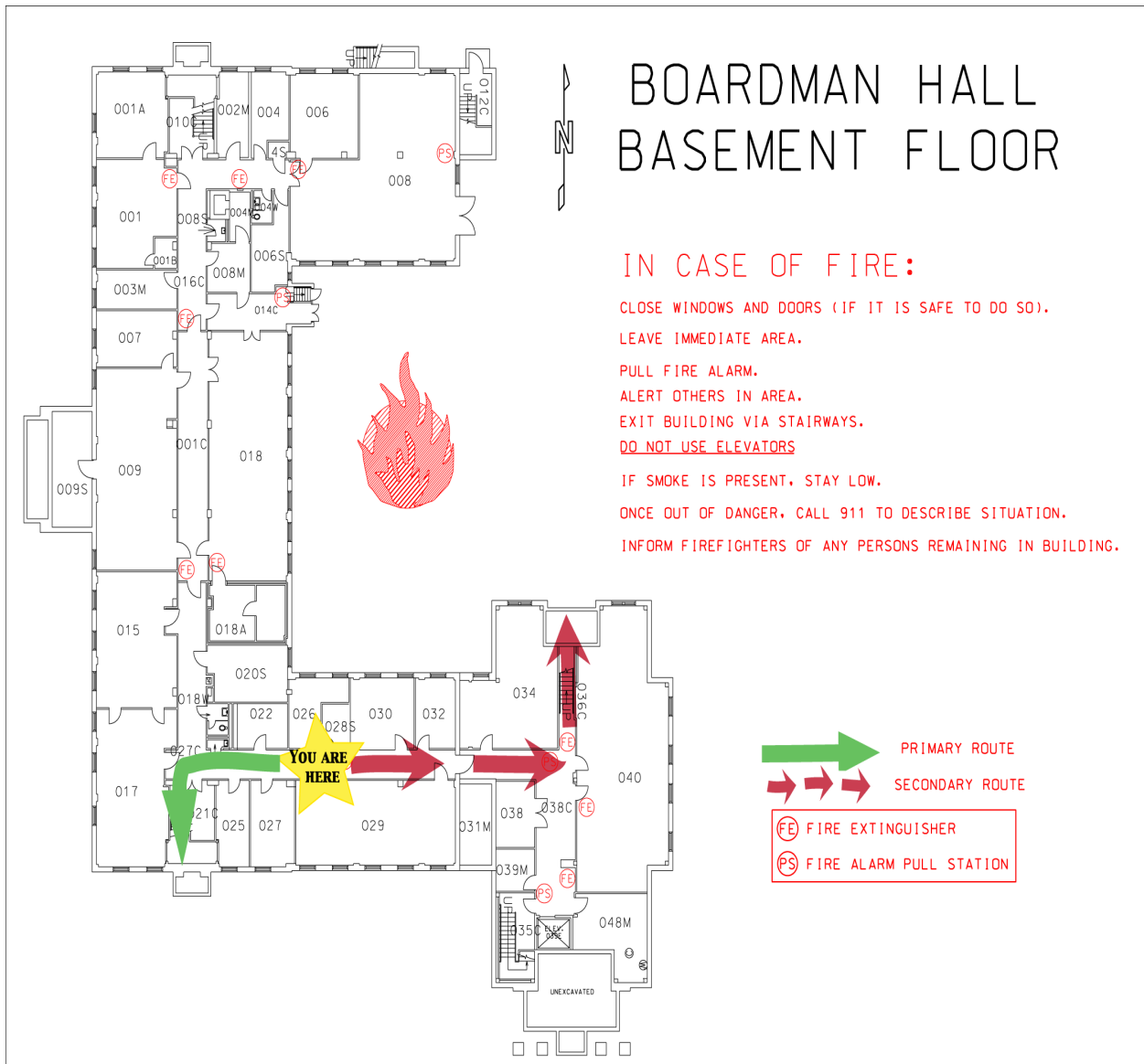
- CLOSE WINDOWS AND DOORS (IF IT IS SAFE TO DO SO).
- LEAVE IMMEDIATE AREA.
- PULL FIRE ALARM.
- ALERT OTHERS IN AREA.
- EXIT BUILDING VIA STAIRWAYS.
- DO NOT USE ELEVATORS
- IF SMOKE IS PRESENT, STAY LOW.
- ONCE OUT OF DANGER, CALL 911 TO DESCRIBE SITUATION.
- INFORM FIREFIGHTERS OF ANY PERSONS REMAINING IN BUILDING.



Map 3. Rooms 15, 17 (Woodard Teaching Lab)



Map 4. Room 26, 28S, 29, 30, 32 (Environmental Labs, Chemical Storage, Tomography Lab)



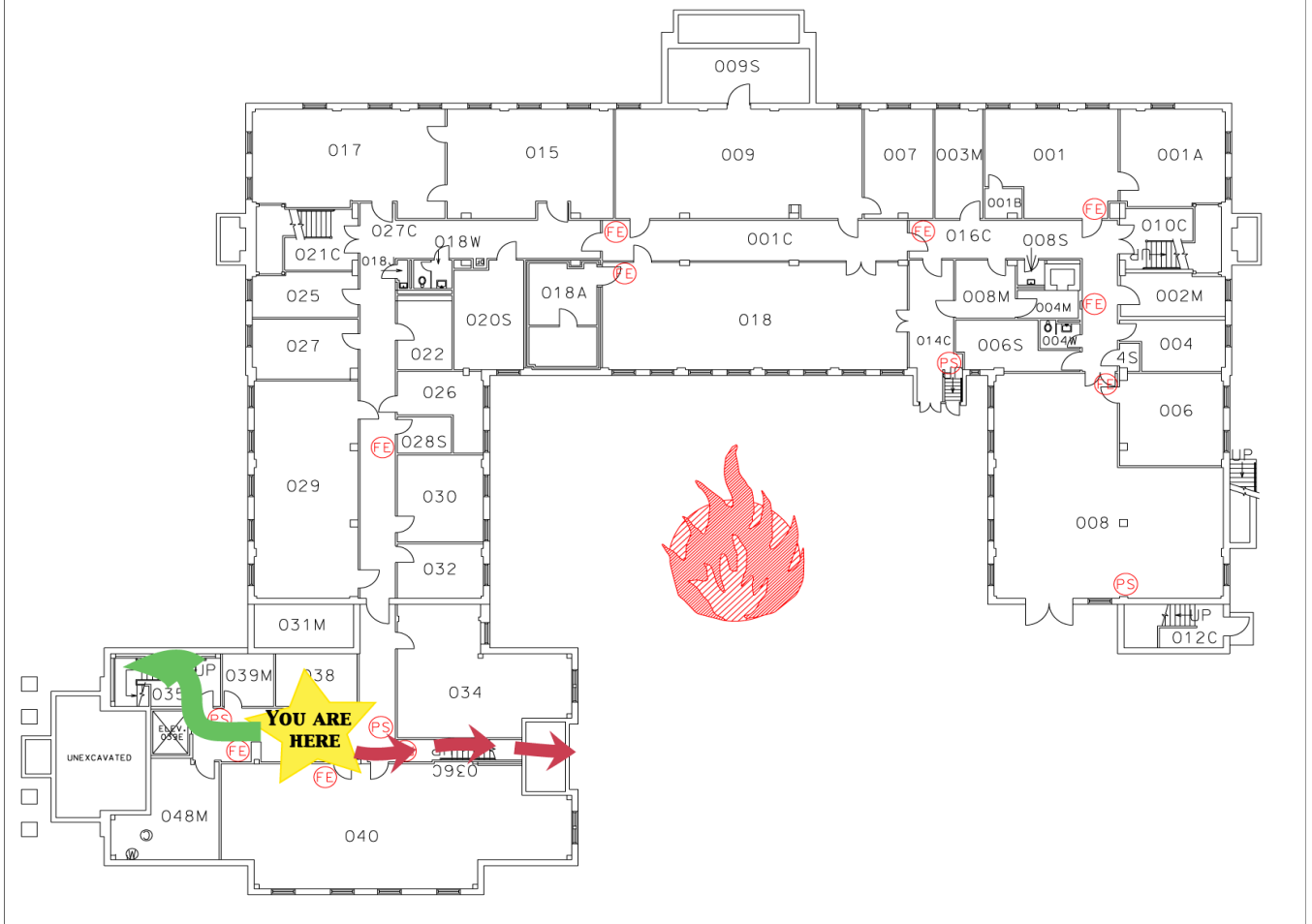
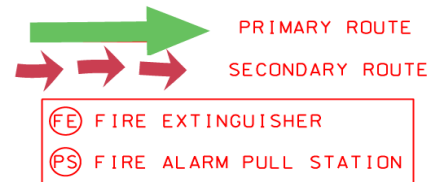
Map 5. Room 40 (Environmental Chemistry Lab)

BOARDMAN HALL BASEMENT FLOOR

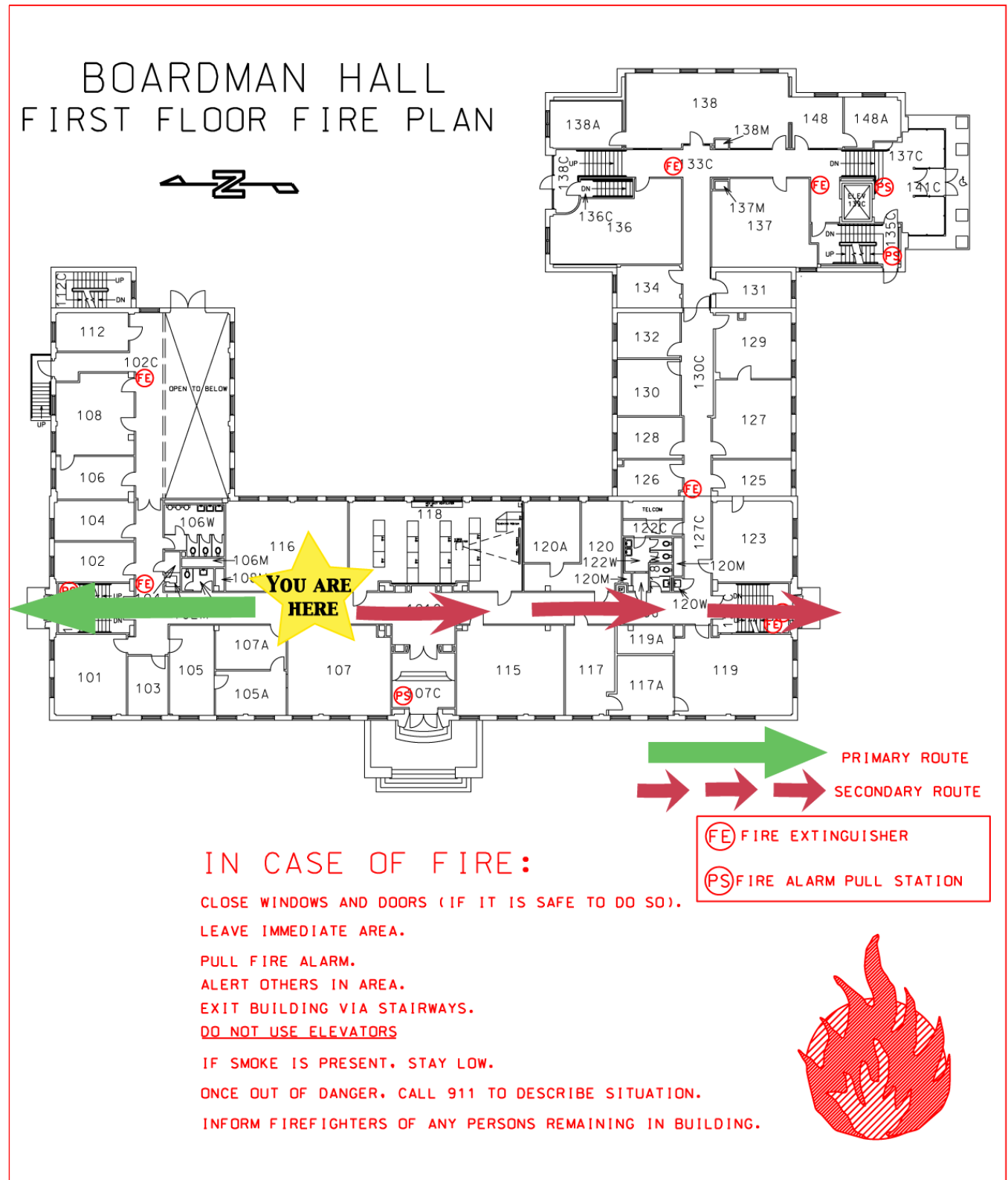


IN CASE OF FIRE:

- CLOSE WINDOWS AND DOORS (IF IT IS SAFE TO DO SO).
- LEAVE IMMEDIATE AREA.
- PULL FIRE ALARM.
- ALERT OTHERS IN AREA.
- EXIT BUILDING VIA STAIRWAYS.
- DO NOT USE ELEVATORS
- IF SMOKE IS PRESENT, STAY LOW.
- ONCE OUT OF DANGER, CALL 911 TO DESCRIBE SITUATION.
- INFORM FIREFIGHTERS OF ANY PERSONS REMAINING IN BUILDING.

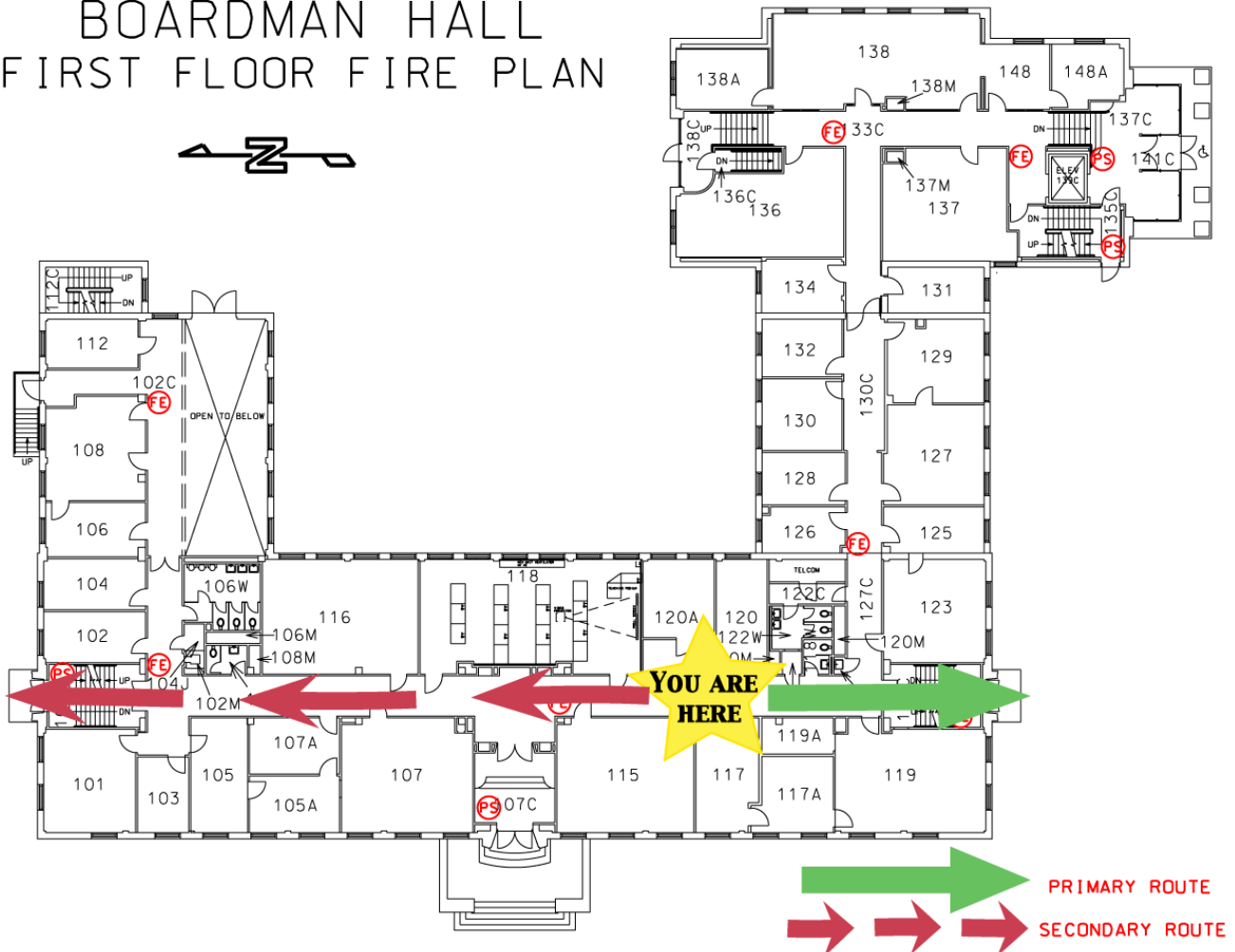


Map 6. Room 116 (Kleinschmidt Hydraulics Lab)



Map 7. Room 120 (Micromechanics Lab)

BOARDMAN HALL FIRST FLOOR FIRE PLAN



IN CASE OF FIRE:

- CLOSE WINDOWS AND DOORS (IF IT IS SAFE TO DO SO).
- LEAVE IMMEDIATE AREA.
- PULL FIRE ALARM.
- ALERT OTHERS IN AREA.
- EXIT BUILDING VIA STAIRWAYS.
- DO NOT USE ELEVATORS
- IF SMOKE IS PRESENT, STAY LOW.
- ONCE OUT OF DANGER, CALL 911 TO DESCRIBE SITUATION.
- INFORM FIREFIGHTERS OF ANY PERSONS REMAINING IN BUILDING.

	FIRE EXTINGUISHER
	FIRE ALARM PULL STATION



Appendix C

Department Annual Safety Training Checklist

Department Annual Safety Training Checklist

The area supervisor or their designee must conduct the required training on the following items on an annual basis. This form will be maintained by the Lab Manager as documentation of training.

Employee Name (<i>print</i>):		Employee (<i>signature</i>)	
Supervisor (or Designee) Name (<i>print</i>)		Supervisor or Designee (<i>signature</i>)	
Department			Date
Employee Training Items		Supervisor's Notes	
1.	<p>Discuss the Hazards of the Job.</p> <p>Review all potential hazards including, but are not limited to:</p> <ul style="list-style-type: none"> • Physical (noise, moving machinery, hot surfaces, electrical, working from heights, ladders, slipping, falling, moving vehicles/equipment, sharp objects); • Chemical (gases, liquids, flammables, toxics, corrosives, poisons); • Ergonomics (repetitive motion, extreme heat/cold, lifting, vibrations, awkward positions); • Biological (blood, bacteria, viruses); • Hidden hazards: (i.e. asbestos, lead, underground utilities) <p>Does the employee use any special equipment / tools / vehicles? If so, discuss any hazards and required additional training.</p>		
2.	<p>Emergency Action Plans</p> <ul style="list-style-type: none"> • Location of the Emergency Action Plan • Evacuation procedures, fire alarms, and rally point information • Indicate who is designated and trained to use a fire extinguisher • Indicate who is designated and trained to be the emergency evacuation coordinator 		
3.	<p>If employee uses Personal Protective Equipment (PPE)</p> <ul style="list-style-type: none"> • Discuss the job tasks that require the use of PPE • Location and availability of PPE • Is the PPE adequate and serviceable? • 		
4.	<p>If employee uses Chemicals</p> <ul style="list-style-type: none"> • Location and availability of Material Safety Data Sheets (MSDS) within the work area • Discuss any changes in the chemicals used or precautions required since previous training • Ensure that hazardous chemical training has been completed for all hazardous chemicals unless covered by a current Chemical Hygiene Plan (CHP) • Discuss any changes to the Chemical Hygiene Plan, for chemicals covered by a CHP • Indicate who is designated and trained to clean up hazardous chemical spills • Discuss Satellite Accumulation Area (SAA) and Universal Hazardous Waste storage and training requirements 		
5.	<p>Review any additional safety training requirements they may require such as using ladders, Handling or using radioactive materials, Work with or around Satellite Accumulation Areas, Using hazardous chemical or cleaning up chemical spills, Wearing Personal Protective Equipment (PPE) such as mask,</p> <ul style="list-style-type: none"> • A complete listing is located on SEM web page at http://www2.umaine.edu/SEM/training.htm 		